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Original article

Childhood mortality in Amara region: A case study of Misrak Gojjam and Wag Hemra zone Girma Kassie

Population Analysis and Studies Center, Central Statistical Authority, P.O. Box 28810, Addis Ababa, Ethiopia
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Abstact

Background: Mortality levels and differentials have shown variations not only among countries but also among areas in an administrative region within a country.

Objective: To examine variations in childhood mortality between food secure and insecure areas in the Amhara Nation Regional State, Misrak Gojjam and Wag Hemra Zones, respectively.

Methods: This is a study based on the 1994 population and Housing Census data. Ordinary Least Square regression is fitted using Trussell and Preston index of childhood mortality (the ratio of observed to expected deaths) as a dependent variable. The explanatory variables were: zonal and urban-rural residence, education level, migration status, age, parity and marital status of the mother, and household size, possession of a radio in the household, economic and sanitation status of the household size, population density and percent adult literate of the wereda.

Findings: Controlling for potential confounding variables, childhood mortality was 11 percent higher in food insecure Wag Hemra Zone compared to Misrak Gojjam Zone that is better food producing.

Conclusion: Effort must be strengthened in drought prone areas to introduce interventions likely to increase survival probabilities of children. [*Ethiop. J. Health Dev.* 2001;15(2):75-88]

Introduction

Mortality levels and differentials have shown variations not only among countries but also among administrative regions within a country (1). This is also true in the case of Ethiopia (2, 3, 4, 5). Thus, an attempt is made to study childhood mortality for Misrak Gojjam and Wag Hemra Zones that are found in Amhara region. The former zone was relatively accessible, and free from drought and civil war in the past decades compared to the latter zone. By studying childhood mortality for these areas one can have an overview about childhood mortality differentials between remote and accessible areas, and relatively food insecure and secure areas in the region, so that it will be easy to understand priority areas for policy formulation and implementation.

The 1994 Population and Housing Census result indicates that mortality rates for children under five years were 211 and 167 deaths per 1000 live births in Misrak Gojjam and Wag Hemra Zones, respectively (2,3). Higher mortality would be expected in areas that suffer from intermittent drought and civil war than areas that are relatively secure. But in the case of Misrak Gojjam and Wag Hemra Zones, the rates are found to be out of one's normal range of expectations. This condition inspired this critical study on childhood mortality in order to possibly draw plausible policy implications for these two areas of the region, based on the 1994 Population and Housing Census data.

Methods

Study Population: This is a study based on data collected during the 1994 Population and Housing Census. The study areas, Misrak Gojjam and Wag Hemra Zones, are located in the southern and northern portion of the Amhara region, respectively (3,6). The sizes of the total population were 1,700,331 and 275,615 for the former and later zone, respectively (3,6). The total populations of women in the reproductive age were 380,939 for Misrak Gojjam Zone and 64, 498 for Wag Hemra Zone that represents the study population. The ultimate target group for the multivariate analysis was women in the reproductive age groups with at least one live birth. This is because the dependent variable for the study will be the ratio of observed to expected deaths of children ever born and if a woman do not have any live birth then the denominator will be zero that will not give a valid result.

Study design and sample: During the 1994 Population and Housing Census a cross sectional sample study was conducted side by side to the census. A 20 percent of households were selected using a systematic sampling selection procedure from each enumeration areas based on a list of households that was prepared three days before the census day (2,3,4,6,7,8). The enumerators collected information on some socioeconomic and demographic characteristics of all members found in each selected household member. In this process, a total of 78,387 and 14,027 women in the reproductive age groups were found in the selected households and interviewed for Misrak Gojjam and Wag Hemra Zones, respectively, that represented 21 percent and 22 percent, in the same order, of the total study population of the same group. Out of these women, 56,896 and 10,056 were with at least one live birth that represents 49 percent and 51 percent of the total ultimate target population of the same group for the former and later zone, respectively.

Data quality checks: The accuracy of the age reporting was checked using Myer's summary index (9). These indices were calculated and 34.4 and 40.7 for Misrak Gojjam and Wag Hemra Zones, respectively, and suggested a fairly accurate age reporting. Such a data quality with respect to age reporting is expected in developing countries like Ethiopia. Thus, the study may give an acceptable result since childhood mortality is mostly estimated for five-year age groups of mothers that avoids age heaping (9).

