ADDIS ABABA UNIVERSITY
SCHOOL OF GRADUATE STUDIES

PRENATAL AND DELIVERY CARE AND INFANT SURVIVAL IN AMHARA REGION OF ETHIOPIA

A Thesis Presented to the School of Graduate Studies

Addis Ababa University

In Partial Fulfillment of the

Requirements of the

Degree of Master of Science in Demography

By

Alemayehu Gebre

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Demographic Training and Research Center

Approved by The Examining Board

Chairman, Department Graduate Committee	Signature
Advisor	Signature
External Examiner	Signature
Internal Examiner	Signature

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LIST OF ABBREVIATION

ANC	Antenatal Care
ARI	Acute Respiratory Infections
CSA	Central Statistical Authority
DHS	Demographic Health Survey
EDHS	Ethiopia Demographic Health Survey
HSDP	Health Sector Development Program
IMR	Infant Mortality
MCH	Maternal Child Health Care
MEDAC	Ministry of Economic Development and Cooperation
MOH	Ministry of Health
NOP	National Office of Population
PHC	Primary Health Care
PHC	Primary Health Care
RCH	Reproductive and Child Health
RTI	Reproductive Treatment and Immunization
STI	Supplies and Treatment of immunization
TFR	Total Fertility rate
UN	United Nation
UNICEF	United Nations Children Fund
WB	World Bank
WHO	World Health Organization

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ABSTRACT

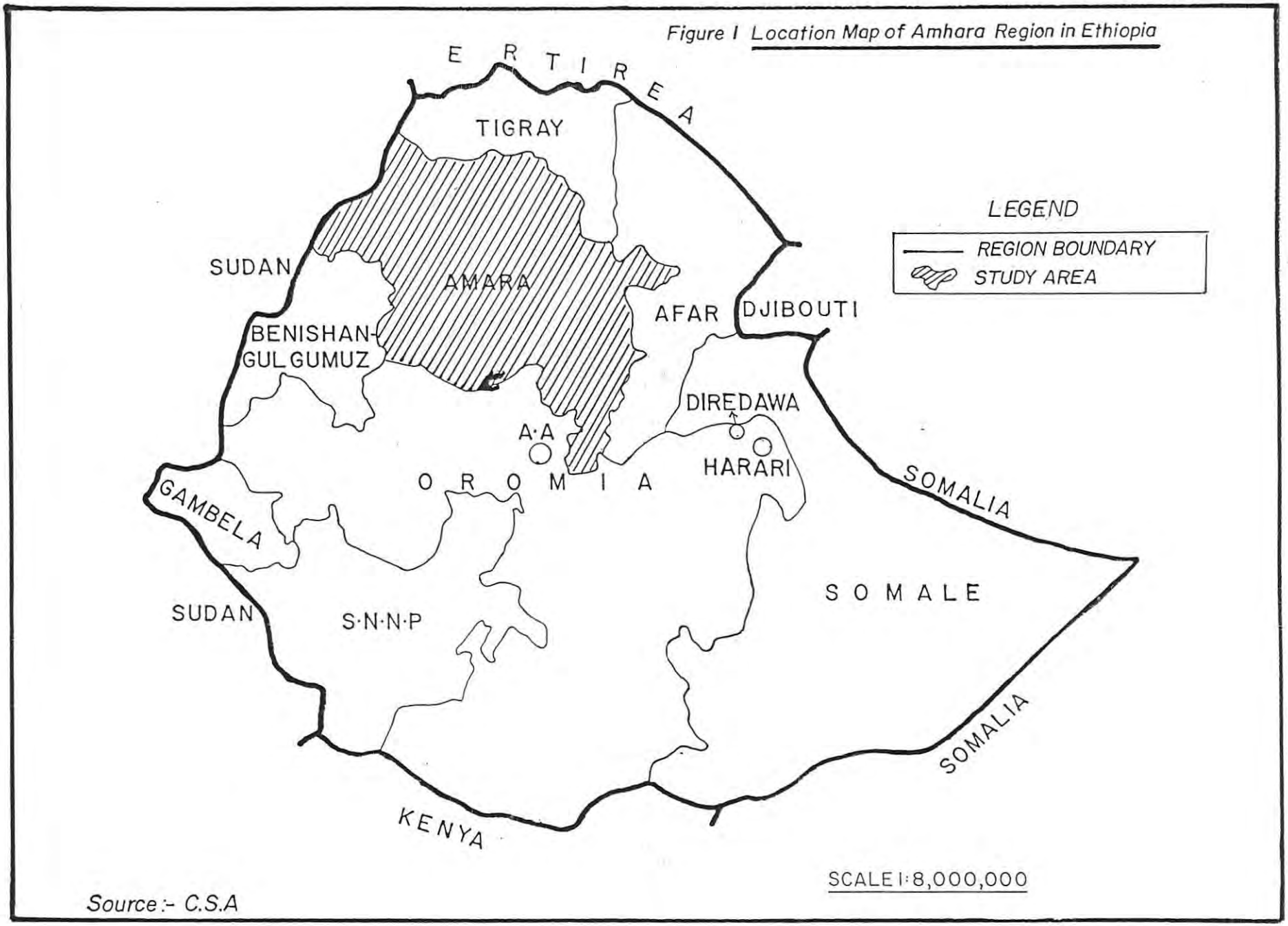
The low utilization of maternal health care services and high risk of infant death has been and still is a serious problem of Amhara region of Ethiopia. Maternal and infant health care issues continue to occupy a prominent place on the public health Agenda and National Population Policy implementation. Prenatal and delivery care is emphasized in this study as a crucial intervention for reducing the risks of adverse outcomes of infants' death. Using Data from 2000 Ethiopian Demographic and Health Survey Conducted by Central Statistical Authority (CSA), this study examines the status relationship and identifies the different factors associated with prenatal and delivery care on infants survival in Amhara region of Ethiopia.

A total of 3713 infants of Amhara region were selected in the study. Both descriptive and inferential techniques were used to analyze the DHS data. The univariate analysis is used to see the percentage share of background variables, while the bivariate and multivariate analysis were employed to examine the net effect and risk factors of prenatal and delivery care factors on infant survival. The findings indicate the access to utilize the services is very low and its impact on infants' survival is adverse. Only 1 in 5 infants mother received prenatal care and the majority of birth (97%) occurred at home in the five years preceding the survey. While the infant mortality rate was high to 112 per 1000 live birth in the year 2000.

The bivariate analysis using the chi-square test showed the existence of association between the maternal health care (prenatal delivery care factors), socio economic demographic factors and infants' survival. The multivariate results using logistic regression Model assessed the probability of infants' survival examining the independent strength of maternal health care factors alone in Model 1; socio economic and demographic factors in Model 2 and the effect of the whole factors in Model 3.The result revealed that prenatal and delivery care and the Socio economic, Demographic factors exerting a significant effect on infants' survival.

Finally, improvement in the access of utilizing the services, expanding the immunization of pregnant women, improving mothers education, the quality and quantity of safe water, extended duration of breast feeding through expansion of family planning for spacing and raising the mothers age at birth and minimum age of mothers at marriage are among the recommendation of the study.

Figure I Location Map of Amhara Region in Ethiopia



Source :- C.S.A

CHAPTER ONE

Introduction

1.1 Back Ground of the Study

Each year approximately 4.3 million infant deaths in the world occur before the age of four weeks. This figure represents 33% of deaths of all children under five years of age. Every hour 500 newborn infant die i.e., -12,000 babies a day. (WHO, 1992).

Women and children comprise almost three fourth of the population of developing countries and are the most vulnerable group in all parts of the word. The gap in both maternal and infants mortality between developed and developing countries is wide. Globally an estimated half a million women die each year from causes related to pregnancy; 99% of these occur in developing countries (WHO, 1993).

Overall mortality rates, as well as infant and child mortality rates have declined steadily in Africa over the past several decades (UNECA, 1993). Africa's average infant mortality rate fell by 38 infant deaths per thousands live births from 1970-1975 to 1990-1995; the largest absolute decrease among all major areas in the world (UN, 1995).

However, Africa has still the highest infant mortality rates in comparison to other regions of the world. In 1988 for instance, infant mortality rate in Africa was about seven times that of the more developed regions (UNECA, 1987).

Ethiopia is one of those countries with high mortality levels; which reflects its low position on the world development scale. As in many countries, in Ethiopia, also, some decline in mortality level has occurred in the population in the last two decades.

Both urban and rural areas experienced some decline. During the 1970s and 1980s infant mortality declined by about 28 percent in rural areas and by 30 percent in urban areas (Assefa Hagos, 1991) and life expectancy at birth increased by about 22 percent in both urban and rural areas during the period.

However, Ethiopia has still a very high level of infant mortality (110 per 1000 live births) (1994) and is among the countries with the highest mortality rates. For several countries infant mortality has reached half level registered for Ethiopia (Assefa H/Mariam, 1991).

Recent indicators suggest the lowest health status of mothers and children being characterized by high mortality and morbidity rates suggesting wide scope for improving maternal and child health in Ethiopia. According to the 2000 Ethiopia- DHS-data three out of four mothers who had birth during the 5 years preceding the survey did not receive antenatal care at the same time an over whelming majority of babies are delivered at home without any supervision from health professionals. An important component of efforts to reduce the health risk and survival of mothers and children is to increase the proportion of babies delivered under the supervision of health professional. On the other hand one out of 10 babies born in Ethiopia do not survive to celebrate his or her first birthday.

Other than the very low socio-economic development and poor quality of life of the population, high fertility is believed to be the major cause for the high rates of morbidity and mortality especially among mothers and children in Ethiopia.

The Ethiopian Government, aware of the problem of high fertility and mortality has issued and is currently implementing a National Population Policy. One of the major objectives of the policy is-*reducing maternal, infant and child morbidity and mortality rates as well as promoting the level of general welfare of the population* (Office of the Prime Minister OPM, 1993).

Besides, the international population consensus is- *to reduce mortality levels particularly infant mortality levels, to the maximum extent possible...and to reduce high levels of infant, child and maternal mortality so as to lessen the need for high fertility and reduce the occurrence of high-risk births (United Nations, 1995).*

The prevailing high rate of infant and child mortality and poor child survival prospects related to low maternal health care poor access and low utilization of health care services are serious obstacles to Ethiopia's future economic development. Adequate knowledge of the levels, trends, differentials and determinants of infant and child mortality in the country is of paramount importance for the improvement of the health of the population and for further reduction of infant and child mortality.

