

Socio-Economic Determinants of Infant and Child Mortality Rate: The Case of Humbo Woreda, Snnpr, Ethiopia

Hailu Sodana Teka

Department of Economics, Wolaita Sodo University, PO Box 138, Wolaita Sodo, Ethiopia

Abstract

Background: Childhood mortality rate is the result of many social and economic factors than simple health crisis. The main aim of this study was analyzing the effect of socio-economic characteristics of households on infant and child mortality rate in Humbo Woreda, Wolaita Zone. This is important for revising the existing health, education, and economic programs and policies to meet GTPE. **Methods:** The study employed a cross-sectional type of data set which consists of a sample of households taken at a given point in time. Data was collected from 202 households using semi-structured questionnaires and interview schedule. Stratified random sampling method was used as sampling technique. The data was analyzed using both descriptive and econometric (logit) regression analysis. The study involved two dependent variables namely; IMR & CMR. **Results:** IMR of the Humbo woreda is 50 and it has shown about 15% reduction over the past 8 years. The current CMR of the Woreda is 48 and has shown about 25% reduction over this period. Working status of mother, level of mother education, access to health facilities, place of household residence, and access to safe water are determining IMR whereas access to safe water, level of father education, household size, working status of mother, occupational status of household heads, marital status of parents, and accesses to health facilities are determining CMR in the district. **Conclusion:** The study concluded that socio-economic factors such as working status of mother, mother education, access to health facilities, place of household residence, and access to safe water were the major determinants of IMR whereas access to safe water, father education, household size, working status of mother, occupational status of household heads, marital status of parents, and access to health facilities were the major determinants of CMR in the district. Community-based intervention is required and should focus on child spacing, improve access to parent's education, access to health facilities, access to safe water and poverty eradication programs, particularly in rural areas.

Keywords: IMR, CMR, Logit Model.

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Abbreviations

ICF: International Children Fund; **CLRM:** Classical Linear Regression model; **CMR:** Child Mortality Rate; **CSA:** Central Statistics Agency; **EDHS:** Ethiopian Demographic and Health Survey; **FMoH:** Federal Ministry of Health; **GTPE:** Growth and Transformation Plan of Ethiopia; **IMR:** Infant Mortality Rate; **MDGs:** Millennium Development Goals; **UNMDGs:** United Nation's Millennium development Goals; **VIF:** Variance Inflation Factor

INTRODUCTION

Poorer families have poor socio-economic conditions and hence higher exposure to illness and death. Among the indicators of socioeconomic and health conditions, infant and child mortality rate is the one that is most frequently facing the developing countries (Mutunga, 2007). In spite of the substantial drop in global childhood mortality rate, about 5.9 million children still die every year before their fifth birthday worldwide. Reducing childhood mortality rate to minimum level is thus a focus of every community and requires improvements in socio-economic status of the population as well as improvements in the direct services. More recently, Ethiopia has outlined the strategic plan to reduce infant mortality to 16/1000 live births and child mortality rate to below 30 deaths per thousand live children by the year 2035 (FMoH, 2014). Figures on vital health indicators show that infant and child mortality rates in national level for the survey year of 2011 are 48 and 58 respectively. These are still higher than GTPE levels and calls for special attention (CSA, 2016). People in the study area are still facing a high rate of childhood morbidity and mortality. Majority of the population remain chronically food insecure and are vulnerable to shocks and potential disasters. Previously, almost no studies have been done except simple Health Surveys on clinical factors only. This study was motivated to identify and analyze the main causes of infant and child mortality in the Woreda.

OBJECTIVES OF THE STUDY

The general objective

The general objective of this study was to identify and analyze the effect of socio-economic factors on infant and child mortality rate in Humbo Woreda, SNNPR.

