THE IMPACT OF PARENTS' EDUCATION ON INFANT AND CHILD MORTALITY: A CASE STUDY OF MBEYA REGION

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A B S T R A C T

Variations in the operation of different socio-economic determinants of infant and child mortality among different socio-cultural and economic groups was the inspiration for undertaking this study. Among other socio-economic determinants, education of parents in particular, is considered here.

The study aimed at finding out whether or not in Mbeya Region infant and child mortality rates are related to the educational levels of the appropriate parents. Comparison of the effects of fathers' and mothers' education separately on infant and child mortality was the next objective. Finally, the study sought to investigate some of the mechanisms through which education operates in affecting the said mortality.

The data were taken largely from the household interviews and Maternal and Child Health (MCH) clinics. The interview schedule, documentary source and observations were the main instruments employed.

Indirect estimates of infant and child mortality by mother's education showed an inverse relationship. The education of each spouse was found to be equally important

in affecting infant and child mortality. Infant and child mortality in urban areas is consistently lower than in rural areas. However, the gap between the mortality experienced by more educated and less educated mothers is greater in urban areas than in rural areas. It was established among other mechanisms, that education operates through health care services and income in affecting infant and child mortality.

Some recommendations were also given. These include: improvements in the quality and quantity of antenatal and postnatal services, strengthening of health education, speeding up the establishment of a population policy and provision of safe water supplies. Finally, suggestions for future research have been given.

Following the above findings and arguments three issues arose:

1. If parental education has a significant influence on infant and child mortality in Tanzania, and Mbeya Region in particular.

2. Whether separate father's and mother's education have an equal influence on infant and child mortality and

3. What are the actual variables of education affecting infant and child mortality as documented by Davanzo and Habicht (1985).

The above three mentioned issues are, therefore, the ones to be investigated. The first one has been investigated in Tanzania but further investigation is needed. This is because, as far as the findings are concerned, there have been contradictions among the researchers involved. The other two issues have not yet been investigated in Tanzania.

TABLE 1.1

The Distribution of Some Health Staffs and Facilities in Mbeya District in 1978

ITEM	MBEYA URBAN	MBEYA RURAL
Population in 1978	78,111	256,472
No. of Hospitals	2	1
No. of M.O./Assistant M.O.	3	1
Hospital beds	414	56
Population per M.O./ASS.M.O	26,037	256,472
Population per Hospital bed	189	4580

Source: Computed from the Inventory of Health Facilities in Mbeya Region in 1978.

Note: M.O. = Medical Officer.

From the 1978 population census, the mortality rates calculated for Mbeya Region appear to match with the above distribution (Table 1.1). According to Sembajwe (1983) infant and child mortality rates were respectively 127.3 and 100.7 in Mbeya Urban whereas in the rural areas the rates were relatively higher. They were 169.9 and 140.3 for infant and child mortality respectively.

1.8 HYPOTHESES

In conducting this study the following hypotheses were put forward:

1. Infant and child mortality rates are inversely related to the parents' years of formal schooling.

-This hypothesis stemmed from the fact that formal education facilitates knowledge and use of the available health care facilities (U.N; 1985). The hypothesis was also necessary so as to resolve the queries derived from the findings of Sembajwe (1973) and Ebanks (1985) as explained in the theoretical framework.

2. Both mother's and father's education have a significant effect on infant and child mortality.

- The hypothesis has been set purposely because most studies that have analysed infant and child mortality differentials according to Parental education have focused on the mother's rather than father's years of schooling (Behm, 1980; Caldwell, 1979; Cochrane et al 1980; Frenzen and Hogan, 1982). Emphasis on the mother's education is based on the greater time and effort devoted to child care

for women than for men. However, it is felt that educated women are more likely to be employed. Thus, the working mother has less time to devote to child care but increases the family's economic resources, which might have a favourable impact on child health just as the case of men.

3. Mortality differentials among more educated and less educated mothers is higher in the rural areas compared to urban areas.

- The hypothesis was set up so as to test if education influences mortality through increasing parents' knowledge of how to care for children and their awareness and use of appropriate health care services. This is because according to Rosenzweig and Schultz (1981), if education has greater effect in rural areas than in urban areas where modern health facilities are concentrated, it would suggest that education may act as a substitute for health care services.

4. The higher the level of education of the parents the higher the frequency of attendance to MCH clinics and the healthier are their infants and children.

- The hypothesis was geared towards proving the claim that educated parents are more likely to use health services, if they are available, than their uneducated counterparts (Sadik, 1989). Educated parents are believed to take the advantage of community services such as antenatal and postnatal care and are better able to tend to their infants and children needs.

5. Parents with equal income but different levels of education experience similar infant and child mortality rates.

- According to Davanzo and Habicht (1985), education is considered also to influence infant and child mortality through the increased income it is associated with. In turn, with the increased income household's ability to afford the inputs - good diet, modern medical care and others is increased.

airfields in use. However, intra-district transport in some interior areas is inadequate and poor. This included Ilembo, the ward which was sampled for the study.

According to the 1978 census, infant mortality rate was 169.9 and 127.3 whereas child mortality rate was 140.3 and 100.7 in the rural and urban areas respectively (Sembajwe, 1983). Total fertility rate in 1978 was reported as 6.3 (Ngallaba, 1983). Of the total population in Mbeya Rural and Urban Districts, 35 per cent are children below 15 years of age and the sex ratio is 94 males/100 females (computed from 1988 Population Census). This indicates an outmigration of male labour. The female surplus is concentrated in the productive age group 15-55 years. In Mbeya Rural District, the population growth rate was 2.7 per cent between 1978 and 1988 whereas in the same period the population growth rate was 7.2 per cent in Mbeya Urban District (Bureau of Statistics, 1989).