The consistency of the data was checked using trends of the sex ratio of children ever born (SRCEB), the mean children ever born (MCEB) and proportion children dead (PCD) against the age groups of mothers. Both the MCEB and PCD increased with the age groups of mothers and suggested a consistent data. The overall observed SRCEB for Misrak Gojjam and Wag Hemra Zones were 1.06 and 1.10, respectively. The expected value of SRCEB is between 1.02 and 1.07 and hence the sex ratio suggested omission of female children for Wag Hemra Zone. But the SRCEB by age groups of mothers didn't show any systematic trend for the two zones and hence suggested a data with reasonable quality (10). In general, most of the quality check methods showed that the data have a reasonable quality for childhood mortality studies.

Variables and conceptual framework: Two groups of explanatory variables have been considered for the study. The first group includes some socio-economic characteristics of the mother, household and wereda. These are zonal residence, urban-rural residence, education level, household size, possession of a radio, economic status, sanitation status, population density and percentage literate of the adult population (15 years and older). The types of materials used to construct the wall, roof and the ceiling of the housing unit and the types of fuel used for cooking, possession of a housing unit and the number of rooms in the housing unit are used to identify the economic status of the household in which the mother is residing. In the same way, the sources of water, the type of toilet and the type of kitchen for the household are used to identify the sanitation status of the household in which the mother is residing.
Some demographic characteristics of the mother are included in the second groups of variables, and these are migration status, age, parity and marital status of the mother. The dependent variable is childhood mortality that has been indexed by the ratio of observed to expected deaths as suggested by Trussell and Preston (11). To

facilitate discussion, the expected interactions among the dependent and the independent variables is portrayed in a conceptual framework (Figure 1), which is a schema for factors affecting childhood mortality.

A*nalysis:* Two indirect techniques are employed - techniques proposed by Brass and Feeney (10, 12, 13), and techniques suggested by Trussell and Preston (11). The techniques proposed by Brass and Feeney are used to estimate the levels and trends of childhood mortality. The techniques of Trussell and Preston are used to calculate childhood mortality indices for descriptive and statistical analysis.

The United Nations Program for Childhood Mortality Estimation (QFIVE) is used to calculate the estimated childhood mortality levels and their reference years. The United Nations Software Package for Mortality Measurement (MORTPAK) is used to estimate the life expectancy at birth that can be used to select the standard mortality model life tables for the study areas. The SPSSWIN is used to calculate the required results for multiple regression analysis.

Levels of childhood mortality: Using the Brass techniques of indirect child mortality estimation, levels of childhood mortality for the two zones are computed considering the West and North families from the CoaleDemeny Model Life Tables as a standard model life tables. These families have been selected because they provide the best fit to depict the mortality pattern of the country when compared with other families (4).

Trends of childhood mortality: To portray trends of mortality the common index of childhood mortality is computed using the procedure proposed by Feeney (10). The total number of children dead before reaching the 5^{th} birth day out of one-thousand live births (q(5) per 1000) is considered as a common index for trend analysis because of the reason that generally most childhood deaths occur before the age of five years (14), and under age five years mortality seems to fluctuate less from population to population and from model to model when compared with other early childhood mortality rates (15).

Trussell and Preston indices of childhood mortality: For descriptive study, mortality indices were computed using Trussell and Preston procedures with out controlling for any independent variable in the study. The analysis is based on women in the age group 20 - 44 years instead of the conventional reproductive age group, 15 - 49 years. The reason for that is information from the first (15 - 19 years) and the last (45 - 49 years) conventional five years reproductive age groups of women suffer from errors and hence may affect the final results (10).

Trussell and Preston noted that the higher the indices of childhood mortality mean the stronger the childhood mortality (11).