The specific objectives

- To determine the levels of IMR and CMR;

- To determine the trends and differentials of IMR and CMR in the district;
- To analyze level of effect of socio-economic factors on IMR and CMR in the district;

MATERIALS AND METHODS

Description of the Study Area

This research was conducted in Humbo Woreda, Wolaita Zone. It is located at 418 km south from Addis Ababa. Agro-ecology of the Woreda is 30% moderate or Woynadega and 70% lowland or “kola”. The average temperature ranges between 15°C and 29°C and the altitude ranges from 1100 to 2800 m above sea level. The population of the Woreda is estimated to be 162,306 in 2016; of the total population, 50.3% and 49.7% are males and females respectively. The total households of the Woreda are estimated to 20,223; of which 16,519 are rural dwellers and 3,704 are urban dwellers.

Research design

The study used quantitative data types to investigate the mortality level & trends. The study employed a cross-sectional type; both primary and secondary data sources; stratified random sampling method as sampling techniques; children of age 1-12 months & children of age 12-59 months as the unit of analysis; 202 respondent households as sample size; and both descriptive and econometric analysis as method of data analysis .

Descriptive analysis

The levels, trends and differentials of mortality rates were calculated by considering total live births, total deaths and total survives in the woreda.

Econometric analysis

The effect of socio-economic factors on infant and child survival was analyzed using binary logit model.

Model Specification

The study involved two models; both models attempted to capture the socio-economic characteristics of households that affect IMR and CMR through Logit regression model. The general form of the logistic equation of these socioeconomic variables with their expected signs was presented in separate model for each dependent variable.

VARIABLE DESCRIPTIONS

Dependent variables

Infant Mortality Rate (IMR):– The dependent variable is “the risk of death occurring in an age interval of 1–12 month period”. It was noted as 1 if the child died before reaching 12 months of age and as 0 if otherwise. The estimated response probabilities in this case were strictly between zero and one.

Child Mortality Rate (CMR): - The dependent variable is “the risk of death occurring in an age interval in the 12–59 month period”.

Explanatory (covariates) variables

The following covariates: level of mother education (Meduc) (0= illiterate, 1= primary, 2= secondary & higher); Levels of Mother’s employment (Memp) (0= unemployed, 1 = employed); Marital status of parents (Ms) (0 if union, 1 if not in union); Level of father’s Education (Feduc) (0= illiterate, 1= primary, 2 = secondary & higher); household income (Hhil) is continue; Household size (Hhsize) (0 if 1-5 family members, 1 if 6-10, 2 if more than 10); Type of household residence (Thhrsd) (0 for rural, 1 for urban); Access to safe water (aswtr) (0 if no access, 1 if better access); Access to health facilities (Hhahf) (0 if no access, 1 if better access); Religion (Rl) (1= Protestant, 2 = Orthodox, 3= Catholic, 4 = Muslim, 5 = others); Occupational status of household heads (Hhoccp) (1= if working in government office, 2 if working on trading of sales and services, 3 if working on farming and 4 if working on domestic services and other.

RESULTS

I. SUMMARY RESULTS OF DESCRIPTIVE ANALYSIS

Table 5: The summary results of IMR in the woreda for the year 2010-2017

Years	Total live births	Total deaths	Total survives	Survival rates (%)	Death rates (%)	IMR
2010	2827	168	2659	94.06	5.94	59
2011	2768	158	2610	94.29	5.71	57
2012	2696	151	2545	94.40	5.6	56
2013	2623	142	2481	94.59	5.41	54
2014	2546	133	2413	94.78	5.22	52
2015	2467	128	2339	94.81	5.19	52
2016	2363	118	2245	95.01	4.99	50
2017	202	10	192	95	4.95	50

Source: Service Delivery Report of Humbo Woreda Health office for the year 2010-2017

Table 6: The summary of results of IMR on urban-rural basis for the year 2017

Variable	Description	Urban basis	Rural basis	District's basis
		Frequency	Frequency	Frequency
Infant mortality	infant survived	36	156	192
	infant died	1	9	10
	Total	37	165	202
	IMR	27	54	50