2.2. THE POPULATION

The population of study was on spouses in Mbeya District on condition that the wives are aged 15-49 years. The target population consisted of 800 households in both

rural and urban areas of the district. In addition, 400 mothers were included. Among these, 200 were attending antenatal and 200 were attending postnatal MCH clinics. Since in each household both spouses could be interviewed, the overall population of study sums up to 2,000 respondents.

As it was impossible to conduct the research in all six districts of the region, Mbeya District (rural and urban) was selected in advance to represent the region. The choice was attributed to the fact that some researchers were interested in comparing some demographic issues as they pertain to urban and rural localities of the region. Yet, others required an area with a fast growing urban area. Considering the above prerequisites together with other contributing factors such as the time allocated for the research and transport accessibility within the districts, Mbeya District (rural and urban) was inevitably found to be an appropriate area.

2.3 THE SAMPLE SIZE AND SAMPLING PROCEDURE

The sampled population in this study consisted of 1000 households. With this number, it was anticipated that 800

households with spouses could be found. This excluded the mentioned 400 mothers attending MCH clinics for antenatal or postnatal care. According to the 1988 population census, the population of Mbeya District was 152,844 and 332,430 in urban and rural areas respectively (Bureau of Statistics, 1989). This implies that the urban population was almost half the rural population. For the sample to be unbiased, therefore, for every household sampled for the research in the urban area, two households had to be taken from the rural area. In other words, the urban to rural ratio was 1:2. Following the above argument, of the 1000 households sampled for the study, about 333 were to be taken from the urban area and 666 from the rural area. Just for simplification, 340 and 660 households from the urban and rural areas respectively were sampled. With the described categorization, it was thought that about 267 and 533 households in the urban and rural areas respectively with couples and meanwhile wives aged 15 to 49 years would be found. This would add up to 800 households which was the required population. However, considering that some households among the 1000 sampled for the study lacked couples and in some cases, where couples existed wives are above 49 years of age, only 702 eligible households were found. This amounted to about 88 per cent of the 800 targeted households.

principle each Ten-cell leader should have 10 households, in practice that is the minimum number. In some villages in the rural areas, the average number amounted to 30 households. Since there were variations on the above conditions among different wards and villages, the number of Ten-cell leaders selected similarly varied among different locations. The actual distribution is summarized in table 2.1.

Table 2.1

The Distribution of Ten-cell Leaders and Eligible Households Involved in the Study in Different Wards of each Residence

PLACE OF RESIDENCE	WARD	VILLAGE	NUMBER OF TEN-CELL LEADERS	HOUSEHOLD WITH ELIGIBLE COUPLES
URBAN	Itezi	-	8	110
	Mabatini	-	8	98
	Majengo	-	6	79
RURAL	Ilembo	Ilembo	16	102
	Iwindi	Iwindi	8	101
	Rujewa	Rujewa	7	111
	Ulenje	Igoma and Kimondo	14	101
TOTAL			67	702

Source: Household Interview.

Table 2.2

Myers' Blended Index for Terminal Digits Preference for Mbeya Rural and Urban Districts

Terminal Digit	Percent Distribution	Deviation from 10
0	16.1	6.1
1	6.0	4.0
2	11.0	1.0
3	5.7	4.3
4	5.3	4.7
5	16.0	6.0
6	8.2	1.8
7	8.2	1.8
8	14.3	4.3
9	9.2	0.8
Total		34.8
Summary Index of Age Preference (Total/2)		17.4

Source: Computed from Household Interview Data.

preference for numbers ending in `0' and `5' in the reporting of dates and ages, any five-year interval of age is used since each interval will contain one preferred number.

In the absence of vital registration system as in Tanzania, reporting of children ever born and surviving could affect the quality of the data. To test this, one assumption made was that, other things being equal, average parity rises with increasing age of women. As table 2.3 reveals, a tabulation of average parities showed the lowest parity for women at age 15-19 and highest parities at 45-49 years.

Table 2.3

Distribution of Average Parity per Woman by Age Group of Mother

Age-group	No. of Mothers	No.of Children ever born		Parity
15-19	40	27	27/40	0.675
20-24	146	289	289/146	1.979
25-29	179	579		3.235
30-34	101	492		4.871
35-39	113	631		5.584
40-44	61	389		6.377
45-49	62	446		7.194

Source: Computed from Household Interview Data

Table 3.01

Percentage Distribution of the Population by Level of Education and Sex

EDUCATIONAL ATTAINMENT	MALE %	FEMALE %
No Schooling	28.5	38.7
1-4 years	20.4	13.1
5-8 years	38.6	41.6
9 or above years	12.5	6.6

Source: Computed from Household Interview Data

An interesting feature that may be observed from table 3.01 is that sex differential in educational attainment is in favour of the males than females. Similarly, as it can be deduced from table 3.02 and appendix 3.06-3.09, an urban population is more educated than the rural population.

Table 3.02

Percentage Distribution of the Population by Residence and Education

EDUCATIONAL ATTAINMENT	RURAL %	URBAN %
No schooling	40.4	23.7
1-4 years	18.7	13.9
5-8 years	34.3	48.5
9 or above years	6.6	13.9

Table 3.03

Children Ever Born and Children Dead

Classified by Age Group and Educational Level of Mother

EDUCATIONAL GROUP (Yrs of Schooling)	NUMBER OF	AGE OF MOTHERS (YEARS) 15-19	20-24	25-29	30-34	35-39	40-44	45-49	TOTAL
NONE	Mothers	9	19	51	51	58	31	39	258
	CEB	6	47	208	277	363	212	296	1409
	CD	1	8	38	59	90	57	94	347
1-4	Mothers	4	6	25	17	25	14	10	101
	CEB	3	17	92	77	127	90	69	475
	CD	1	3	18	16	27	20	16	101
5-8	Mothers	25	113	93	25	25	10	6	297
	CEB	17	214	263	108	120	57	41	820
	CD	2	32	40	18	25	15	13	145
9 and above	Mothers	2	8	10	8	5	6	7	46
	CEB	1	11	16	30	21	30	40	149
	CD	0	1	2	4	3	5	7	22
ALL	Mothers	40	146	179	101	113	61	62	702
	CEB	27	289	579	492	631	389	446	2853
	CD	4	44	98	97	145	97	130	615