In line with these goals, the present study attempts to identify the impacts of variation in antenatal and delivery care on infant survival. The findings can be valuable for policy formulation and for the identification of priority areas for program design and, in order to improve chances of infant survival as well as the well being of the society as a whole.

The emphasis in this study is the impact of prenatal and delivery care on infant's survival for several reasons. First, available evidence shows that deaths of infants in Ethiopia account for

nearly a quarter of all deaths which implies that significant further decline in general mortality level will not be possible without a simultaneous decline in infant morality rate.

Secondly, the health of newborn is intimately and intrinsically linked with that of their mothers. It strongly influences subsequent infant childhood and adolescent health, nutrition growth and development. The health problems of mothers and children have their origin in the inherently vulnerable stages of the human cycle of reproduction, growth and development. At no stage are this vulnerability greater and its life long impacts so profound for both mother and infant as during pregnancy, delivery and neonatal and early infancy period. (UNICEF and WHO, 1994).

Regular antenatal care (ANC) a mother receives during pregnancy, at delivery and in the postnatal period, can mitigate if not avoid altogether, those complications of pregnancy and delivery which may jeopardize the mothers and the infants chances of survival.

In addition, the occurrence of death during early ages is wastage of human resource and thus needs to be studied.

Different studies were done on the levels and differentials of infant and child mortality using multivariate approach, in Ethiopia (Yohannes, (1990); Assefa (1991); Gabremaskal, (1994); Mulugeta, (1995). Most of these studies, have focused on under five mortality and especially on the socio-economic, environmental and cultural differentials of mortality. Mekonen (1993) had done his study on Sebeta town on infant and early childhood mortality focusing, in addition, on demographic determinants.

But no extensive research has been conducted in Ethiopia in general and in the Amhara region in particular that attempted to relate maternal care with its impact on infant and child hood- survival.

The 2000 Ethiopia demographic and health survey permits us to study, among others, the demographic factors which influence infant mortality using birth history data.

Inspite of the above fact one can validly infer that poor accesses to and low utilization of health care services continue to be an important area of study with its effect on infants childhood that need to be focused.

The study is presented into five chapters. Chapter one deals with the introductory part describing the background of the study, statement of the problem and the study area. Chapter two deals with the most important part of the study, the review of related literatures describing the factors affecting infant survival in relation to the prenatal and delivery care, the analytical frame work and operational definitions, the general objective and the hypothesis to be tested. Chapter three describes, material and methods, with the source of data sample design and selection, as well as the assessment of data quality, definition specification of the study variables, the method of data analysis, significance and limitation of the study. While chapters four and five present the finding of the study and summary, discussions and policy implications of the findings respectively.

1.2 Statement of The Problem

As of mid 2000 Ethiopia had a total population of 63.5 million about 1.2 percent of the worlds total and 8 percent of the Africa's total. Growing by 2.92 percent or 1.8 million persons, between mid-1999 and mid 2000 (CSA, 1998 and NOP 1993:2).

Demographically the proportion of women of child bearing age (15-49 years) constitutes 23.5 percent and under five children accounts for 18 percent of the total population both constitute 41 percent being the most vulnerable part of the total population. In other words the target population of maternal and child health programs makes up more than one third of the total population. Indicators of the outcome of their health care dramatically provide a picture of the most vulnerable and sensitivity of exposure to unfavorable influences in their environment, which is described below.

The major problems in health and social care of childbearing age of women lie in the area of women's reproductive health. Specifically these problems lie in the area of pregnancy and childbirth. Lack of access for comprehensive reproductive health care is the main reason why so many women and infants suffer and die. The health care that a mother receives during pregnancy and at the time of delivery is important for the survival and well being of both the mother and the child.

In Ethiopia indicators suggest the low health status of mothers and children has been characterized by high mortality and morbidity rates. The maternal mortality rate is estimated about 871 per 100,000 live births and the infant mortality is estimated about 97 per 1000 live births (EDHS, 2000).

Both access to and utilization of maternal health care services are very low in Ethiopia. Furthermore service coverage is inadequate relative to need yet utilization of available service is also poor. Only very few women in Ethiopia have received basic maternal, delivery and post-partum care. The majority of the women do not have access to these basic health care services. According to EDHS 2000 preliminary report almost 64 percent of women in urban areas have received ANC from trained personnel' in contrast to 22% of the women in rural areas, less than 15 percent of rural women have received Tetanus Toxoid injections while more than 38% of urban woman have received the vaccination (EDHS 2000).

From the above a very low percentage rate having access to basic health services, for instance assistance at delivery from health professional is relatively low in Ethiopia. According to the Ethiopian Demographic and health survey report only 10 percent of the births were attended by trained health personnel compared to 27 percent of births to mothers, which were attended by untrained traditional birth attendants (EDHS 2000). Fewer than 11 percent of the total deliveries took place in health institutions and 31.7 percent of pregnant women received immunization against Tetanus (MOH; 1998).

An important component of effort to reduce the health risks for survival of mothers and children is to increase the proportion of babies delivered under the supervision of health professionals. Proper medical attention and hygienic conditions during delivery can reduce the risk of complications and infections that may cause death or serious illness to either the mother or the baby or both.

Maternal and child health is a priority in many developing countries and has long been the subject of major resource expenditure and research effort. Some of the key factors, which

have been shown to have an effect on the health of the mother and her offspring, relate to the circumstances of pregnancy and childbirth (Jeliffe and Jeliffe, 1987). In particular both antenatal and intra-partum care have been found to have important implications as predictors of subsequent events, such as neonatal mortality, whilst examination of the covariates in the utilization of maternity care has given useful information for improving the up take of these and other maternal and child health services (Ebrahim, 1982).

Social, cultural economic and environmental factors have more influence on fetal, neonatal and childhood periods than on any other stage of human life. Failure to meet the growth and development needs at these intervals adversely affects later stage of life. Low birth weight is an appropriate example that demonstrates this close inter-relationship between the mother, the child and the environment. Low-birth weight is the end result of a mother's lifetime of ill health, malnutrition, parasitic infection, over work, smoking and infections during pre-conception and pregnancy periods.

Most of the problems concerning the study are also briefly described and discussed related to the Amhara region in the following section.

1.3 Rationale for Selecting the Study Area

Survival of infants is highly influenced by access to maternal health care. Mortality is noticeably higher when both antenatal and delivery care are not utilized than when care is taken.

An estimated 30% of pregnant women received prenatal or antenatal care and about 10% delivered at health care facilities in Ethiopia. As for the Amhara region it is even worse, from

the expected pregnant women in the region an estimated 25% of pregnant women have received prenatal care and about 6.19% delivered in health care facilities (Ethiopia, 2000c). The health facility based safe motherhood assessment carried out in 1996 revealed that most of the antenatal visits occurred late in pregnancy. The potential health service coverage for Ethiopia and Amhara region is 50.71% and 42.37% respectively. There are 67 health centers, 523 health stations and 308 health posts in the region. Not all hospitals and very few health centers provided essential care for obstetric-complications. Health facilities suffered from chronic shortages of trained personnel. There are 170 physicians, 1476 nurses and 1735 health assistants in the region. The distribution rate is 9 physicians per 10,000, 2 nurses per 5000 and 9,135 people for each health assistant. Further distribution of physicians and nurses by specialization in the region shows 7 obstetric Gynecologists and 740 nurse midwife out of which 330 are female midwife nurses for an estimated 15,850,000 population of the Amhara region in 2000/01.

As of the subject to be studied is concerned, Amhara region is also selected purposely because it has one of the highest infant death (112.4 per 1000 live births) and lowest maternal health care as noted above. In addition to the above-indicated facts, the low status of women and other socio-cultural reasons in the society, a low priority is usually given to their health within the family, and most rural women are also reluctant to avail themselves of health services. Furthermore, various reports show pregnant women hesitate to be seen by male-medical professionals and hence the problem of the pregnant women is exacerbated with professional staffs to care obstetric as well as gynecological problems in the region (HSDP, 1999).

In general because of the variation of the above-indicated related factors the health status of this region is relatively poor and the utilization of health services are also very low and its impact on infant survival is adverse.

Moreover in review of health policy among the development of the preventive components of health care major emphasis has been given on the most under served regions and segments of the population including the majority of the rural population and the urban poor (MEDAC, 1992/93-1997/98).

1.4 Objective Of The Study

The general objective of this study is to assess prenatal and delivery care factors affecting infant's survival after controlling social, economic cultural and demographic factors in the Amhara region of Ethiopia.

Specific Objectives

1. *To examine the status of prenatal and delivery care in the region under study.*
2. *To examine the relationship between Prenatal and Delivery care on infant survival in the Amhara region.*
3. *To identify selected socio-economic and demographic factors, which affect utilization of Prenatal and Delivery care on infant survival.*
4. *To suggest policy implication of the research findings.*

1.5 Background Characteristics of The Study Population

Population size and Characteristics

According to the census result, the population of Amhara Region projected as of October 2000 is 15,879,236 persons; of which 7,967,005 are males and 7,912,231 females. The percentage share of males is 50.2 percent while that of females is 49.8 percent. The urban residents of Amhara Region number 1,600,447 while its rural residents number 14,278,789. That is, above 90 percent of the population in Amhara Region is living in rural areas.

Considering the age distribution of the residents of Amhara Region, the proportion of children under the age of 15 is about 44.1 percent of the total population. The proportion of the population at the age group 15-59 years is almost half (i.e. 49.7 percent) of the residents of the region, which are economically active. The proportion of population aged 60 years and over is about 6.2 percent. For further breakdown of the age group refer to Table 1.1. The pattern as revealed for total population also holds for urban and rural areas of the region.