Trussell and Preston multivariate regression analysis: Unlike the descriptive analysis, Trussell and Preston multivariate regression analysis is used to measure the net effect of each variable while all others are controlled (11). The ratio of observed to expected deaths of each woman has been taken as a dependent variable. Several continuous and categorical variables have been considered as independent variables. For categorical variables, dummy variables are created and introduced into the model, i.e. for zonal residence, current rural-urban residence, migration status (length of continuous residence), marital status, possession of a radio, and household economic and sanitation conditions dummy variables are created. The age of the mother, educational level of the mother, parity of the mother, household size, population density and percentage adult literate population of the wereda are continuous items that are introduced into the model as interval scale variables. Thus, one needs to take into account these facts during interpretation of the results.

Results

As can be understood from Table 1, about 88 percent and 96 percent of women in the reproductive age groups reside in rural areas of Misrak Gojjam and Wag Hemra Zones, respectively. In the same way 14% and 2%

were literate, 80 percent and 84% were non-migrants, 8% and 17% were never married, 28% and 30% had no any live birth, 4% and 3% had been residing in a house hold with size 10 and more persons, 10% and 5% had been residing in a household with a working radio for Misrak Gojjam and Wag Hemra Zones, respectively. Only 37% and 5% reside in a household with a high economic status, and 12% and 4% reside in a household with a high sanitation status for Misrak Gojjam and Wag Hemra Zones, respectively.

The estimated childhood mortality levels are presented in Table 2. These levels increase comparatively for both zones with the age of children and mothers. In all age groups, estimated childhood mortality rates were higher in Misrak Gojjam Zone as compared to Wag Hemra Zone. Even if a strong difference was observed between the two zones in the first three age groups of mothers, percentage difference in childhood mortality levels decreases progressively with the age of children except at the age of 15 years. The highest difference was observed in the age group 20 - 24 years of the mothers in which mortality was estimated to be nearly 32% higher for Misrak Gojjam Zone compared to Wag Hemra Zone for both models.

Observing mortality by time showed a declining trend for years between 1986 to 1992 (Figure 2). The decline in mortality over recent years was much higher for Wag Hemra Zone as compared with Misrak Gojjam Zone. Under age five mortality declined approxi-mately by 10.0 to 12.2% every two years between the years 1986 and 1992 for Wag Hemra Zone, compared to a 3 to 7% decline for Misrak Gojjam Zone.

It is interesting that in all age groups of mothers, and in all years for which the estimated childhood mortality refers, childhood mortality levels were higher for Misrak Gojjam Zone than in Wag Hemra Zone (Table 2 and Figure 1). This raises interesting questions such as- Being a remote and drought prone (food insecure) area, why is the estimated mortality levels lower for Wag Hemra Zone? Is the observed direction of difference in childhood mortality levels between the two zones actually true or are there some other contributing factors, which are confounding the estimated results? The next attempt will provide the possible answers to these questions using Trussell and Preston procedures.

The descriptive result based on Trussell and Preston procedure is presented in Table 3. As can be seen from this table in almost all groups of women the indices are higher for Wag Hemra Zone compared to Misrak Gojjam Zone as explained by the negative sign of the percentage differences of the indices of childhood mortality between the two zone. In particular, the descriptive result indicated that the over all childhood mortality was 5% lower in Misrak Gojjam Zone compared with Wag Hemra Zone.

When observation is made with in each zone by categories in Table 3, childhood mortality was higher in rural than urban settings for Misrak Gojjam Zone, while the reverse was true in the case of Wag Hemra Zone. Childhood mortality declined as educational level increased, except moving from the 'Illiterate' category to the 'Informal' category for Wag Hemra Zone. Children of the recent migrants, migrants who continuously resided only for 0 - 9 years, had the highest index and hence had the highest mortality as compared to the other groups, while children of women who resided since birth (non- migrants) enjoyed the lowest mortality for both zones. Children of never married and currently married women had a relatively lower mortality as compared with the other groups for Misrak Gojjam and Wag Hemra Zones, respectively. Children of divorced women suffered from strong mortality than the other groups for both zones.