Source: Household Interview

For each educational group there were seven parities $P_{(i)}$, i.e. P_1 which refers to age group 15-19, P_2 age group 20-24 ..... P_7 age group 44-49. As shown in appendix 3.1 to 3.5, the average parity per woman $P_{(i)}$, in column 4 was calculated using the formula:

$P_{(i)} = CEB_{(i)} / FP_{(i)}$ where $CEB_{(i)}$ is the number of children ever born by women in age group i, appearing in column 3; and $FP_{(i)}$ is the total number of women in age group i shown in column 2.

The proportion of children dead for each age group of mother, $D_{(i)}$ was computed by dividing the number of children dead given in column 5 by the children ever born, CEB.

Thus, $D_{(i)} = CD_{(i)} / CEB_{(i)}$.

Column 7 shows the age intervals of children representing the length of the period at which children for mothers in various five-year age groups are exposed to the risk of death. The multipliers $K_{(i)}$, in column 8 required to adjust the reported proportion dead for the effects of the age pattern of childbearing, were calculated from the ratios P_1/P_2 and P_2/P_3. Together with these ratios, the standard regression coefficients obtained from North family of model life table were employed. They are shown in appendix 3.11.

The formula used is: $K_{(i)} = a_{(i)} + b_{(i)}\ P_1/P_2 + C_{(i)}\ P_2/P_3$. The North family model life table was employed because it was established that the Tanzanian mortality pattern follows the underlying pattern of North family (Egero and Henin, 1973). Chanaka; (1985) and Sembajwe; (1983) derived mortality levels in Tanzania by employing North family model life table and their results were consistent. The estimated values of probabilities of dying $q_{(x)}$, shown in column 9 were computed by multiplying the $K_{(i)}$ values by the corresponding proportions dead, $D_{(i)}$.

$$\text{Thus, } q_{(x)} = K_i D_i$$

The probability of surviving at each age given in column 10 was obtained by subtracting from one, the estimated proportion dead. The mortality level for each estimated $q_{(x)}$ value was derived from the North model life table by linear interpolation of the two successive values of $l_{(x)}$ given in the life table that encloses the estimates $l_{(x)}$ corresponding to each $q_{(x)}$. These $l_{(x)}$ values are shown in appendix 3.10. The interpolation factor, IP, is therefore given by;

$$IP = (x-x_1) \ / \ (x_2 - x_1) \text{ where:}$$

x is the estimated $l_{(x)}$ value

x_1 and x_2 are respectively the lower and upper $l_{(x)}$ values in the life table enclosing the estimated $l_{(x)}$. The calculated IP was added to the mortality level of the lower $l_{(x)}$ value so as to get mortality level for appropriate $q_{(x)}$ value. The Coale-Demeny Regional life tables was chosen because it has an advantage of providing the relevant mortality measures and a set of stable population models with measures of vital rates (Egero and Henin, 1973).

The overall mortality level for each educational group was finally obtained by averaging the mortality levels for $q_{(2)}$, $q_{(3)}$ and $q_{(5)}$. Final implied infant and child mortality rates ($_1q_0$ and $_4q_1$) were obtained from Coale-Demeny North model life table. The level q^1 was not considered because it is based on the $D_{(1)}$ corresponding to younger women in ages 15-19. According to Brass et al (1968), the mortality of children born to teenage women is substantially higher than the mortality of other children. This would tend to make the $q_{(1)}$ estimated from $D_{(1)}$ unrepresentatively high. This was found to be valid in Tanzania during the analysis of 1967 population census data (Egero and Henin, 1973). Similarly, when analyzing the 1973 National Demographic Survey of Tanzania, it was found that the l_1 value led to the lowest life expectancies. This supports that the

mortality experience of children born to younger mothers is unrepresentative (Henin, Ewbank and Sekatawa, 1973). Moreover, the number of women in this group, being relatively small, would lead to bias estimate. Similarly, $q_{(10)}$, $q_{(15)}$ and $q_{(20)}$ are based on the memory of remote events by women whose responses are likely unrepresentative due to the wide prevalent of omissions and age misstatements (Brass et al; 1968).

So as to provide a wide range of comparison, the overall infant and child mortality rates for all educational groups were as well computed. All mortality rates are given in table 3.04

Table 3.04

Infant and Child Mortality Rates for Different Educational Groups

Education Level of the Mother (Years)	Infant mortality per 1000	Child mortality per 1000	North mortality level.
None	116.8	89.4	12.9
1-4	112.3	84.4	13.3
5-8	95.8	66.8	14.8
9 or more	66.2	39.2	17.7
All groups	106.7	78.2	13.8

Source: Computed Data from Household Interview.