Table 1.1

Age Distribution of the Residents of Amhara Region by Broad Age Group (2000)

BROAD AGE-GROUP	URBAN		RURAL		TOTAL		BOTH SEXES
	Male	Female	Male	Female	Male	Female	
0-14	303569 (41.6%)	320323 (36.8%)	3260075 (45.0%)	3117353 (44.3%)	3563644 (44.7%)	3437676 (43.4%)	7001320 (44.1%)
15-59	386326 (52.9%)	497390 (57.1%)	3483936 (48.0%)	3531558 (50.1%)	3870262 (48.6%)	4028948 (51.0%)	7899210 (49.7%)
60 (+)	40172 (5.5%)	52667 (6.1%)	492927 (7.0%)	392940 (5.6%)	533099 (6.7%)	445607 (5.6%)	978706 (6.2%)
Total	730067 (45.6%)	870380 (54.4%)	7236938 (50.4%)	7041851 (49.3%)	7967005 (50.2%)	7912231 (49.8%)	15879236 (100%)

Source: 2000 population census projection 1994 (CSA) 2000.

Religion

Religion is one of the major socio-cultural characteristics of a population. Hence, according to the census result, the religious composition of the population of Amhara Region indicates that 81.5 percent are Orthodox Christians, 18.1 percent Muslims and 0.1 percent Protestants. The religious composition of the urban as well as the rural areas follow similar pattern to that of the total population of the region. Orthodox Christians constitute 76.4 of the urban and 82.0 percent of the rural population. Next to Orthodox Christians, 23.0 percent of the urban and 17.9 percent of the rural population are Muslims and 0.5 percent of the urban and 0.04 percent of the rural population are Catholics.

Ethnicity

The results of the census further indicate that the resident in the major ethnic groups of Amhara Region are found to be 91.2 percent Amhara, 3.0 percent Oromo, 2.7 percent Agew/Awingi, 1.2 percent Kimant, and 1.0 percent Agew/Kamyr. Among the urban population of the region, 92.1 percent are Amhara, 2.5 are Tigraway, 1.6 are Awingi and 1.6 are Oromo. The data revealed that the proportion of Amhara is also large in rural areas being 91.1 percent of the rural population while 3.2 percent are Oromos, 2.8 percent are Agew Awingi, 1.3 percent are Kimant, and 1.1 percent are Agew/Kamyr.

Marital Status

Considering the marital status of the residents, the results show that out of the total persons aged 10 years and over, 33.4 percent are never married, 52.8 percent are currently married, and 13.9 percent are divorced or widowed. Also the data revealed that, 41.0 percent of the

males and 25.6 percent of the females are never married; 52.5 percent of the males and 53.0 percent of the females are currently married, and 76.5 percent of the males and 21.5 percent of the females are widowed or divorced.

Educational Attainment

Based on the census data 1994 the total population aged 5 years and over, 8 percent of the males, 5 percent of the females and 7 percent of both sexes were attending school at various levels. Those who were attending school in urban areas constituted 33 percent while in rural areas it was only 4 percent. Similarly, 14 percent of the males, 7 percent of the females and 10 percent of both sexes aged 5 years and over reported as having attended school in the past. This percent varied between 28 percent in urban areas and 9 percent in rural areas. Further description revealed that of the total population of Amhara Region aged 10 years and above, 23 percent of the males, 12 percent of the females and 18 percent of both sexes are found to be literate. The literacy rates for urban and rural areas were found to be 62 and 13 percent, respectively.

Population Dynamics

The variables that determine population growth rate are fertility, mortality and migration. According to the census result, the total fertility rate (the number of births a woman expects to have in her entire reproductive age span if she follows the current fertility behavior reported by women in the different age groups) are found to be 4.3 for the total region, 2.7 for urban areas and 4.5 for rural areas. The estimated infant mortality rates for the total, urban and rural areas of the region are 112.4, 102 and 117 death per 1000 births, respectively. The

estimated expectation of life at birth are 50 years for males, 52 years for females and 51 years for both sexes for the total population of the region, 52 years for males, 56 years for females and 54 years for both sexes in urban areas; and 50 years for males, 52 years for females and 51 years for both sexes in rural areas.

Moreover, in the twelve months prior to the census date, the number of persons who in-migrated to Amhara Region amounted to about 0.9 percent of the total population. Whereas, those who in-migrated to Amhara Region in the four years before the census data constituted 4.7 percent of the total population.

Housing

In the 1994 population and Housing Census of Amhara Region detailed information on housing were collected. Thus, the results indicated that there were 2,985,268 residential housing units in Amhara Region of which 285,203 were in urban areas and 2,700,065 were in rural areas. The total number of rooms in these housing units were 4,139,604 for the region as a whole, 540,123 for urban and 3,599,481 for rural areas. These give an average of 3.3,2.3 and 3.4 persons per room for the region, urban and rural areas, respectively.

The information on sources of water supply shows that 9.1 percent of the housing units used piped water; 12.3 percent used protected wells or springs; 42.1 percent unprotected wells or springs; and 36.4 percent used rivers, lakes or ponds. About 70.4 percent of the housing units in the urban areas used piped water while 10.1 percent, 9.2 percent and 10.3 percent of them used protected and unprotected wells or springs and river, lakes and ponds, respectively. In the rural areas, residential housing units which used piped water accounted for only 2.7 percent, protected wells or springs for 12.6 percent, unprotected well or springs for 45.5

percent and those that used rivers, lakes or ponds constituted 39.2 percent. Sources of lighting for the housing units out of the total residential housing units in the city shows 16.6 percent have private electric meters, 39.7 percent have shared electric meters, 43.7 percent use lanterns or kerosene lamps. Out of the total residential housing units 5.8 percent have toilets while the rest 93.6 percent do not. In the urban areas 37.3 percent of the residential housing units have toilet while 61.5 percent do not. In the rural areas only 2.5 percent have toilets and 97.0 percent do not have toilet.

Data on availability of housing amenities such as Radios, Television sets and Telephone sets indicate that out of the total housing units in Amhara Region, nine percent had Radio sets. Of the total urban residential housing units, three percent had Television sets and four percent of them had Telephone sets.

1.6 General Characteristics of The Mothers Aged 15-49 of Amhara Region

The general characteristic of mothers at their reproductive age 15-49 is presented in Table 1.2. According to the census of 1994 the projection made for the year 2000 mothers of age 15-49 was 36,18743, which accounts for 23 percent of the total population, and 45.7 percent of the female population in the region.

Mothers' age at birth

Among the mothers with in the reproductive ages the highest percentage of mothers are age group 20-34 (48.2 percent) followed by ages 35-49 and 15-19 with 28.2 percent and 23.6 percent respectively.

Marital status

Considering the marital status, the result shows that out of the total mothers with in the age group (15-49) 67.3 percent are married, 15.1 percent are single, 14.3 percent are divorced while 3.1 percent are widowed.

Literacy status of mothers

The educational status of mothers revealed in Table 1.2 obtained from the projected census result of 2000 shows the majority of mothers (87.9 percent) to be illiterate while 12.1 percent are literate.

Table 1.2

Percentage of Selected Demographic Back Ground Characteristics of Mothers Aged 15-49 of Amhara Region (2000)

Characteristics	Number	Percent
Mothers age at birth		
15-19	854023	23.6
20-34	1744234	48.2
35-49	1020486	28.2
Total	3618743	100
Marital status		
Single	546430	15.1
Married	2435414	67.3
Divorced	517480	14.3
Widowed	112181	3.1
Others	7238	0.2
Total	3618743	100
Literacy status		
Illiterate	3180875	87.9
Primary (+)	437868	12.1
Total	3618743	100

Source:2000 Population census projection 1994 (CSA) 2000.

Ethnicity

Based on Table 1.3 the major ethnic group of Amhara mothers are found to be 91.2 percent and 8.8 percent are Oromo /Agew and others.

Religion

As described earlier religion is one of the major socio-cultural characteristics of a population. Accordingly 81.2 percent of the mothers within the reproductive ages are Orthodox Christians, while 18.8 percent are followers of Muslim and other religions (Table 1.3)

Economic activity status

In urban areas all mothers who were productively engaged for at least one day during the seven days reference period and in rural areas all mothers participating in a productive activity if they were engaged in the production of economic goods and services during most of the twelve months prior to the census day were classified as economically active. Economic or productive activity in the census was defined in terms of production of goods and services following the concept presented in the United Nations System of National Account (SNA) production boundary (ILO, 1990a). Accordingly Table 1.3 shows that 73.5 percent of the mothers as economically active while 26.5 percent as non-active.

Table 1.3

Percentage of Selected Socio-economic Back Ground Characteristics of Mothers Aged 15-49 of Amhara Region (2000)

Characteristics	Number	Percent
Religion		
Orthodox	2938419	81.2
Muslim/others	680324	18.8
Total	3618743	100
Ethnicity		
Amhara	3300294	91.2
Oromo/Agew and others	318449\	8.8
Total	3618743	100
Economic activity status		
Active	2658690	73.5
Non active	960053	26.5
Total	3618743	100

Source:2000 Population census projection 1994 (CSA) 2000.

CHAPTER TWO

Review of Related Literatures

2.1. Factors Influencing Infant Survival

Various studies have shown that the levels and trends of infant survival vary from country to country depending on the socio-economic development of each country. In fact infant mortality is widely used as a summary measure of socio economic and well being of a nation (Davanzo et al, 1983; Gubhaju, et al. 1991).

Furthermore, studies have also revealed that infant mortality differs by socio economic-status of parents within countries (Caldwell, 1979; Hobcraft et al, 1984) by demographic factors (Gubhaju et al, 1991; Hob craft et al 1985) and environmental factors (Gubhaju et al, 1991)

However, the relative importance of socio economic demographic and environmental factors on infants survival varies with the level of socio economic development of the nation, (Kim, 1988;Gubhaju et al, 1991), observed that in a traditional society demographic factors affect infant mortality more than socio-economic factors.

The different socio economic, cultural, environmental as well as demographic factors affecting infant survival are identified and studied by various researchers. Literature related to the correlates of infant death considered in this study are reviewed in this section

2.1.1. Demographic Factors

In various research studies the sex of the child, maternal age at birth of child, birth interval and birth order are found to be important in influencing infant and child survival.

The demographic determinants can be broadly divided into maternal and child factors. The first group refers to those factors, which affect the health of the mother to the extent of exposing her offspring to a higher risk of infant mortality, (Meegama, 1980).