Table 7: Summary of results of IMR in comparison with GTPE and National achievement

Variable	Plan to be achieved in 2035	National achievement level in 2015	Woreda's achievement level in 2017	Differentials compared to National achievement	as compared to level	Gaps as compared to GTPE
IMR per 1000 live births	16	48	50	Lower achievement		Lower achievement

IMR was 59 in 2011 and 50 in 2017. It has shown about 15% reduction over the past 8 years. To see this rate on urban-rural basis, it is 27 in urban and 54 in rural areas. IMR is higher in rural areas than urban areas of the district. It is comparable with both the national figure and the country's strategic plan. IMR 50 is higher than both the national level in 2015 and the country's strategic plan by the year 2035.

Table 8: The summary results of socio-economic characteristics on basis of IMR

Hh Cxs.	Categories of socio-economic Cxs. & their codes	birth & death			IMR	Correlation with IMR
		Total births	live	No of deaths		
Meduc	0 = illiterate	103		8	78	Inverse
	1= primary educated	74		1	14	
	2= secondary and higher	25		1	40	
Memp	0= unemployed	157		4	25	Direct
	1= employed	45		6	133	
Ms	0= living in union	178		3	17	Direct
	1= not living in union	24		7	292	
Feduc	0 = illiterate	69		7	101	Inverse
	1= primary educated	83		2	24	
	2= secondary and higher	50		1	20	
Hhsize	0= 1-5 family members	170		2	12	Direct
	1= 6-10 family members	20		3	18	
	2= > 10 family members	12		5	417	
aswtr	0= Not piped (Others)	39		9	231	Inverse
	1= Piped water	163		1	6	
Hhahf	0 = not accessible	62		8	129	Inverse
	1= Accessible	140		2	14	
Thhrsd	0= Rural dweller	165		9	54	Inverse
	1= urban dweller	37		1	27	
Rl	1= Protestant	164		2	12	Direct
	2= Orthodox	24		3	125	
	3= Catholic	11		4	364	
	4= Muslim	-		-	-	
	5= Others	3		1	333	
Hhoccp	1=working gov't office	75		2	27	Direct
	2 = working in sales	50		3	60	
	3 = working on farming	72		5	69	
	4 = working other services	5		0	-	

Source: Computation from survey data, 2018

To see the effect of socioeconomic characteristics on IMR, IMR was 78, 14 and 40 for children whose mothers have no education and primary, secondary and higher respectively. It was 25 when mothers are unemployed and

133 when employed. It was 17 & 282 for children whose parents are living in union and not in union respectively. It was 101, 24 & 20 children whose fathers have no education and primary, secondary and higher respectively. All the deaths were in households in which their income was low. IMR was 12, 18 & 417 for children whose households have 1-5, 6-10 and > 10 family members respectively. It was 54 & 27 for children whose households live in rural and in urban respectively. It was 231 & 6 for children whose households have no access to safe water and have better access respectively. IMR was 129 & 14 for children whose households have no access to health facilities and have better access. It was 27, 60, & 69 for children whose households heads were working in government offices, working on sales & services and working on farming respectively. It was 12, 125, 364 & 333 for children whose parents were Protestant Christianity followers, Orthodox, Catholic and other religion followers respectively.

Table 9: The summary results of CMR in the woreda from the year 2010-2017

Years	Total live births	Total deaths	Total survives	Survival rates %	Death rates %	CMR
2010	21,234	1,359	19,875	93.60	6.4	64
2011	19,811	1,208	18,603	93.90	6.1	61
2012	18,576	1,096	17,480	94.10	5.9	59
2013	17,563	1,001	16,562	94.3	5.7	57
2014	16,701	935	15,766	94.41	5.59	56
2015	16,180	857	15,323	94.7	5.3	53
2016	15,722	802	14,920	94.9	5.1	51
2017	252	12	240	95.24	4.76	48