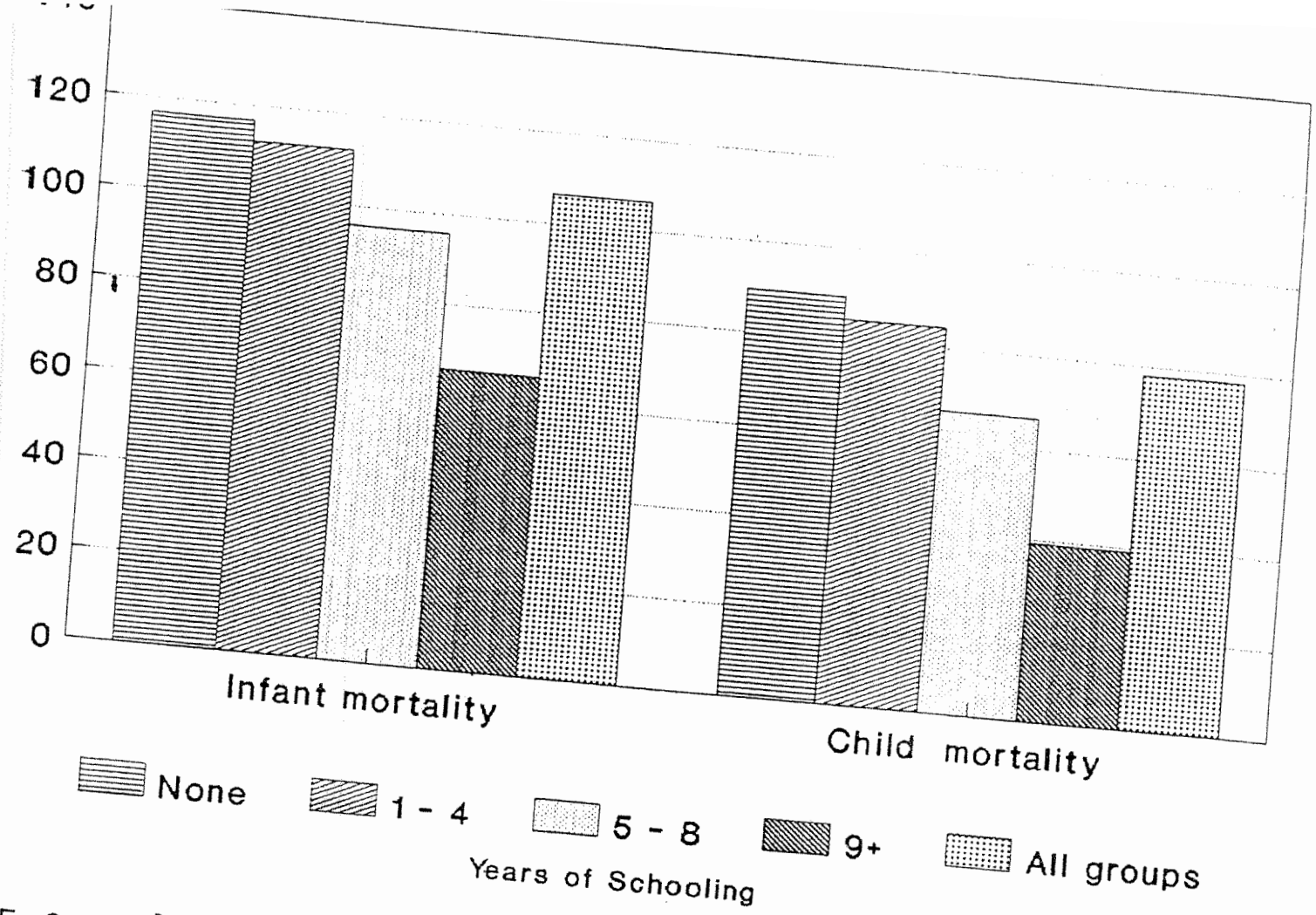

FIGURE 3: Mortality Rate by Mothers Education
Mbeya Rural and Urban Survey, 1989

on infant and child mortality. To test the hypothesis, three different methods were employed. Firstly, the proportions of children surviving by the educational level of parents were computed as indicated in table 3.05.

Table 3.05

Proportion of Children Surviving by Educational Level of Mothers and Fathers

SCHOOLING IN YEARS	PROPORTION OF CHILDREN SURVIVING TO MOTHERS		FATHERS	
ZERO	0.7397	(1529)	0.7118	(1152)
1-4	0.7890	(436)	0.7893	(674)
5-8	0.8378	(777)	0.8306	(791)
9 AND ABOVE	0.8523	(149)	0.8905	(274

Note: Number of Births in Parenthesis

Source: Computed Data from Household Interview.

The aim behind was to test if the observed difference in the contribution of fathers and mothers education to

children survivorship was significant. Table 3.05 indicates that 53 per cent of all births in Mbeya District were born to illiterate mothers, and only 40 per cent by illiterate fathers. The education status of mothers is thus worse than that of their husbands. The table also shows a positive relationship between the level of education of any of the parent and the proportion of children surviving. In other words, the higher the level of education of the parent, the higher the proportion of children surviving. These findings strengthen approval of the former hypothesis. At zero educational level, both parents are filled by the constraints of traditional cultures, accepting traditional theories of illness and treatment. Their level of income is very low. However, at this level mothers seem to contribute more to the welfare of their children because they are always with them. At educational level of 1-8 years (Primary), the authority of the school directly challenges the traditional authority structure. Their household income is satisfactory and hence, to some extent, there is a reduction in infant and child mortality. The contribution of education for both mothers and fathers to the survivorship of their children is, therefore, more or less similar. Attainments of secondary education (9 years and above) makes the reduction

of infant and child mortality even greater. This is because parental educational level is positively associated with the nutritional status of their babies (Cochrane, 1980). Well educated parents are most likely to work in occupations which are highly paying. As Cochrane (1980) quotes Schultz (1979), wife's education increases the wife's income, which reduces infant and child mortality, but also increases the wife's time outside the home; which increases infant and child mortality. However, the overall net effect of education is still negative. It is felt that, since educated mothers are the ones most likely to work on occupations where they must be completely separated from their children, education acts to reduce breastfeeding with deleterious effects on mortality. Basing on the above arguments, therefore, the notion that mothers contribute more because they are always with their children is not applicable at this particular level of education. As such, the contribution of both fathers and mothers is expected to be the same.