Maternal Factors

a) Birth Order

Birth order influences neonatal mortality, much more than post-neonatal mortality (Davanzo et al, 1983 Meegama, 1980). Studies have revealed that infant mortality rate is higher for first and higher birth orders (Davanzo et al, 1983, Meegama, 1980, Majumder 1991; Gubhaju et al. 1991). The negative effect on the first order and higher order above 5 births is also confirmed in the study done in Sebeta town (Mekonen, 1993). The higher risk of dying of first order births is usually explained by the mothers inexperience in child care or child bearing. And the elevated risk of dying of higher birth orders is usually attributed to the enfeeblement of the mother, which affects the infant's health.

b) Birth Interval

Preceding birth interval is considered as one of the most proximate correlates of infant mortality (Davenzo et al, 1983). Various studies have demonstrated that the length of interval since previous birth influences significantly the probability of infant survival. Among others,

studies in Malaysia (Davanzo et al, 1983), Bangladesh (Majunder, 1991), Kenya (Kibet, 1987) and Nigeria (Ogunlade et al. 1987) have shown that infant born after a relatively short interval (generally less than 2 years) experiences considerably higher mortality than those born after long intervals, birth intervals of 2 or 3 years are found to be associated with lower mortality rates.

Furthermore length of the preceding birth interval is found to be the most important variable affecting infant mortality compared to maternal age or birth order (Davenzo et al. 1983, Majunder, 1991). The study by Mekonen (1993) also revealed that the negative effect of short preceding birth interval on infant survival persists whether preceding child survived or not.

c) *Age of Mothers at Maternity*

Children born to women under 20 years of age and to older women at the end of their reproductive cycle are much more likely to die in the first five years of life than are those born to women in their twenties or thirties. The pattern of high mortality among children born to women at the extremes of the reproductive ages is fairly universal. It is associated with selectivity with respect to socio economic factors though it is principally and directly, has an effect of physiological determinants (DHS (1991/92), YDMCHS, 91/92).

Children born to younger mothers are at risk in the neonatal period for a range of causes associated with pregnancy and delivery; in addition, the larger proportion of low birth weight children born to younger mothers involves a disadvantage which extends beyond the neonatal period.

d) Sex

Infant mortality is generally higher for males. The mortality of male infants is higher through out their first year, and especially during the second six months (Davanzo et al, 1983). Higher infant mortality of boys has been recorded nearly everywhere except where girls are discriminated against (UN 1985, reviewed by Davanzo et al, 1983) Studies in Ethiopia (Assefa H/M 1991, Mekonen, 1993) also confirm the general findings, the higher mortality of boys is generally ascribed to biological factors.

In general biological factors, especially maternal ones, are likely to affect neonatal deaths than post-neonatal deaths, which are much more affected by exogenous (environmental) factors (Meegama, 1980). Exposure to exogenous and environmental hazards after birth has been found to play some role, but often a minor part on neonatal deaths (Meegama, 1980; Davanzo et al, 1983).

e) Breast-feeding

The early initiation of breast-feeding is important for a number of reasons. Early suckling benefits mothers because it stimulated breast milk production and release a hormone that helps the mothers to contract and reduce post-partum blood loss. The first breast milk contains colostrums, which is highly nutritious and has antibodies that protect the new born from diseases (CSA/ORC MACRO (2001), EDHS 2000 Ethiopia).

Breast-feeding plays a particularly important role in child survival in developing countries. It contributes to the child's imunological defense system, and increases its resistance to disease.

Breast-feeding also facilitates child survival through post-partum an ovulation and post-partum abstinence as these increases the intervals between births. (Social science and medicine No. 52 (2001): Abada 2001)

2.1.2. Socio-Economic Characteristics

Infant and child mortality are often thought to be higher among certain socio economic groups than others because of differences in living standards and health conditions in general and differential availability and access to public health facilities in particular. In this section differentials in infant and child mortality are examined with special attention given to selected background characteristics: place of residence, level of mothers education and maternal health care (etc).

A central finding of various studies on the socioeconomic determinants of infant mortality has been the importance of maternal and sometimes-paternal education in reducing a child's risk of dying (Caldwell, 1979; Hobcraft et al. 1984; Gubhaju et al, 1991). Socioeconomic determinants can be analyzed at individual and at household level.

a) Mother's Education

Studies on infant mortality have shown that children of educated parents have higher chance of survival than those of the uneducated. And in particular, differences in infant survival have been found to be highly associated with maternal education (Hobcraft et al., 1984, Tabutin et al., 1992).

In his Nigerian study, Caldwell (1979) has shown that mother's education plays an important role on infant survival. Among various other studies, studies in China (Dankert et al., 1991), in Bangladesh (Gubhaju et al., Pant, 1991), Kenya (Kibet, 1987) and Srilanka (Meegama, 1980) confirm the findings of Caldwell. The negative relationship between the extent of mother's education and infant and child mortality was also confirmed by studies in Ethiopia (Yohannes, 1990; Assefa Hagos, 1991; Mekonnen, 1993), the strong effect of mother's education is found to be maintained even after controlling other variables.

As the survival prospects of children during infancy and childhood depend on the level of nutrition, hygiene and health care, educated mothers are likely to provide better services and care than uneducated mothers (even if both have the same economic resources) (Pant, 1991; Gubhaju et al., 1991) for education provides the mother with the necessary skills for child care (Caldwell, 1979).

b) Mothers Employment and form of Earnings

In the demographic literature the discussion of the relationship of women's work and infant/child mortality has always focused on paid employment outside the home, which is believed to be a possible cause of child neglect and child malnutrition due to abandonment of breastfeeding (Ware, 1984).

However, mother's occupation is not of importance, but the circumstances in which it is carried out are (Ware, 1984). Women economic activities will have a negative impact on child care only where the activity is incompatible with simultaneous childbearing or where the mother lacks access to another person able to care for the child (Ware, 1984).

Besides, the work status of the mother can be an important determinant of mortality at early years of life. The need to work, especially outside the home, may affect survival chances directly, simply by preventing the mother from caring for the infant (Hobcraft et al., 1984). This may have substantial effects through lack of proper feeding and particularly breastfeeding early in life.

Work outside the home is likely to be associated, on the other hand, both with modernity and with higher family income, both of which probably increase chances of survival (Hobcraft et al., 1984). For instance, Ogunlade et al. (1987) in their study in Nigeria have found out that children whose mothers work away from home have the lowest infant and child mortality rates, as they are likely to be better educated and have jobs in the modern sector. Similar result was also obtained in the study done in Sebeta town by Mekonen (1993).

However, work status of the mother as compared to father's and mother's education is not found to be an important explanatory variable in a socioeconomic study of infant and child mortality in 28 countries (Hobcraft et al. 1984).

The immediate cause of babies' death may be lack of food, disease, severe birth defect, extreme low birth weight or injury. But underneath most infant deaths is likely to be mosaic of low family income, lack of sanitation, crowding high fertility, or exposure to toxic substances (Wallace, 1990).

The potential role of income- related factors in child survival is complex mainly due to the multifaceted nature of income itself. Many different concepts of income are in current use, one of these concepts is household money income. The total volume of financial instruments

mainly cash received by members of a household during a special period of time plus the value of goods and services received directly ("In kind" income); (UN, 1985).

Since the goal of this analysis is to examine factors impinging on the survival of children, it is clear that income should serve as an indicator of children consumption of goods and services that affect their health including among others calories and nutrients, clothing and shelter sanitary facilitates, use of medical systems, and adult supervision.

In addition to ambiguities in measurement, the interpretation of income's relation with mortality is not straightforward. It is obviously reasonable to expect that, ceteris-paribus a higher income household should experience lower child mortality risks (UN 1985).

c) Ethnicity and Religion of Mother

Studies have revealed that infant mortality varies significantly among religious and ethnic groups. In Nigeria for instance, Ogunlade and Mezue (1987) have shown that there is a wide mortality gap between Christians and Muslims. Comparison within two religions revealed that about 50 percent Muslims are more likely to die than Christians. Lower infant and child mortality among Christians was also observed in studies done in different regions of Ethiopia (Gabremaskal, 1994; Mekonnen, 1993; AssefaH/M, 1991).

Regarding ethnicity, the United Nations (1985) (as reported in Assefa Hagos, 1991) in its study in eleven developing countries has observed substantial variations in child loss across ethnic groups.

The variations are usually said to be the result of different cultural practices in childcare beyond the difference in access to socio-economic advantages. In this line, findings in

Ethiopia too (as cited in Assefa H/M, 1991) showed that an Oromo mother had higher child mortality than her Amhara compatriot.

2.1.3. Environmental Factors

One subset of the set of intermediate/ proximate determinants through which socioeconomic factors influence early mortality is environmental contamination refers to the transmission of infectious agents to children (Mosley and Chen, 1984).

Levels of potential exposure to disease can be approximated and scaled by using a series of simple physical indexes that are known to be strongly correlated with the levels of biological contamination of the environment (Mosley and Chen, 1984).

Environmental variables considered being important in influencing infant survival include, source of drinking water, availability of toilet facility and housing structure etc.

a) Toilet Facility

Access to proper toilet facilities lowers the risks of environmental contamination (Meegama, 1980; Pant, 1991) and thus increases the probability of infant and child survival. For instance, in urban Nepal (Gubhaju et al., 1991) the net effect on probability of dying of children whose households, did not have their own toilet facility, was found to be 64% higher than that of those belonging to households, which had their own toilet facilities.

Similar result was also obtained in studies done is Ethiopia (Yohannes, 1990; Assefa H/M, 1991; Mekonnen, 1993). Furthermore, Assefa Hagos (1991) and Mulugeta (1995) in their study in Shewa and Urban Ethiopia, respectively, have shown that the type of toilet facility in

a household affects significantly the survival chance of children. As to their findings, children born in households with flush toilet were found to have higher chances of survival compared to those born in households with dry pit latrines or no toilet facility.

b) Source of Drinking Water

In various studies, source of drinking water was found to have a significant influence on infant and child mortality. In urban Nepal, for example, the probability of dying during infancy of children born to households which use drinking water from a river or a lake etc. is found to be 44% higher than the probability of dying of children born to households which use piped/tube-well drinking water as their source (Gubhaju et al., 1991). Besides, in the context of Ethiopia, Yohannes (1990), as cited in Mekonen (1993) has reported that, in Addis Ababa, women who use tap water in their house or within their compound experience lower child mortality than women who use tap water outside their compound.