Table 10: The summary of results of CMR on urban-rural basis for the year 2017

Variable	Description	Urban basis	Rural basis	District's basis
		Frequency	Frequency	Frequency
Child mortality	child survived	37	203	240
	child died	1	10	12
	Total	38	213	252
	CMR	26	47	48

Source: own computation from survey data, 2018

Table 11: Summary of results of CMR in comparison with GTPE and National achievement

Variable	Plan to be achieved in 2035	National achievement level in 2015	Woreda's achievement level in 2017	Compared to National level in 2015	Gaps compared to GTPE
CMR	<30	58	48	Better achievement	Lower achievement

Source: own computation from survey data, 2018 & FMoH, 2014

Based on the above table 9, 10 & 11 above, CMR in the district was 64 in 2010 and 48 in 2017. It has shown about 25% reduction between the two periods. To see the rate on urban-rural basis, it is 26 in urban and 47 in rural areas. It is higher in rural than urban areas. CMR in 2017 is comparable with both the national figure and its strategic plan to be achieved by the year 2035. Hence, CMR 48 is lower than the national child mortality rate in 2015 and higher than its strategic plan to be achieved by the year 2035.

Table 12: The summary results of socio-economic characteristics on basis of CMR

HhCxs.	Categories of socio-economic Cxs.	birth & death			Correlation with CMR
		No of live births	No of deaths	CMR	
Meduc	0 = None educated	128	9	70	Inverse
	1= primary educated	94	3	32	
	2 = secondary and higher	30	-	0	
Memp	0= unemployed	187	11	59	Inverse
	1= employed	65	1	16	
Ms	0= living in union	198	5	25	Direct
	1= not in union	54	7	130	
Feduc	0 = No educated	89	10	112	Inverse
	1= primary educated	98	2	20	
	2= secondary and higher	65	-	0	
Hhsize	0= 1-5 family members	190	3	16	Direct
	1= 6-10 family members	35	5	143	
	2= > 10 family members	27	4	148	
aswtr	0= Not piped (Others)	59	10	170	Inverse
	1= Piped water	193	2	10	
Hhahf	0 = not accessible	82	7	85	Inverse
	1= Accessible	170	5	29	
Thhrsd	0= Rural dweller	204	10	49	Inverse
	1= Urban dweller	48	2	42	
Rl	1 = Protestant	194	3	16	Direct
	2 = Orthodox	29	4	138	
	3 = Catholic	26	5	192	
	5 = Others	3	0	0	
Hhocep	1= working in gov't office	72	2	28	Direct
	2 = working in sales	90	4	45	
	3 = working on farming	89	6	67	
	4 = working on domestic services & others	1	0	0	

Source: own computation from survey data, 2018

To see the effect of socioeconomic characteristics on CMR, CMR was 70, 32, & 0 for children whose mothers have no education and primary, secondary and higher respectively. CMR was 59 & 16 for children whose mothers were unemployed and employed respectively. It was 25 & 130 for children whose parents are living in union and not in union respectively. It was 112, 20 & 0 for children whose fathers have no education and primary, secondary and higher respectively. No deaths were occurred in households of higher monthly income level. It was 16, 143 & 148 for children whose households have 1-5, 6-10 and > 10 family members respectively. CMR was 49 & 42 for children whose households live in rural and in urban respectively. It was 170 & 10 for children whose households have no access to safe water and have better access respectively. It was 85 & 29 for children whose households have no access to health facilities and have better access. It was 28, 45 & 67 for children whose households heads were working in government offices, working on sales & services and working on farming respectively. It was 16, 138 & 192 for children whose parents were Protestant, Orthodox, and Catholic followers respectively.