High parity women had higher childhood mortality as compared with relatively lower parity women for both zones. Woman from a household with relatively larger household size had reported a lower proportion dead of her children ever born for both zones. Women from a household with a radio had lower childhood mortality as compared with women from households without radio. Household economic status had shown a negative association with childhood mortality for Misrak Gojjam Zone, while a clear direction of association was not observed in the case of Wag Hemra Zone. In all zones, childhood mortality indices increase with household sanitation status and this suggests that the survival chance of children from women residing in a household with a better sanitation status was higher than their counter parts.

As shown in Table 4, the descriptive result supported by the multivariate statistical analysis. That is, after controlling all variables in the model, the overall childhood mortality was 11% higher (p =.00) for Wag Hemra Zone as compared with Misrak Gojjam Zone. When observation is made for each other groups of variables, age and education level of mothers; household size and population density appear to have a statistically significant negative association (p=.00) with childhood mortality. Parity of a woman and percent adult literate population in the wereda had a statistically significant positive association (p=.00) with childhood mortality.

Women in rural areas, those with a radio in the household, women in a household with high economic status and medium sanitation status had significant lower childhood mortality when compared with their respective reference categories. Recent migrants, and single (never married), divorced and widowed women showed a statistically significant higher childhood mortality when compared with their respective reference categories as explained by positive regression coefficients (p=.00).

Discussion

The higher estimated childhood mortality obtained for Misrak Gojjam Zone relative to Wag Hemra Zone using the Brass and Feeney techniques is reversed in the case of the estimated mortality indices and ordinary least square regression results that are computed by a statistically strong techniques suggested by Trussell and Preston (11). The estimated indices of childhood mortality and multivariate results revealed that childhood mortality was actually higher in Wag Hemra Zone compared to Misrak Gojjam Zone. Specifically, the multivariate result indicates that children born to women in Wag Hemra Zone had 11 per cent higher mortality as compared with children born to women in Misrak Gojjam Zone, and the difference was also statistically significant (p=.00).

A dummy variable of zonal current residence was introduced into the model as a proxy indicator of many other socioeconomic variables that are not considered in this study. Thus, the difference in the general level of welfare of the two populations with respect to food security, weather conditions and ecological setting, and other quality of community life variables might be responsible for the significant higher mortality observed in Wag Hemra Zone compared to Misrak Gojjam Zone. But the higher level of childhood mortality observed in Misrak Gojjam Zone relative to Wag Hemra Zone obtained using the Brass method is not attributed to socioeconomic differences (differences in mortality risks) between the two zones, but it may be due to the confounding factor called the exposure term. In other wards, the high level of childhood mortality observed for Misrak Gojjam Zone relative to Wag Hemra Zone may be a result of higher length of exposure to the risk of dying for children in Misrak Gojjam Zone compared with children in Wag Hemra Zone that has been removed by Trussell and Preston procedures (11).

When observation is made between categories of variables other than zonal residence, the multivariate result revealed that childhood mortality was lighter in rural areas than urban areas. The same result was observed in a study in Kenya (1). The possible reason may be that most towns in the study areas may include low-income

populations who have abandoned some of the traditional child rearing, and who have not yet learned to take advantage of modern life styles (1). Age of the mother appears to have a significant negative association (p=.00) with childhood mortality and supported by a study in Kenya (1). The possible reason for this may be due to the higher infant death rate suffered by children born to mothers at the early reproductive age groups (1). It might also be due to the reason that child-raising practices improve with age. Education level had also shown a statistically significant negative association (p=.00) with childhood mortality and this finding is supported by various studies conducted by scholars around the world (1, 14, 16, 17, 18, 19). The possible reason is that educated mothers may have a better skill in child health care practices and be able to manage the feeding and childcare practices better than non-educated mothers, given a fixed amount of income for a household. In general, education may have strong power in changing the behavior of individuals to interact with the modern world and to have a range of choices for mothers and their children.

Those children born to recent-migrants had significantly higher (p=.00) mortality than children born to nonmigrant mothers. Such significant difference between recent migrants and non-migrants is in agreement with the study conducted in Senegal (20). The possible reason for this phenomenon may be due to the fact that recent migrants are mostly subjected to several adverse conditions at the early arrival of their place of distention. Their life style may be disturbed and not stabilized within a short period of time and hence children of such mothers may be subjected to hazards of life (20). Children born to never married, divorced and widowed women also had a higher mortality as compared to children born to currently married women and the results obtained were statistically significant (p=.00). Such finding is in agreement with studies else where in Ethiopia and other countries (19, 20, 21, 22). The possible reason for the observed lower childhood mortality among the currently married women may be the role of husbands in child raising activities such as income generating and psychological treatment for the family.