Previous studies have shown that environmental factors like, access to safe water, electricity and toilet or latrines are important for infant and child survival in urban areas rather than in rural areas. Moreover, Meegama (1980) in her study in Sri Lanka, Gubhaju et al., (1991) and Pant (1991) in their studies in Nepal have shown that environmental factors are important for infant survival particularly in the rural areas.

2.1.4. Maternal - Care Factors

Several studies support the view that antenatal care attendance reduces suffering during pregnancy and reduces infant and maternal death rates.

Generally, the risk of maternal morbidity and mortality is significantly higher among women who had not attended antenatal care services compared to those who attended (Royston and Armstrong, 1989; Mustard and Ross, 1994). Antenatal care is also believed to have a beneficial impact on birth weight and reduces the rates of neonatal, infant and child mortality (Quick et al 1981; Donaldson et al 1984; Jiro Jwong, 1990).

Delivery at a hospital, clinic or other health facility moderately improves neonatal and post-neonatal survival chances. The importance of giving birth, at a health facility rather than at home may be under estimated in this analysis, however due to selectivity factors: mothers who deliver at home may be more likely to die and hence be excluded (along with their particularly vulnerable children) for DHS surveys. Additionally women with pregnancy complications may be more motivated to go to hospitals where they may give birth to children with poor health, although there are constraints to birth facility access in some African settings (Prevention of Maternal Mortality Network 1992; Thaddeus and Maine 1994).

Regardless of such selectivity small but significant reductions in the risk of dying from giving birth at a health facility suggest that health systems in these countries are sufficiently equipped to offer at least one modern medical benefits, for example blood transfusion and the ability to perform caesarean sections so as to make a difference in saving new born lives.

This conclusion would support continued promotion of WHO's longstanding goal of delivery of all births in modern health centers (Martin-Brocker Hoff, 1995).

According to studies conducted in Ethiopia antenatal care attendance showed a significant protective effect against low birth weight (Melkie and Getnet, 1996) and that lack of this care is among the most important factors determining prenatal death (Tadessie et al 1989). Several other studies in the country underlined the need for effective and early prenatal care services to improve pregnancy outcome and maternal and child health status (Asseffa H/M, 1991; Kelly, 1992; Desalegn 1993; Mekbib and Tefera, 1994; Ali, Y 1995).

Studies in Ethiopia showed reduction in maternal morality rates among women who had received antenatal care as compared to those who did not (Kwast et al, 1986; Alasbu, 1987; Seyoum and Kifle, 1988). UNICEF (1990) estimated that 63% of the neonatal deaths in Ethiopia are due to Tetanus, which could be averted by immunization of mothers with tetanus toxoid and/or proper handling of deliveries by trained professionals. However where antenatal care is shown to be effective, constraints on access to such care limit the number of women who may derive benefits.

2.1.5. Urban-Rural Differentials

Studies in different countries have shown the existence of regionally differentiated risk of infant and child mortality (Kibet, 1987).

As argued by the UN, the pattern of variations in the less developed countries appeared to be different from that of the developed region where the geographic variation may simply reflect the geographical distribution in socio-economic factors [cited in Assefa (1991)]. In

developing nations, regional differences in child mortality are not entirely explained by socio-economic, inequalities alone (UN, 1995). Climatic and ecological conditions associated with disease environment (where major disease vectors flourish) are suspected to be the other causes for the variation in infant and child mortality

Other than the regional differentials of mortality risk by variation in altitude is also confirmed by the study of Gabremaskel (1994) on Showa and Arsi province.

2.2 Analytical Framework of the study

Factors, which can influence and determine the level of infant and child mortality, are known to be several, complicated and interrelated. However, they can be roughly divided into socio-economic factors and biomedical factors (UN, 1985).

Because death is a biological process, factors affecting infant and child mortality in the most direct manner are biomedical (Mosley and Chen, 1984).

Mosley and Chen, in an attempt to develop an analytical framework of the study of infant and child mortality demonstrated that all social and economic variables operate through some biological mechanism (proximate determinants) that enhance or, in contrast, reduce the child's biological response to adverse elements or conditions endangering its chances of survival.

Accordingly the proximate determinants can be broadly grouped in to various categories of Socio-economic, Cultural, Environmental and Demographic factors.

Socio-economic factors such as education of mother, cultural factors operating through religion and ethnicity, water and toilet facilities are considered as environmental factors with expectation having direct effect on infant survival for the study. The demographic factors referring to the sex of the child, mothers age at birth, birth order, birth interval, breast-feeding are taken as a proximate determinants of infants survival.

These proximate determinates are considered to operate through the intermediate variables of utilization of prenatal and delivery factors considered care which directly influences the risk of morbidity and mortality.

Each of the variables has been shown to exert an independent influence on pregnancy outcome and infants survival; however, sex of the baby and birth interval has an indirect effect on the intermediate variable.

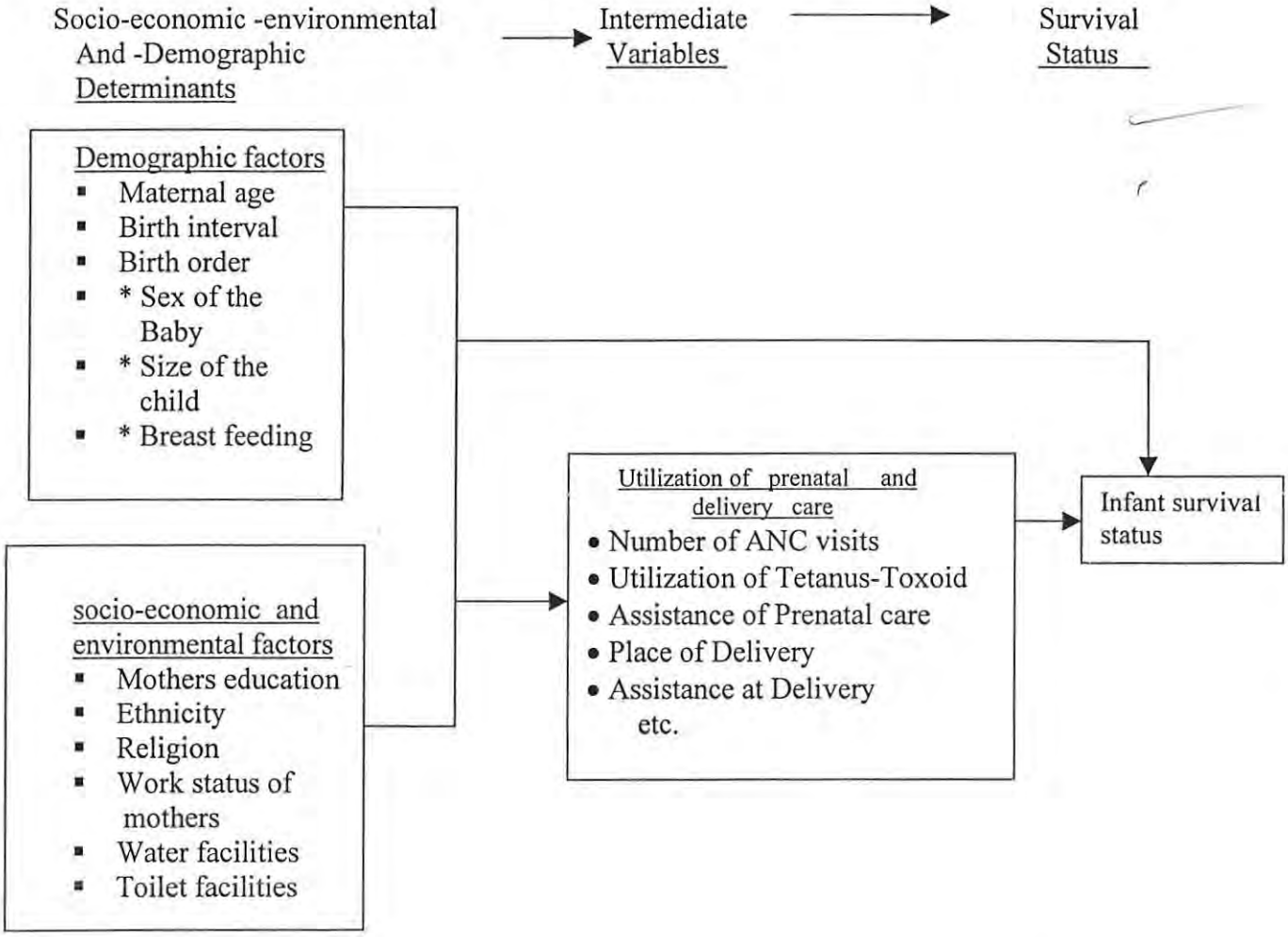
The key to the model is the identification of a set of proximate determinants, and intermediate variables that directly influence the risk of mortality but, synergism or combined effect of factors may also exist in the process for example short birth interval with young maternal age has a significant effect on the intermediate variable and infants mortality.

Most demographic surveys lack relevant information that would make possible investigation of both socio-economic and biological variables. However, the 2000 Ethiopian Demographic and Health Survey permits us to undertake such analysis. The present study is, thus, done taking into consideration the framework proposed by Mosley and Chen (1984).

FIGURE 2

Analytical Frame Work

For the analysis of the effect of socioeconomic, demographic and health factors on infant's survival.



Source: W. Henry- Mosley and Lincoln C. Chew (Population and Development Review - Supplement to vol. 10, 1984) Page 26(Adopted for the study by the Author)

** Has no direct impact on utilization of prenatal and delivery care but they have direct impact on survival status of infants (Mosley, 1984).*

2.3 Operational Definitions

- ***Health facilities***:- Health institutions such as hospitals, health centers, health stations or clinics that provide Antenatal and delivery care.

- ***Infant mortality***:- refers to the probability of dying before exact age of one year and the rate is the number of dead infants (under one year of age) per thousand live births per year.

- ***Neonatal death***:- is the number of infants who died during the first month of life, and neonatal mortality rate is the ratio of the number of infants who died in the first month of life to the number of live births in a year.

- ***Post-neonatal death***:- refers to the infants who survived the first month of life, but died before celebrating their first birth day The post-neonatal mortality rate is defined as the ratio of the infants who died between 1 and 11 months of life among live births in a year.

- ***Tetanus-Toxoid***:- injection which are given during pregnancy for the prevention of neonatal tetanus, an important cause of death among infants. For protection a pregnant women should receive at least two doses during each pregnancy.