A t-statistic was employed to test, at the level 0.01, the null hypothesis that there is no significant difference between the mean proportion children surviving by

Table 3.07

Correlation Coefficients Between Proportion of Children Dead with some Selected Socio-economic Variables.

	CEB	INCOME	RESIDENCE	OCCUPATION	EDUCATION
MOTHERS	.2158**	-.0926*	-.1524**	-.0559	-.1479**
FATHERS	.2380**	-.1000*	-.1508**	-.1452**	-.2313**

Source: Computed from Household Interview Data

Note: ** 1 tailed significance - 0.001

* 1 tailed significance - 0.01

From the results obtained, both mother's and father's education have a significant effect on infant and child mortality as hypothesized. It seems the reasons given when the first method was used to test the hypothesis are applicable here as well.

The last method employed is the multiple regression analysis. Just for the control of other intervening variables, education was taken together with four other independent variables. While multivariate analysis does not provide a perfect solution, it does enable one to get

a rough approximation of the relative importance of education while controlling for these other variables, and of other variables while controlling for education. Here, the regression of proportion of children dead on the five independent variables was done. The multiple regression relationship assumed is:

$D_i = a + b_1E + b_2I + b_3R + b_4O + b_5C$

where, E, I, R, O and C are respectively Education, Income, Residence, Occupation and Children-ever born measured as shown in Table 3.08.

Table 3.08

Multiple Regression Coefficients for the Proportion of Children Dead with Some Socio-economic Variables for both Mothers and Fathers

VARIABLE	BETA COEFFICIENT FOR MOTHER	BETA COEFFICIENT FOR FATHER
CEB	.17894**	.17189**
Occupation	.00724	-.04302
Residence	-.11126**	-.08061*
Income	-.04926	-.00893
Education	-.03360	-.12100**

Source: Computed from Household Interview Data.

Note: * Significant at 0.05 level (95% level)

** Significant at 0.01 level (99% level)

Table 3.09

Mean Attendance for Antenatal Care by Mother's Level of Formal Education

Level of Education (Years)	Times Attended
0	3.6
1-4	3.7
5-8	3.4
9 or Above	3.2

Source: Computed from MCH Clinics Data.

As there is no partial attendance, it can be taken for granted that all educational groups have a mean attendance of four. However, considering the decimal points, it is puzzling because, roughly, attendance to MCH clinics decreases as the number of years of schooling increases. The same procedure was repeated but this time the education of their husbands was taken as an independent variable. Almost the same values were obtained. Following the above results, one can as well approximate an absence of the relationship between the two variables. Basing on the information obtained from the indepth study, the findings

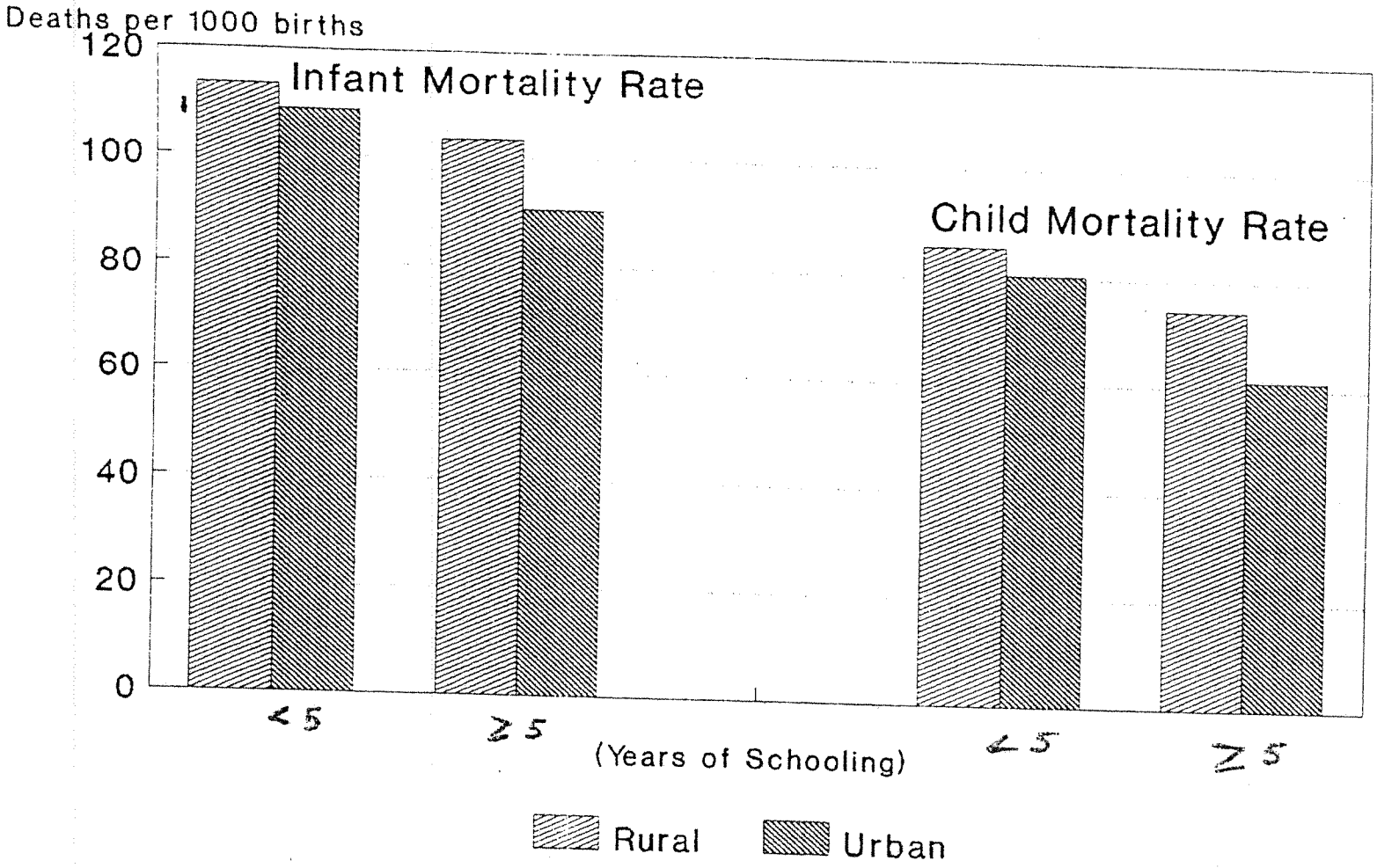

FIGURE 4: Mortality Rates by Mothers Education and Residence
Mbeya Rural and Urban Survey, 1989