Parity of the mothers appears to have a strong positive relationship with childhood mortality. The possible reason may be that, if all other conditions are assumed to be equal, high parity women may have less birth intervals and hence less time interval for each child to be given an adequate care during his/her early stages of life (23, 24, 25, 26). High parity women may have poor nutritional status due to resource sharing with their children. Children born to these group of women may be more likely to be born with birth defects and ultimately their chance of survival could be lower as compared with children born to low parity women (24,25, 26). The study also revealed that there was a strong negative relationship (p=.00) between household size and childhood mortality. The possible reason may be the major backward agricultural economy that prevails in the study areas. That means, in backward agricultural economy labor intensive activities have a paramount importance for a relatively adequate food production. A larger household size enables the household to have various divisions of labor and hence a better income (27). In line with this argument childhood mortality may be lower for those mothers from a household with large number of members.

Availability of a working radio in a household had shown a statistically significant (p=.00) lowering effect on childhood mortality. Household members may interact with the outside modern world through radio. They may get information about the ways of life to attain better sanitation, treatments and prevention of communicable diseases and hence they may give care for themselves and their members. Such facts may be the possible reasons for the observed association between childhood mortality and availability of a working radio in the household (28). Statistically significant higher mortality was observed among women in the low economic status compared with women in the high economic status. This may be due to the fact that better economic status means a better supply of basic necessities such as food, clothing and housing for the household members. A continuous supply of such necessities in turn may reduce child mortality in a household (29). Those children born to women in a household with high and medium sanitation status had a better survival

chance compared to children born to women in a household with a low sanitation status, but the difference between the high and the low sanitation status was not statistically significant which might be due to the poor indicators used for household sanitation status.

A statistically significant negative association was observed (p=.00) between population density and childhood mortality. The possible reason may be that densely populated areas may be priority areas for governments to provide socio-economic service centers such as education and health facilities, and hence tend to decrease mortality (1). Percent adult literate was included in the multivariate analysis as a proxy indicator of modernization (14) and the study showed a significant positive association (p=.00) between percent adult literate and childhood mortality. The possible explanation for this may be that the early stages of modernization in the study areas may be increased childhood mortality at community level (14). In Misrak Gojjam Zone, for instance, among the literate persons about 40% were below grade 9 (7). Such an early level of education in turn may affect the attitude of persons to abandon some of the traditional child-feeding practices such as extended breast-feeding, but not yet learned to take advantage of modern child care facilities. As a result of which childhood mortality might tend to increase in such communities.

The decline in childhood mortality between 1986 to 192 for both zones may be attributed to the improvement in services likely to increase the survival probabilities for children in the reference periods. The fast decline in childhood mortality for Wag Hemra Zone relative to Misrak Gojjam zone may be due to the better interventions likely to increase survival chance of children in the former zone than the later zone. In deed, further and detailed investigation is required to identify the specific reasons for these situations.

The adjusted value of the coefficient of determination (adjusted R^2) was 13.4% and statistically significant (F=0.000) which implies that all the variables in the model explain 13.4% of the variations in childhood mortality. Such a low value of an adjusted R^2s may arise due to the absence of some important variables such as nutrition status of the child, breast feeding practices, cause of death and the like. Even if the model is not adequate for prediction purpose because of its weak explanatory power, it can be used to measure the proportionate effect of each explanatory variable in the model that is in fact the major objectives of this study. In addition, the variance inflation factor (VIF) was computed and cheeked for each variable and category to assess confounding factors. Since each value of the VIF was below 5, it can be said that there is no problem of collinearity (confounding) in the regression analysis (30).

To sum up, using a statistically sound procedure the study reveals that children born to women who were residing in drought prone and remote areas had a lower chance of survival that may arise due to a lower socioeconomic conditions. Thus, special efforts must be made in drought prone areas to introduce services likely to increase survival probabilities for children.