- ***Antenatal Care / Prenatal Care***:- is the regular observation and care of mother and fetus by trained health personnel through the whole pregnancy with necessary examinations and recommendations to assure a safe pregnancy. Women who visited the health facilities at least once for their pregnancy that terminated in a live birth within 12 months prior to the date of the survey are considered in the study.

- ***Delivery Care*:-** the service given for a pregnant women during labour, management of normal delivery and detection of complications, management of risk cases in labour and complicated cases. Care given to woman's birth assisted by a trained health professional at a health facility is considered for this study in the analysis.

2.4 Hypothesis to be tested

1. *The higher the utilization of prenatal and delivery care by mothers the higher the chance of infants surviving.*

2. *First birth order and higher birth order above 5 have lower utilization of prenatal and delivery care showing a lower infant survival than the intermediate order of birth.*

3. *The survival of infants born to literate mothers utilizing prenatal and delivery care services will be high.*

4. *Mothers of youngest age (15-19) and higher ages of 35 and above both have lower utilization of prenatal and delivery care services and survival of infants born to them than the mothers of age (20-34).*

5. *The higher the length of the preceding birth interval the higher the utilization of prenatal and delivery care services by mothers, the infant survival will also be high.*

6. *Assistance of prenatal and delivery care by health professional increases the chances of infants' survival.*

7. *Socio-economic and demographic factors in general affect the chance of infant survival less than utilization of prenatal and delivery care factors.*

CHAPTER THREE

Materials and Methods

3.1 Source of Data, Sample Design And Selection

In order to attain the set of objectives and testing of the hypothesis data set of the 2000 Ethiopian Demographic and Health Survey conducted in Ethiopia as part of the world wide demographic and health survey (DHS) project, which was carried out under the aegis of the Ministry of Health and implemented by the Central Statistical Authority (CSA) has been used for the study.

Three questionnaires were administered during the survey. The household questionnaire, the women's questionnaire and the men's questionnaire, which were based on model survey instruments, developed for the International Measure DHS (+) project. The questionnaire was specifically geared towards obtaining the kind of information needed by health and family planning program managers and policy makers. The model questionnaires were then adapted to local conditions and a number of additional questions specific to on going health and family planning programs in Ethiopia were added.

The principal objective of the survey was to provide current and reliable data on fertility and family planning behavior, child mortality, children's nutritional status, the utilization of maternal and child health services and knowledge of HIV/AIDS.

The Ethiopian DHS collected Demographic and Health information from a nationally representative sample of women and men in the reproductive age groups 15-49 and 15-59

respectively. The primary focus of the 2000 Ethiopia DHS was to provide estimates of key population and health indicators including fertility and mortality rates, for the country as a whole and for urban and rural areas separately. In addition the sample was designed to provide estimates of key variables for the nine regions, namely Tigray, Affar, Amhara, Oromia, Somali Benishangul- Gumuz, Southern, nations nationalities and peoples (SNNP). Gambella and the two administrative council areas of Addis Ababa and Dire Dawa.

The Sample for the survey was based on a two stage stratified, nationally representative sample of households. At the first stage of sampling, 540 EAS, 139 in the urban and 401 in the rural areas were selected using systematic sampling with probability proportional to size.

The procedure of selection of enumeration area and households for the region of Amhara follows the same procedure as presented above.

The Survey was designed to obtain completed interviews of 14,000 women of age 15-49. In addition all males of age 15-59 in every fifth household were interviewed to obtain a target of 2,700 men. In order to take non-response into account a total of 14,642 house holds nation wide were selected of which 14,167 were found occupied. Household interviews were completed for 99 percent of the occupied households. A total of 15,716 eligible women from these households and 2,771 eligible men from every fifth household were identified for the individuals interview. The interviews were successfully completed for 15367 women and 2,607 men out of which 1,909 women and 321 men 3,930 households here selected and interviewed from Urban and rural areas of the Amhara region.

3.2 Assessment of Data Quality

It is well known that survey as well as census data may not be free of errors and biases, especially in developing countries. Since errors and biases may create significant distortions in the results of any demographic analysis, it is essential to evaluate or appraise the quality of and/or limitations of the data in order to explain some of the irregularities that may arise. Besides, evaluation of the data helps us choose the most appropriate analytical method (Gabremaskal, 1994).

In view of this, before moving into any detailed analysis and estimation a brief assessment of the quality of the data is carried out. The types of data that are evaluated include birth, death and age data.

The household schedule was administered before the individual questionnaire. It contains a list of all household members along with their age, sex, marital status and other relevant information. Eligible women, for the individual interview, were identified at this stage. A brief evaluation of the general quality of reporting of the eligible women, is in order.

Evaluation of age data

Misreporting of age is a common problem in developing countries like Ethiopia and Amhara region is no exception. In a situation where the absolute majority of the respondents are illiterate (EDHS 2000), very few can report their exact date of birth.

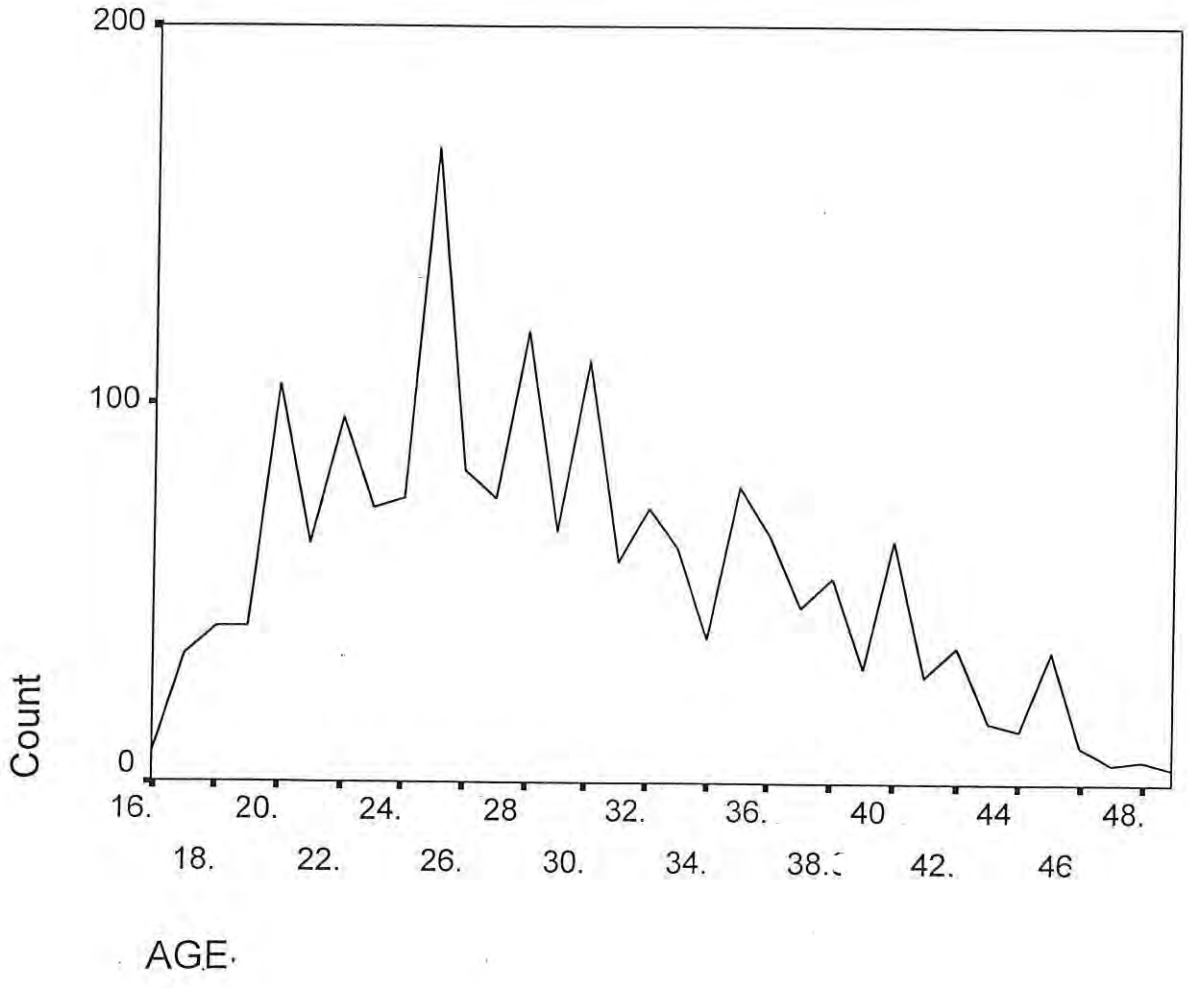
In the absence of significant reduction in mortality, increased mortality to selected ages, significant migration of population, and given that age is accurately reported, the expected age distribution is one which has a descending pattern as age advances.

Age displacement is common in many surveys that include both demographic and health information for children below a specified age. In the Ethiopia DHS, the cutoff date for asking health questions was Meskerem 1987 in the Ethiopian calendar (which roughly corresponds to September 1994 in the Gregorian calendar). Table 3.1 shows that there is some age displacement across this boundary and it is more obvious for living than dead children. This pattern could be attributed to the transference of births by interviewers out of the period for which health data were collected. However, since transference is not proportionally higher for dead children than living children, mortality rates are unlikely to be affected by such displacement. The overall sex ratio of 104 is also higher than expected, indicating that there may be some underreporting of female births, especially of female children who are no longer alive.

Heaping of the age at death on certain digits is another problem that is inherent in most retrospective surveys and in this study as shown in figure 4. Misreporting of age at death biases age pattern estimates of mortality if the net result is the transference of deaths between age segments for which the rates are calculated; for example, child mortality may be overestimated relative to infant mortality if children who died in the first year of life are reported as having died at age one or older. In an effort to minimize misreporting of age at death, interviewers were instructed to record deaths under one month in days and under two years in months, In addition, they were trained to probe for deaths reported at exactly 1 year or 12 months to ensure that they had actually occurred at 12 months. The distribution of

deaths under 2 years during the 20 years prior to the survey by months of death shows that there is definite heaping at 6,12 and 18 months of age with corresponding deficits in adjacent months. However, heaping is less pronounced for deaths in the five years preceding the survey, for which the most recent mortality rates are calculated.