Table 3.11

Infant and Child Mortality Rates (IMR & CMR)

by Education and Residence of Mothers

	EDUCATIONAL GROUP			
	MORE EDUCATED MOTHERS		LESS EDUCATED MOTHERS	
RESIDENCE	IMR	CMR	IMR	CMR
Urban	90.5	61.5	108.9	80.7
Rural	103.4	74.6	113.4	85.6

Source: Computed from Household Interview Data

The findings show that in urban areas, infant and child mortality differentials between more educated and less educated parents is higher compared to rural areas. This is contrary to what was hypothesized. According to Rosenzweig and Schultz (1981), if education has greater effect in rural areas than in urban areas where modern health facilities are abundant, it is an indication that

hypothesis was put forward: Parents with equal income but different levels of education experience similar infant and child mortality. Both fathers and mothers were grouped in one among the four income groups shown in table 3.12. The classification also considered their level of education. For convenience, three educational levels were thought to be proper: those who did not go to school, those who have completed or at least attended primary education and those who have attended secondary education or above. That is 0, 1-8 and 9+ years of formal schooling.

Table 3.12

Percentage Distribution of the Parents by Income and Level of Education.

INCOME PER	LEVEL OF EDUCATION							
	ZERO		PRIMARY		SECONDARY +		TOTAL	
ANNUM (Tshs)	M	F	M	F	M	F	M	F
≤10,000	8.7	7.7	4.0	5.0	0.1	0.1	12.8	12.8
10,001-30,000	21.0	14.9	26.5	31.0	0.4	1.9	47.9	47.9
30,001-50,000	6.4	4.3	15.4	15.4	2.3	4.4	24.1	24.1
> 50,000	2.7	1.6	8.7	7.5	3.8	6.1	15.2	15.2
TOTAL	38.8	28.5	54.6	59.0	6.6	12.5	100.0	100.0

Source: Computed from Household Interview Data.

Table 3.13

Proportion of Infants and Children Dead by Educational and Income Levels of Parents.

Income per Annum -(Tshs)	Educational Level of Mothers			Educational Level of Fathers		
	Zero	Primary	Secondary+	Zero	Primary	Secondary+
30,001-50,000	0.2948	0.1773	0.1522	0.2766	0.2141	0.1310
>50,000	0.2308	0.1504	0.1489	0.2639	0.1613	0.1043

Source: Computed from Household Interview Data.

Table 3.13 portrays two different trends. Firstly, basing on the two income levels, it is found that the proportion of infants and children dead decreases with increasing income. Therefore, other intervening variables being constant, infant and child mortality is negatively related to income. Secondly, considering a particular income level, infants and children deaths decrease as the level of education increases. Hence, regarding the hypothesis previously set, parents with equal income but different levels of education do not experience similar

C H A P T E R F O U R

CONCLUSIONS AND RECOMMENDATIONS

4.0 INTRODUCTION

This chapter presents the main conclusions reached and makes recommendations pertaining to the attempts to lower the infant and child mortality rates in Mbeya Region as a whole. There are also suggestions for further research on the issue in future.

4.1 CONCLUSIONS

The objective of the study, which is based on Mbeya Rural and Urban Districts, was to investigate if there is a relationship existing between parental education and both infant and child mortality rates. Furthermore, the study aimed at determining the extent of the contribution of the education of mothers and fathers separately in influencing infant and child mortality. The study also sought to establish some of the mechanisms through which education operates in affecting infant and child mortality.

The hypotheses put forward in this study were:

1. There is a negative relationship between Parent's education and both infant and child mortality.

2. The education of both fathers and mothers have a significant effect on infant and child mortality.

3. Infant and child mortality differentials between more educated and less educated mothers is greater in rural areas as compared to urban areas.

4. The higher the education of spouses the higher the frequency of utilization of public health services and the healthier are their babies.

5. Spouses having similar household income experience similar infant and child mortality, regardless of their educational levels.

A random sampling method was used to get 1000 households involved in the interview. Of these, only 702 households were found to have spouses eligible for the

study. The interview schedule, documentary source and observations were the main instruments employed to obtain the required data. The instruments sought to obtain data about the birth history, household income, general hygiene and both antenatal and postnatal records in MCH clinics. Together with the tabular analysis and t-tests, correlation and multiple regression were employed.

From the study it was found that infant and child mortality rates were respectively 116.8 and 89.4 for parents who have not attended formal schooling, 112.3 and 84.4 for those with 1-4 years, 95.8 and 66.8 for parents with 5-8 years and 66.2 and 39.2 for those with 9 or above years of formal schooling. The overall infant and child mortality rates for all parents regardless of their levels of education are 106.7 and 78.2 respectively. The results show that both infant and child mortality rates decrease with increasing parental level of education.