II. SUMMARY RESULTS OF ECONOMETRIC ANALYSIS

We start with fitting regression model. Table 14 below summarizes the result obtained from binary logit regression analysis. From this table, we can identify candidate covariates to be considered for the multivariable model. Mother education, mother employment status, area of residence, access to safe water and access to health facilities are significant at the 5% level of significance in the first model whereas working status of mother, marital status of parents, level of father's education, family size, access to safe water, access to health facilities, and occupational status of household heads are significant from the second model.

ECONOMETRIC DIAGNOSIS TESTS

It is important to check whether the basic assumptions of the models are met or not, then to estimate the specified models. According to the diagnosis test results; no multicollinearity problem in both models (VIF = 4.32 & 3.73); no heteroscedasticity problem (prob-chi²=0.0834 & 0.7238) & the models were fitted with the data (the goodness of fit test result p-value 0.9629 & 0.7195).

Table 14: The summarized regression results of the first model using Odds ratio

Logistic regression		Number of obs =202				
LR chi2(11) =60.03						
Prob > chi2 =0.0000						
Log likelihood = -9.7896218		Pseudo R2 = 0.7541				
IMR	Odds Ratio	Std. Err.	Z	P>z	[95% Conf. interval]	
Meduc**	-0.024	.0410	2.18	0.029	.009	.684
Memp**	8.438	2.244	2.23	0.026	2.258	13.154
Ms	1.415	2.634	0.19	0.852	.0368	4.384
Feduc	-0.126	.203	1.29	0.198	.054	2.945
Hhil	-0.992	.031	0.24	0.809	.833	1.055
Hhsize	1.103	1.339	0.08	0.936	.102	3.924
Thhrsd**	-0.117	.071	2.06	0.039	0.0445	.645
aswtr**	-0.404	.0112	2.00	0.046	.018	.905
Hhahf**	-0.340	.105	2.08	0.038	.214	.731
Hhoccp	2.083	2.580	0.59	0.554	.184	3.607
Rl	7.269	4.103	1.43	0.154	.477	10.807
_cons	52.330	5.38	0.64	0.521	.0299	91.718

CMR	Odds Ratio	Std. Err.	Z	P>z	[95% Conf. Interval]	
Meduc	-0.302	.380	0.95	0.341	.026	3.552
Memp**	-0.61	.208	2.17	0.030	.078	.984
Ms**	2.306	5.898	2.13	0.033	.153	3.467
Feduc***	-0.151	.372	2.64	0.008	.012	1.887
Hhil	-0.982	.027	0.66	0.510	.929	1.037
Hhsize**	7.471	13.251	2.43	0.015	2.31	11.163
Thhrsd	-0.155	.290	0.99	0.320	.004	6.121
Aswtr***	-0.3384	.674	2.86	0.004	.0682	.6791
Hhahf**	-0.375	.584	2.11	0.035	.1777	.791
Rl	3.327	2.934	1.36	0.173	.591	8.731
Hhoccp**	2.829	2.940	2.15	0.031	1.309	3.314
_cons	.1361	.5007	-0.54	0.588	.01004	1.845

DISCUSSIONS

The effect of socioeconomic characteristics of households on IMR

Infants of whose mothers are educated at primary and higher level are 0.024 times in better position of survival probability as compared to those of whose mothers are illiterate. This suggests as mother's education improves the survival probability of infants. Infants of whose mothers are employed are 8.438 times more likely died as compared to those whose mothers are unemployed by suggesting working status of mother affects the survival probability of infants. Infants who reside in urban areas of the district are 0.117 times less likely died as compared to those who reside in rural areas by suggesting residing in urban areas improves the survival probability of infants. Infants who have better access to safe water were 0.404 times in better position of survival probability as compared to those who have no access to safe water by suggesting having better access to safe water improves the survival probability of infants. Infants who have better access to health facilities are 0.34 times in better position of survival probability as compared to those who have no access to health facilities by suggesting having better access to health facilities improves the survival probability of infants.