Finally, child survival studies based on statistically sound procedures at large scale in terms of variable and area coverage may have a great role for population and development planning that aimed at improved people's welfare.

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Tables

Table 1: Percentage distribution of women at reproductie age (15-49 years) in the sample for different background variables by zone, 1994

Background variables	Misrak Gojjam Zone No.	%	Wag Hemra Zone No.	%
Total sampled women* 100.0	78387	100.0	14020	
Current Residence				
Rural	69245	88.3	13386	95.5
Urban	9142	11.7	634	4.5
Educational Level				
Illiterate	67058	86.5	13522	98.1
Literate	10478	13.5	261	1.9
Migration Status (Length of Continuos Residence)				
Since Birth[1]	62376	80.4	11547	83.8
0-9 Years[2]	7840	10.1	1359	9.9
10+ years[2]	7318	9.4	869	6.3
Marital Status				
Never Married	6237	8.0	2329	16.7
Currently Married	53111	68.0	9698	69.6
Divorced	16327	20.9	1474	10.6
Widowed	2486	3.2	431	3.1
Parity of Woman				
0 Births	21491	27.9	3964	29.6
1-4 Births	30988	40.2	6484	48.3
5-9 Births	21148	27.5	2780	20.7
10+ Bithes	3374	4.4	184	1.4

Household Size				
1-4 Persons	32967	42.1	7321	52.2
5-9 Persons	42137	53.8	6310	45.0
10+ Persons	3190	4.1	389	2.8
Possession of Radio By Household				
No radio	70458	90.2	13140	95.1
Has radio	7640	9.8	675	4.9
Household Economic Status[3]				
High	28362	36.9	649	4.9
Medium	22551	29.3	1335	10.0
Low	26010	33.8	11338	85.1
Household Sanitation Status[3]				
High	9428	12.1	578	4.2
Medium	15000	19.3	2857	20.6
Low	23452	68.6	10415	75.2

* The total number of women under each background variable may not be add up to the total because of missing cases 1 Non-migrants 2 Migrants 3 Created based on household and housing characteristics: where the household resides; goods owned and services generated by the household

Table 2: Estimated childhood mortality levels (q(X)*), using coale-demeny west mortality model as a standard, by zone and pecentage difference between the two zones, 1994

Age groups of mothers	Age of child, x	Misrak Gojjam Zone	Wag Hemra Zone	Percentage[1] Difference
15 - 19	1	0.140	0.107	30.8
20 - 24	2	1.166	0.126	31.7
25 - 29	3	0.192	0.152	26.3
30 - 34	5	0.225	0.189	19.0
35 - 39	10	0.250	0.228	9.6
40 - 44	15	0.283	0.235	20.4
45 - 49	20	0.289	0.269	7.4

1 Level of Misrak Gojjam Zone minus level of Wag Hemra Zone divided by the level of Wag Hemra zone times 100.

* q(x) = The probability of dying before reaching the 5th birthday.

Table 3: **Indices of childhood mortality (ratio of observed to expected deaths) by zone, and percentage differences of the indices between zones by different background variables for the age group 20 - 44 year of mothers, 1994**

Background Variables	**Misrak Gojjam Zone**	**Wag Hemra Zone**	**Percentage[1] Difference**
Overall index	1.0728	1.1316	-5.20
Current Residence			
Rural	1.0737	1.1298	-4.97
Urban	1.0577	1.1826	-10.56
Education Level			
Illiterate	1.0901	1.1335	-3.83
Informal	0.9460	1.2197	-22.44
Grade 1-6	0.7916	0.7379	7.28
Grade 7 and above	0.4128	0.4243	-2.69
Migration Status (Length of Continous Residence)			
Since Birth[2]	1.0636	1.0799	-1.51
0 - 9 years[3]	1.1358	1.4473	-21.52
10 years and older[3]	1.1025	1.2908	-14.59
Marital Status			
Never Married	0.8699	1.4468	-39.88
Currently Married	1.0353	1.0698	-3.22
Divorced	1.3458	1.553.5	-13.37
Widowed	1.2315	1.4987	-17.82