Figure 3 Distribution of Births by Mothers Age for the selected sample under study of Amhara Region (1996-2000)



Omission of Births and Deaths

The reliability of mortality estimates depends on the sampling variability of the estimates and non-sampling errors. Non-sampling errors depend on the extent to which the date of birth and age at death are accurately reported and recorded and the completeness with which child deaths are reported (Refer figure 3 and 4). Omission of births and deaths affects mortality estimates; displacement of date impacts on mortality trends, and misreporting of age at death may distort the age pattern of mortality. Typically, the most serious source of non-sampling errors in a survey that collects retrospective information on births and deaths arises from an underreporting of both births and deaths of children who are not alive at the time of the survey. It may be that mothers are generally reluctant to talk about their dead children because of the sorrow associated with any death, or they may live in a culture that discourages discussing the dead. Underreporting of births and deaths is generally more severe the further back in time an event occurred.

Table 3.1

NUMBER OF BIRTHS, DEATHS AND MORTALITY RATES BY YEAR OF BIRTH OF AMHARA REGION FOR THE SAMPLED INFANTS (1996-2000)

Year of Birth	Births	DEATHS		MORTALITY RATES		
		< 1 Months	1-11 Months	Neonatal	Post Neonatal	Infant
1996	1020	63	43	61.8	42.1	103.9
1997	1025	64	62	62.4	60.5	122.9
1998	683	43	37	62.9	54.2	117.1
1999	600	53	19	88.3	31.7	120.0
2000	385	26	4	67.5	10.4	77.9
Total	3713	249	165	67.1	44.4	111.5

Source:- Computed by the author based on the 2000 DHS Data

An unusual pattern in the distribution of births by calendar years is an indication of omission of children or age displacement. Table 3.1 shows that the percentage of births for which year of birth was reported decreases as one moves further back in time, from 100 percent for births in calendar year 2000 to 62 percent for births in calendar year 1996. This decline is more severe among dead than among living children. For example, complete information is available for 99 percent of living children, but for only 89 percent of dead children, in calendar year 1997. There is also some indication of omission of deaths in the most recent period. For example the proportion of deaths to births declines from 21 percent in the period 1991-1995 to 12 percent during the period 1996-2000. Some of this decline may be due to a real decrease in mortality in the most recent period, and some may be due to the fact that younger children have a shorter period of exposure to the risk of mortality. Nevertheless, such a sharp decline in the proportion of deaths since 1995 suggests some underreporting in the most recent period.

Underreporting of deaths is usually assumed to be higher for deaths that occur very early in infancy. Table 3.1 shows data on age at death for early infant deaths. Selective underreporting of early neonatal deaths would result in an abnormally low ratio of deaths within the first seven days of life to all neonatal deaths. Early infant deaths have not been severely underreported in the Ethiopia DHS as suggested by the high ratio of deaths in the first seven days of life to all neonatal deaths.[1]

[1] *There are no model mortality patterns for the neonatal period. However, one review of data from several developing countries concluded that at levels of neonatal mortality of 20 per 1,000 or higher, approximately 70 percent of neonatal deaths occur within the first seven days of life (Boerma, 1988)*

Figure 4 Distribution of Age at Death in months for the selected sample under study of Amhara Region (1996-2000)

3.3 Definition of The Study Variables

Dependent (Out come variable)

The units of analysis are those infants of age (0-11 months) born of women aged 15-49 starting from their last delivery, for the five years period preceding the survey conducted.

The out come variable is "The Probability of infant survival of those woman's 15-49 utilizing and not utilizing the prenatal and Delivery care" Based on their survival status, the response category is collapsed to create Dichotomous variable (with two outcomes) discrete variable survived or dead and on the basis of the following respective issues.

If the infants of those women 15-49 utilizing or not utilizing the prenatal care and delivery care survived the value coded '1' not survived or dead otherwise 'o'.

Independent Variables

The socio-economic, demographic, environmental and maternal health characteristics have been considered independent or predictors of infant survival.

The following independent controlled variables are used in the analyses:

1. Socio-economic status: mothers literacy status (illiterate, literate); mothers current residence (urban or rural) mothers religion (Orthodox or Moslem/others); and her ethnicity (Amhara, Oromo/Agew and others), work status (working and not working)

2. Bio demographic variables: sex of child; mothers age at birth, birth order (2^{nd} through fifth, sixth and over); breast feeding and size of child at birth (average, small or very small and large or very large)

3. Environmental and communication variables: source of drinking water, sanitation facilities, and access to mass media.

4. Maternal health care service such as utilization of prenatal and delivery care, such as assistance of prenatal care, number of prenatal visits, tetanous toxoid injection given before birth, assistance at delivery, place of delivery, etc.

Environmental characteristics such as sanitation and source of water facilities and their utilization are taken into consideration, with the variation in the place of residence.

Other factors such as ever use of family planning and quality of care is not included in this study based on the basic concern of the study. (See Appendix 1)

3.4 Method of Data Analysis

The data analysis will start with univariate presentation that is simple description to summarize data using descriptive statistics for the essential features of data in easily interpretable terms. Following such examination bivariate cross - tabulations will be carried out for exploring the association of the relationship between variable (Chi-square test, will be used.)

Finally multivariate analysis will be carried out to examine the impact of several independent variables on dependent variable.

For analyzing the data the **logistic model** will be used in this study. The rationale for selecting this model is that the status of infant survival is used as binary, and the logistic regression model lends itself to biologically meaningful interpretation. In addition to this the model is widely applicable in epidemiological and health studies and is a powerful statistical tool for estimating the magnitude of the association between independent variables and a binary outcome variables. Furthermore, from mathematical point of view it is extremely flexible and can easily be used for further research and investigation (David. W. H and S. Lemshow et al., 1989).

3.5 Significance of The Study

In Ethiopia level of human development is one of the lowest in the world. The country had taken different effort to improve the situations. However regarding the health sector the government had given prior attention among other sectors to expand the health service coverage and hence decreasing the mothers and infants death.

The purpose of this study will be to clarify the major factors affecting the survival of infants related to the prenatal and delivery cares. Knowledge of those factors will be useful in developing interventions to maintain ways to target services efficiently and reduce the impact on infant death.

Therefore this study would enlighten and contribute its part infilling the knowledge gap for government and non-government agencies by identifying area to these specific factors.

The primary aim of this study is to provide a reference set of linkage between maternal care and risk of infant death in the study area, to policy maker, program managers and

researchers. Such a study is very necessary because its outcome will help policy makers in revising and improving the existing policies and strategies of the MCH programs. Accordingly the analysis will be helpful in identifying and targeting those factors that impacts on infant survival and women access to health care services.

This study highlights factors affecting infant's survival related to the utilization of maternal health care that helps to promote and improve the health status of mothers and infants. Addressing basic health services to the most sensitive and vulnerable groups such as infants and mothers means reducing maternal and infant mortality. Hence it has an impact on the socioeconomic development of the country.

In general the impact of prenatal and delivery care on infant survival is one of the most powerful interventions to improve infant survival and maternal care reducing infants and maternal mortality. Thus to monitor and evaluate the survival of infants with regard to the prenatal and delivery care is particularly important for further studies and can give insight to the researcher.

Finally the result of this study could be useful to the concerned bodies in order to overcome and improve the existing problems. The result of this study is also vital to draw plausible policy implications for the region under study. Subsequently the Health Offices in Amahra region of Ethiopia and other non-governmental organizations working in the MCH services could utilize results of this study for planning evaluating and monitoring their activities.

3.6 Limitation of the Study

This study has the following limitations.

- As the study has used birth history data, omission of births and deaths as well as misreporting of age at death may influence the estimated levels of mortality.
- The sequence and wording of questions and response choices are crucial for subsequent data analysis.
- The core maternity care questions proposed by the DHS during its first phase have a number of draw backs, In this regard in most African surveys and in this study considered on the whole produced more useful results by adopting the core question to meet their own local needs (Airey and Camp Bell, 1988)

In a population where the majority is illiterate and where there is poor knowledge of utilizing care services even knowledge of pregnancy, one could easily predict problems to exist such as:

- Identifying a pregnant woman and those who took prenatal care,
- Those who have taken Tetanous Toxoid injection, question and responses,
- Extracting the prenatal visit from some other visits for some medical problem,
- The omission of information on utilization of care services provided to the population with the existing less number of services.

But as any other survey the present DHS survey has taken exhaustive measures and cautions to provide a wide range of variables to be used in this study and on further studies.

CHAPTER FOUR

Findings of the Study

4.1 General Background Characteristics of the respondents

This section focuses on describing the selected characteristics of respondents' socio-economic demographic characteristics of infants (0-11) months of age.

4.1.1 Demographic Background Characteristics of Infants survival

The distribution of births, deaths and infant mortality by selected characteristics of mothers is presented in Table 4.1a

The effect of prenatal and delivery care on infants survival is associated with different demographic variables. Background characteristics of infants mother have significant contribution to the survival of infants. Therefore having knowledge of the background characteristics assists in understanding the factors responsible in detail and to take appropriate measures in order to overcome the problem.

Mothers age at birth: -

For both social and biological reasons, infant mortality rates often exhibit a U-shaped pattern with respect to mother's age at child birth, with the children of the youngest and oldest mothers experiencing higher mortality rates than children whose mothers are in their prime reproductive age.

As can be seen from table 4.1a, out of the total births (3713) of Amhara region 67.1 percent of the infants belonged to mothers of age 20-34 while 26.2 percent of the infants were born to mothers of aged 35 and above, and 6.7 percents born to mothers under age 20 years.

The survival status of infants of the youngest mothers (15-19 years of age) were found to have the highest risk of death with infant mortality rate of 157.3 per 1000 live births, while infants of mothers of age 20-34 and 35 and above showed mortality rates of 115.3 and 90.3 respectively.

Birth order

Birth order also tends to have a U-shaped relationship to infant deaths with first birth and higher order births having elevated infant mortality rates. The birth order 2-4 constitutes the highest proportion (41.2 percent) while infants with birth order 5 and above and 1st birth order accounts for 4.0 and 18.8 percent respectively (Table 4.1a).