The effect of socioeconomic characteristics of households on CMR

Children of age 12-59 months of whose mothers are unemployed were 0.61 times more likely died as compared to those whose mothers are employed by suggesting the working status of mother improves the survival probability of children of age 12-59 months. Children of whose parents are not living in union are 2.306 times more likely died as compared to those of whose parents are living in union by suggesting not living of parents in union affects the survival probability of children of age 12-59 months. Children of whose fathers are educated at primary and higher level are 0.151 times less likely died as compared to those of whose fathers are illiterate and suggests as father's education improves the survival probability of children of age 12-59 months. Children who live in large family size are 7.471 times more likely died as compared to those who live in small family size by suggesting as having large family members affects the survival probability of children of age 12-59 months. Children whose

family has better access to safe water are 0.3384 times less likely died as compared to those who have no access to safe water by suggesting having better access to safe water improves the survival probability of children of age 12-59 months. Children whose family has better access to health facilities are 0.375 times less likely died as compared to those who have no access to health facilities by suggesting having better access to health facilities improves the survival probability of children of age 12-59 months. Children of whose household heads are working on farming are 2.825 times more likely died as compared to those whose household heads are working in trading of sales & services and government offices by suggesting working in government office improves the survival probability of children of age 12-59 months.

SUMMARY OF MAJOR FINDINGS

IMR of the woreda is 50 whereas CMR is 48. About 15% reduction of IMR and 25% reduction of CMR have been registered over the past 8 years in the district. IMR is higher as compared to both GTPE reduction plan by the year 2035 and the national achievement level in 2016 whereas CMR is higher as compared to GTPE and lower than the current national achievement level. Level of mother's education, working status of mother, place of household residence, access to safe water, and access to health facilities are standing as major determinants of IMR whereas working status of mother, marital status of parents, level of father's education, family size, access to safe water, access to health facilities, and occupational status of household heads are standing as major determinants of CMR.

CONCLUSIONS

The study concluded that socio-economic factors such as level of mother's education, residing in urban areas, having better access to safe water, and having better access to health facilities improve the survival probability of infants. This is because of mother education equips mothers with the necessary knowledge of how to care for their kids; urban areas have better access to basic services than rural areas; using safe water to reduce the incidence of disease and infection of infants; having better access to health facilities to improve the situation to get health services. Level of father's education, having better access to safe water, and having better access to health facilities improve the survival probability of children of age 12-59 months as literate father engages in highly paid job and earn high income to improve child nutrition and hence its survival probability. Not living of parents in union, having large family size and occupational status of household heads other than government office and trading of sales and services affect the survival probability of children of age 12-59 months. This is due to the reason that mothers in unstable marriages would not get support from their partners during child care which can increase the risk of childhood mortality; large family size has high dependency ratio; government workers and traders earn secured family income throughout the year than other occupations. Working status of mother affects the survival probability of infants as infants are highly dependent of their mothers and working mothers spent more time on their work & less time to care for their kids but; improves the survival probability of children of age 12-59 months as children in this age are less dependent of mothers than infants and working mothers earn additional income to improve their household income level, hence improves child nutrition.

RECOMMENDATIONS

The study advises the government (local, zonal and federal) to play key roles in improving the socio-economic status of the rural poor as urban households are in better position of socio-economic conditions than rural households in the district; insure the benefit of rural people from the expansion of infrastructures (health facilities, safe water, road, and marketing facilities); improve the quality of existing health services (organize health posts and health centers with full of necessary equipment, medicines, ethically & technically competent health workers); create appropriate staying room for infants at work place with full of necessary facilities, allow working mothers with adequate resting time after delivery; address the key socio-economic characteristics of households that have been identified as determining factors of IMR and CMR by the existing Health, education and economic policies. encourage NGOs to participate in activities that improve the socio-economic conditions in the district; give awareness creation training on the key issues of the finding; advantages of education; how to improve home environment to practice modern life; advantages of having small family size & birth spacing; how to develop tolerance with among marriage partners at the time of conflict.

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