Parity of Woman			
1 - 4 Births	0.7407	0.7168	3.33
5 - 9 Births	1.1264	1.3807	-18.42
10 and above Births Persons	1.5564	2.1438	-27.40
Household Size			
1 - 4 Persons	1.4952	1.5892	-5.92
5 - 9 Persons	0.9651	0.9355	3.17
10+ Persons	0.6122	0.6852	-10.65
Possession of Radio			
No radio	1.0871	1.1395	-4.61
Has radio	0.9014	0.9598	-6.09
Household Economic Status[4]			
High	1.0130	1.1016	-8.05
Medium	1.0508	1.1309	-7.08
Low	1.1722	1.1258	4.11
Household Sanitation Status[4]			
High	0.9899	0.9462	4.62
Medium	0.9957	1.1078	-10.12
Low	1.1063	1.1489	-3.71

1 Index of Misrak Gojjam Zone minus index of Wag Hemra Zone divided by index of Wag Hamra zone times 100.

2 Non-migrants

3 Migrants

4 Created baed on houehold and housing characteristics: where the houehold resides; goods owned and services generated by the household.

Table 4: Ordinary least square regression outputs, based on information from women in the age group 20 - 44 years: Misrak Gojjam and Wag Hemra Zones, 1994.

Background Variables	Coefficient, B_i	Standard Error of B_i	VIF	P=value
Zone				
Misrak Gojjam (=0)[R]				
Wag Hemra	.1104	.0198	1.961	.0000
Current Residence				
Urban (=0)[R]				
Rural	-.1860	.0271	2.218	.0000
Age of Mothers	-.0238	.0010	1.700	.0000
Education Level	-.0371	.0040	1.345	.0000
Migration Status (Length of Continuous Residence)				
Reside Since Birth[1] (=0)[R]				
Reside only 0 - 9 years[2]	.2000	.0183	1.101	.0000
Reside 10 years and above[2]	.0210	.0164	1.068	.1992*
Marital Status				
Currently Married (=0)[R]				
Never Married	.5111	.0767	1.015	.0000
Divorced	.4422	.0154	1.128	.0000
Widowed	.0877	.0275	1.052	.0014
Parity of Woman	.2071	.0026	1.938	.0000
Household Size	-.1139	.0022	1.238	.0000

Possession of Radio					
No radio (=0)[R]					
Has radio		-.0707	.0205	1.179	.0006
Household Economic Status[3]					
Low (=0)[R]					
High		-.0379	.0132	1.503	.0040
Medium		-.0092	.0132	1.333	.4843*
Household Sanitation Status[3]					
Low (=0)[R]					
High		-.0135	.0243	1.895	.5783*
Medium		-.0525	.0134	1.143	.0001
Population Density[4]	-.0001	.00003		3.426	.0001
Percent Adult Literate[4]		.0038	.0010	4.285	.0002
Constant	1.3699	.0422	-	.0000	

Note: R=Rreference category for the factor

VIF = Variance Inflation Factor; VIF<5 means not confounding

Adjusted coefficient of determination = 13.4 (F = 0.000)

* Not significant at .05 significant level

[1] Non-migrants

[2] Migrants

[3] Created based on houehold characteristics: where the household resides; goods owned and services generated by the household.

[4] Population density of the wereda and percentage literate of the wereda population 15 years and older.