The proportion of children dead by the education of mothers and fathers separately showed no statistical difference. The coefficient of correlation between mothers' years of formal schooling and the number of children dead was found to be -0.1479 whereas that of fathers' was-0.2313. Both coefficients were significant at

0.001 level. From multiple regression analysis, which besides education included children ever born, income, residence and occupation as other independent variables, revealed mothers' education to be insignificant. Fathers' education was found to be significant at 0.001 level. For mothers, the residence was found to be more significant.

There is a greater infant and child mortality differential between more educated parents (those attained 5 or above years of formal schooling) and their less educated (less than 5 years of formal schooling) counterparts within the same residence. Infant and child mortality rates computed for the rural district are 113.4 and 85.6 respectively for less educated parents whereas for more educated parents are 103.4 and 74.6 respectively. In the urban district, the calculated infant and child mortality rates are respectively 108.9 and 80.7 for less educated parents and 90.5 and 61.5 for more educated parents. These rates show that the gap between less educated and more educated parents is greater in the urban than in the rural district.

The frequency of attendance for antenatal care was higher for less educated mothers than more educated ones. That is, as the level of education of mothers increased,

the attendance tended to decrease. The decrease was, however, very small so that statistically it was found to be insignificant.

The number of infants and children with graphs of their body weights concentrated in the green area (showing good health status) of the postnatal clinic card increased with increasing educational level of their parents. Those with graphs concentrated in the red region (poor health status) decreased with increasing educational level of their parents.

The household income in most cases was found to increase with the education of the parents. In turn, the proportion of children dead decreased as the income of the household increased. However, parents having similar income do not experience similar children deaths as long as there is a variation in their level of education. The more educated in any given level of income are always at the advantage.

As regard the above hypotheses, respectively the following are the conclusions reached.

a) There is a negative relationship between both infant and child mortality rates and the corresponding years

of formal schooling of the parents. In other words, mortality rates decline as the level of education of the parents increases. However, the relationship was not tested for non-linearity. The mortality gap between parents with none and 1-4 years of formal schooling for example, is very small compared to the mortality gap between any other two consecutive educational groups. The hypothesis is thus accepted.

b) There is no significant difference in the extent to which fathers' and mothers' education contribute in affecting infant and child mortality. Generally speaking, statistically there was no significant difference between the proportion of children dead by the education of any of the spouses. The hypothesis has also been accepted.

c) Infant and child mortality differential between more educated and less educated parents is greater in urban areas than in rural areas. This warrants the rejection of the hypothesis. However, following Rosenzweig and Schultz (1981) explanations, this is an indication that education does not influence infant and child mortality through increasing health care services alone. Other channels of operation do exist.

d) Infants and children of more educated parents are healthier in terms of body weights than those of their less educated counterparts. However, there is no significant difference in the frequency of attendance for antenatal care between the two groups. Yet, the difference in health status among kids of different educational groups, by itself, proves that health care services is among the most important mechanisms through which education operates to influence infant and child mortality. The hypothesis is, therefore, partly accepted and partly rejected.

e) The income of the household similarly varied negatively with infant and child mortality. Nevertheless, the hypothesis is rejected because when controlling for income, infant and child mortality, decreased with increasing level of education.

In short, this study has indicated that parental education measured by years of formal schooling is negatively related to infant and child mortality. In that respect, the education of each spouse is equally important. Education operates through income and health care services in influencing infant and child mortality. Still, the two

Appendix 3.1

Estimation of Infant and Child Mortality Using Trussell's method for Women with Zero Years of Formal Schooling

Age-Group	Number of Women	Number of Children Ever Born	Parity	Number of Children Dead	Proportion of Children Dead	X	Multipliers	Probability of Dying at Exact Age x	Probability of Surviving at Exact Age x	Mortality Level (North Family
	FP	CEB	P(i)	CD	Di		K(i)	q(x)	L(x)	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
15-19	9	6	0.667	1	0.167	1	0.8375	0.1399	0.8601	11.1
20-24	19	47	2.474	8	0.170	2	0.8870	0.1508	0.8492	12.8
25-29	51	208	4.078	38	0.183	3	0.8868	0.1623	0.8377	13.2
30-34	51	277	5.431	59	0.213	5	0.9433	0.2009	0.7991	12.6

Source: Computed from Household Interview Data.

Appendix 3.2

Estimation of Infant and Child Mortality Using Trussell's Method

for Women with 1-4 Years of Formal Schooling.

Age-Group	Number of Women	Number of Children Ever Born	Parity	Number of Children Dead	Proportion of Children Dead	X	Multipliers	Probability of Dying at Exact Age x	Probability of Surviving at Exact Age x	Mortality Level (North Family
	FP	CEB	P(i)	CD	D(i)		K(i)	q(x)	l(x)	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
15-19	4	3	0.750	1	0.333	1	0.9908	0.3299	0.6701	1.3
20-24	6	17	2.833	3	0.176	2	0.8457	0.1488	0.8512	12.9
25-29	25	92	3.680	18	0.196	3	0.8025	0.1573	0.8427	13.5
30-34	17	77	4.529	16	0.208	5	0.8496	0.1767	0.8233	13.4

Source: Computed from Household Interview Data.

Appendix 3.3

Estimation of Infant and Child Mortality Using Trussell's Method

for Women with 5-8 Years of Formal Schooling.