Figures

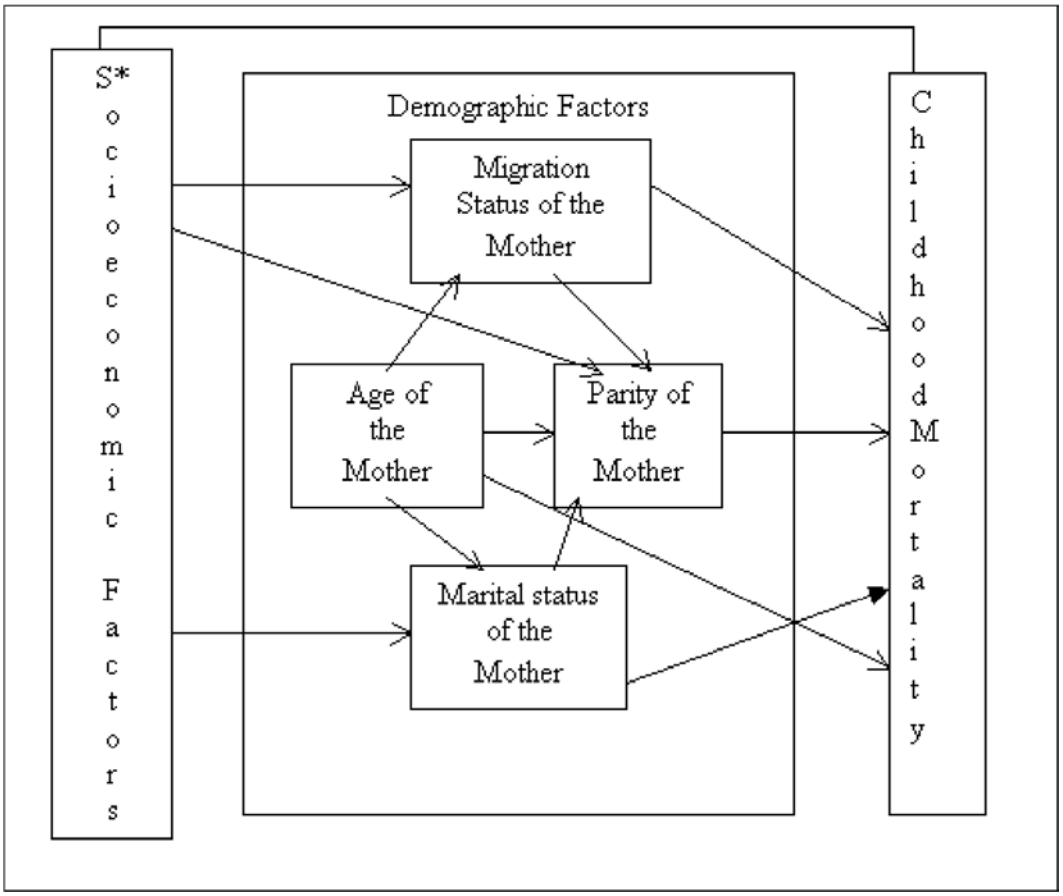

Figure 1: Conceptual framework of the study

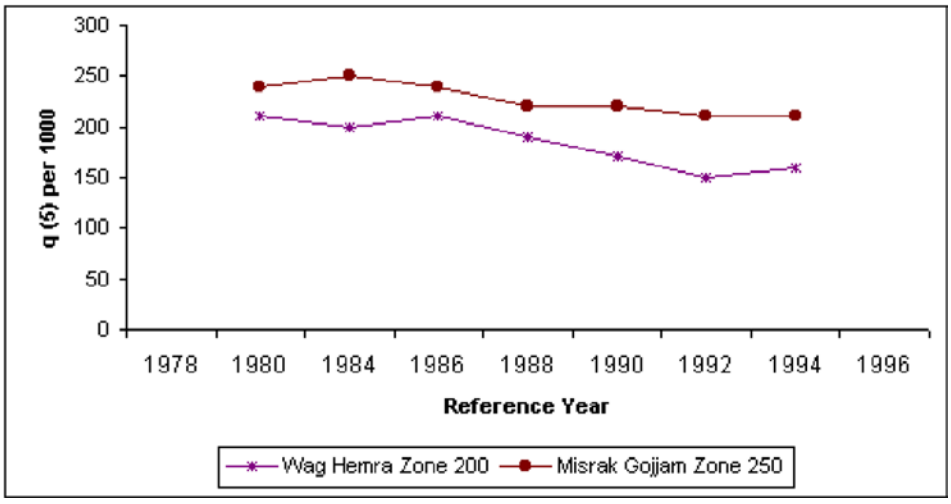

Figure 2: Estimated childhood mortality levels (q(5) per 1000) by time using the west family of the CoaledemeBny model (Trussell Equations) as a standard model life table

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