Age-Group	Number of Women	Number of Children Ever Born	Parity	Number of Children Dead	Proportion of Children Dead	X	Multipliers	Probability of Dying at Exact Age x	Probability of Surviving at Exact Age x	Mortality Level (North Family)
	FP	CEB	P(i)	CD	Di		K(i)	q(x)	l(x)	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
15-19	25	17	0.680	2	0.118	1	0.6305	0.0744	0.9256	16.8
20-24	113	214	1.894	32	0.150	2	0.8086	0.1213	0.8787	14.7
25-29	93	263	2.828	40	0.152	3	0.8581	0.1304	0.8696	15.1
30-34	25	108	4.320	18	0.167	5	0.9347	0.1561	0.8439	14.7

Source: Computed from Household Interview Data

Appendix 3.4

Estimation of Infant and Child Mortality Using Trussell's Method for Women with 9 or Above Years of Formal Schooling

Age-Group	Number of women	Number of Children Ever Born	Parity	Number of Children Dead	Proportion of children Dead	X	Multipliers	Probability of Dying at Exact Age x	Probability of Surviving at Exact Age x	Mortality Level (North Family)
	FP	CEB	P(i)	CD	D(i)		K(i)	q(x)	l(x)	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
15-19	2	1	0.500	0	0.000	1	0.7766	0.0000	1.0000	24.0
20-24	8	11	1.375	1	0.091	2	0.7533	0.0686	0.9314	18.6
25-29	10	16	1.600	2	0.125	3	0.7608	0.0951	0.9049	17.3
30-34	8	30	3.750	4	0.133	5	0.8293	0.1103	0.8897	17.2

Source: Computed from Household Interview Data.

Appendix 3.5

Estimation of Infant and Child Mortality Using Trussell's Method

for all Women (All Educational Groups)

Age-Group	Number of Women	Number of Children Ever Born	Parity	Number of Children Dead	Proportion of Children Dead	X	Multipliers	Probability of Dying at Exact Age x	Probability of Surviving at Exact Age x	Mortality Level (North Family)
	FP	CEB	P(i)	CD	Di		K(i)	q(x)	l(x)	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
15-19	40	27	0.675	4	0.148	1	0.6338	0.0938	0.9062	14.9
20-24	146	289	1.979	44	0.152	2	0.8369	0.1272	0.8728	14.3
25-29	179	579	3.235	98	0.169	3	0.8872	0.1500	0.8500	13.9
30-34	101	492	4.871	97	0.197	5	0.9620	0.1895	0.8105	13.1

Source: Computed from Household Interview Data.

$CD_{(i)} / CEB_{(i)}$

age intervals of children representing the length of the period at which children for mothers in various five-years groups are exposed to the risk of death.

Appendix 3.6

Estimation of Infant and Child Mortality Using Trussell's Method for Women with Zero and Less than 5 Years of Formal Schooling in Mbeya Rural

Age-Group	Number of Women	Number of Children Ever Born	Parity	Number of Children Dead	Proportion of Children Dead	X	Multipliers	Probability of Dying at at Exact Age x	Probability of Surviving at Exact Age x	Mortality Level (North Family)
	FP	CEB	P(i)	CD	Di		K(i)	q(x)	l(x)	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
15-19	4	4	1.000	1	0.250	1	0.7287	0.1822	0.8178	8.3
20-24	13	38	2.923	7	0.184	2	0.8047	0.1481	0.8519	12.9
25-29	50	201	4.020	39	0.194	3	0.8280	0.1606	0.8394	13.3
30-34	48	268	5.583	55	0.205	5	0.8973	0.1839	0.8161	13.4

Source: Computed from Household Interview Data

Appendix 3.7

Estimation of Infant and Child Mortality Using Trussell's Method for Women with Zero and less than 5 Years of Formal Schooling in Mbeya Urban

Age-Group	Number of Women	Number of Children Ever-Born	Parity	Number of Children Dead	Proportion of Children Dead	X	Multipliers	Probability of Dying at Exact Age x	Probability of Surviving at Exact Age x	Mortality Level (North Family)
	FP	CEB	P(i)	CD	Di		K(i)	q(x)	l(x)	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
15-19	9	6	0.667	1	0.167	1	0.6939	0.1159	0.8841	12.9
20-24	12	26	2.167	4	0.154	2	0.8714	0.1342	0.8658	13.8
25-29	26	99	3.808	17	0.172	3	0.9080	0.1562	0.8438	13.6
30-34	20	86	4.300	16	0.186	5	0.9763	0.1816	0.8184	13.5

Source: Computed from Household Interview Data.

Appendix 3.8

Estimation of Infant and Child Mortality Using Trussell's Method for Women with 7 or Above Years of Formal Schooling in Mbeya Rural

Age-Group	Number of Women	Number of Children Everborn	Parity	Number of Children Dead	Proportion of Children Dead	X	Multipliers	Probability of Dying at Exact Age x	Probability of Surviving at Exact Age x	Mortality Levels (North Family)
	FP	CEB	P(i)	CD	D(i)		K(i)	q(x)	l(x)	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
15-19	9	8	0.889	1	0.125	1	0.2784	0.0348	0.9652	21.2
20-24	62	114	1.839	19	0.167	2	0.7199	0.1202	0.8798	14.8
25-29	55	148	2.691	25	0.169	3	0.8566	0.1448	0.8552	14.2
30-34	18	79	4.389	15	0.190	5	0.9650	0.1834	0.8166	13.4

Source: Computed from Household Interview Data

Appendix 3.9

Estimation of Infant and Child Mortality Using Trussell's Method for Women with 7 or Above Years of Formal Schooling in Mbeya Urban

Age-Group	Number of Women	Number of Children Ever-Born	Parity	Number of Children Dead	Proportion of Children Dead	X	Multipliers	Probability of Dying at Exact Age x	Probability of Surviving at Exact Age x	Mortality Level (North Family)
	PP	CEB	P(i)	CD	D(i)		K(i)	q(x)	l(x)	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
15-19	18	9	0.500	1	0.111	1	0.9190	0.1020	0.8980	14.2
20-24	59	111	1.881	14	0.126	2	0.8673	0.1093	0.8907	15.5
25-29	48	131	2.729	17	0.130	3	0.8444	0.1098	0.8902	16.3
30-34	15	59	3.933	11	0.186	5	0.8957	0.1666	0.8334	14.2

Source: Computed from Household Interview Data.