The risk of death was observed consistently to increase with the increase of the birth order. Infant mortality rate of 1st birth order was the highest (189.4) followed by birth order 5 and above (98.3) and birth order (2-4) 88.8.

Preceding birth interval

A birth interval, defined as the length of time between two successive live births, indicates the pace of child bearing. Short birth interval may adversely affect a mother's health and her children's chances of survival. Past research has shown that children born too close to previous birth are at increased risk of dying, especially if the interval between the birth is less than 24 months (Mekonnen, 1993;Pandey et al, 1998).

Majority of the births (50.9%) occur within 2-3 years of previous birth and 36.7 percent and 12.3 percent occur within the birth intervals 4 and above and birth interval of less than 2 years respectively.

A comparison of the level of infant survival in different birth interval reveals that the infant mortality were relatively lower for the preceding birth interval (2-3 years) than the corresponding figures for both the birth intervals of less than 2 years or 4 and more years (Table 4.1a).

Table 4.1 a

Birth, Death and Mortality Rate according to selected Demographic Characteristics for Mothers who gave birth in the last five years preceding the survey Amhara (1996-2000)

Characteristics		Birth	%	Death	%	Infant mortality rate
1.0 Demographic characteristics						
1.1 Mothers-Age-At Birth						
15-19	(1)	248	6.7	39	9.4	157.3
20-34	(2)	2490	67.1	287	69.3	115.3
35 (+)	(3)	975	26.2	88	21.3	90.3
	Total	3713	100%	414	100%	
1.2 Birth - order						
1st	(1)	697	18.8	132	31.9	189.4
2-4	(2)	1531	41.2	136	32.9	88.8
5 (+)	(3)	1485	40.0	146	35.2	98.3
	Total	3713	100%	414	100%	
1.3 Proceeding birth interval						
< 2 years	(1)	458	12.3	82	19.8	179.0
2-3 years	(2)	1890	50.9	162	39.1	85.7
4 (+)	(3)	1364	36.7	170	41.1	124.6
	Total	3713	100%	414	100%	
1.4 Sex						
Male	(1)	1976	53.2	248	59.9	125.5
Female	(2)	1737	46.8	166	40.1	95.6
	Total	3713	100%	414	100%	
1.5 Breast feeding						
Not fed	(1)	764	20.6	169	40.9	221.2
Yes breast fed	(2)	2949	79.4	244	59.1	82.7
	Total	3713	100%	414	100%	
1.6 Size of the child						
Average	(1)	1346	36.2	147	35.5	109.2
Small or v-small	(2)	1739	46.8	184	44.4	105.8
Large or v-large	(3)	628	16.9	83	20.1	132.2
	Total	3713	100%	414	100%	

Source:- *Computed by the author based on 2000 DHS survey.*

** Total number of birth = 3713*

** Total number of infant death = 414*

** Infant mortality rate calculated = 112*

Sex of infants

The total number of births covered in the present study in Amhara region was 3713. About 53.2 percent of the births were males and 46.8 percent were females. The reasons for lower female births in the region may be sex preference or misreporting of female child.

Sex preference of infants might bring variation in the survival status of infants. Since there are various reasons for the preference, which can broadly be classified as social economic, religious and biological. However, males showed the relatively higher mortality rate (125.5) compared to females mortality rate (95.6).

Breast-feeding

Breast-feeding has direct effect on following birth interval and child survival because of its effect on post- partum amenorrhea. Breast-feeding has direct effect on child survival especially at low standard of living, because early weaning may suddenly expose the child to considerably adequate nutrition and a much higher risk of disease from contaminated water and food.

It can be seen from the table that infants not fed constitute 20.6% while those who fed account for 79.4 percent of births (Table4.1a).

Breast feeding have shown a direct relation with infant survival, as the decline on the chances of survival due to the non breast-feeding reflected the highest mortality rate of (221.2) and those infants fed with better chance of survival with lower mortality rate of 85.7 per 1000 live births.

Size of the infants

Studies have shown that infants weight at birth is an important determinant of its survival. Since most birth in Amhara and in Ethiopia occur at home, infants actual weights were unavailable for most children, instead mothers in the Ethiopian DHS were asked whether their child was very large, larger than average, smaller than average size of birth and has been found to be a good proxy for infants weight. According to table 4.1 46.8 percent were small or very small and 36.2 percent average and 16.9 percent large sized infants (Table4.1a).

The death rate with respect to size of infants showed that large or very large sized infants experienced higher risk of death with higher infant mortality rate 132.2. However the average and small sized infants had mortality rates of 109.2 and 105.8 per 1000 live births respectively.

4.1.2 Socio-economic Background Characteristics and Infants survival

Literacy Status of Mothers

Table 4.1b also gives the percentage of births, deaths and infants mortality according to literacy of mothers. From the table it has been observed that 81.4 percent of births were occurred to illiterate mothers and only 18.6 percent of total births occurred to mothers who were literate.

It has been described in the literature review part that mother's education directly or through some other variables affects the survival status of infants, i.e. as mothers education increases the survival of infants shows improvement.

Better chance of infants survival was observed from infants mother who completed primary education and above than those infants of illiterate mothers. The infant mortality rate of better-educated mothers was comparatively lower than that of illiterate mothers.

Work status and occupation of mother

The occupational status of mothers has been grouped into working (away home) and not working (at home) categories. The occupational status of mothers is considered to have direct relationships with the survival of children. It is expected that with working categories there would be an increase in survival. From the table, it is obvious that three fourth of children were born to mothers, working away from their home and about one fourth to mothers who were not working. The percentage of births to working mothers is lower than that of the figure reported in 1994 census of Ethiopia, where 80 percent of births occurred to economically active females and the rest of births to economically inactive females (Table4.1b).

It is evident from the table that infant mortality rates among children of mothers not working was higher (132.8) than that of children of mothers working away from home 104.3 per 100 live births, showing the effect of family income contributing for the survival status of infants.

Religion

Table 4.1b also shows the percentage distribution of births during the five years preceding the survey by religion. In Amhara region, 83 percent of total births occurs to the mother of Orthodox religion and only 17 percent to the mothers belonging to Moslem and other religions.

The risk of infant death for Moslem and other religious group was comparatively higher (129.5) than the infant mortality rates of orthodox religion (107.8 per 1000 live births).

Table 4.1 b

Birth, Death and Mortality Rate according to Selected Socio -Economic Characteristics for Mothers who gave birth in the last five years preceding the survey Amhara (1996-2000)

Characteristics		Birth	%	Death	%	Infant mortality rate
2.0 Socio-Economic Characteristics						
2.1 Mothers literacy status						
Illiterate	(0)	3024	81.4	349	84.3	115.4
Literate	(1)	689	18.6	65	15.7	94.3
	Total	3713	100%	414	100%	
2.2 Work status of mothers						
At home/Not working	(0)	933	25.1	124	30.0	132.9
Away/working	(1)	2780	74.9	290	70.0	104.3
	Total	3713	100%	414	100%	
2.3 Religion						
Orthodox	(1)	3080	83.0	332	80.2	107.8
Moslem/others	(2)	633	17.0	82	19.8	129.5
	Total	3713	100%	414	100%	
2.4 Ethnicity						
Amhara	(1)	3360	90.5	386	93.2	114.9
Oromo/Agew and others	(2)	353	9.5	82	6.8	79.3
	Total	3713	100%	414	100%	
2.5 Source of Drinking water						
Well /spring/ river						
(Not-pipes)	(1)	3442	92.7	391	94.4	113.6
Piped	(2)	271	7.3	23	5.6	84.9
	Total	3713	100%	414	100%	
2.6 Sanitation facilities						
No Facility/Bush	(1)	3571	96.2	399	96.4	111.7
Pit-Latrine	(2)	142	3.8	15	3.6	105.6
	Total	3713	100%	414	100%	
2.7 Access to Mass Media						
Not-At All	(0)	3107	83.7	334	80.7	107.5
Radio/TV/News Paper	(1)	606	16.3	80	19.3	132.0
	Total	3713	100%	414	100%	
4.0 Place of Residence						
Urban	(1)	213	5.7	36	8.7	169.0
Rural	(2)	3500	94.3	378	91.3	108.0
	Total	3713	100%	414	100%	

Source:- *Computed by the author based on 2000 DHS survey.*

** Total number of birth = 3713*

** Total number of infant death = 41*

** Infant mortality rate calculated = 112.*

Ethnicity

The major ethnic group which, contributes the majority of the births (90.5 percent) was found to be Amhara, while the Oromo, Agew and other ethnic groups, contributed the remaining 9.5%. (Table 4.1b)

The highest risk of death was observed for the Amhara with infant mortality rate of 114.9 per 1000 live birth as compared to Oromo, Agew, and other ethnic groups which is 97.3.

Access to Safe water and Toilet facilities

The sources of water supply and the availability of sanitary facilities are an important determinant of the health status of household members, particularly of newborn children. At the same time, the lack of sanitary facilities poses a serious health problem.

The information on source of water supply is shown in Table 4.1b reveals majority of the children born to the mother (92.7 percent) who had no access to clean water and 7.3 percent of the birth occurring to the mothers who has availability of safe water from tap.

The similar trends of births observed in case of water availability were also found with sanitary facilities like toilet.

As expected, accordingly, the infant mortality among new born who had no access of water was (113.6) per 1000 live births while those with safe water have a better chance of survival with a mortality rate of 84.9 per 1000 live births.

The infant mortality rate observed 111.7 among those births who had access of toilet facility and 105.6 per 1000 live birth among who use pit latrine.

Exposure to Mass Media

Exposure to mass media messages on maternal health, child survival and family planning brought out differentials to child survival.

83.7% of the birth given by mothers under study had no access to radio while the remaining 16.3 percent had access. However infant mortality among the birth given by mothers who had access to mass media was about 19.3 percent and more than 80 percent to their counterpart (Table 4.1b).

Place of Residence

Since the majority of the population of Amhara region live in the rural area, 94.3 percent of the births took place to mothers belonged to the rural areas and 5.7 percent from the urban area (Table4.1b).

The percentage of death recorded out of the total births is given in Table 4.1. The table reveals that majority of infants death (91.3 percent) occurred to the births from rural areas while 8.7 percent of the infant death were from urban areas. It is pertinent to note that a comparatively higher infant mortality occurred in urban area compared to rural areas. One of the reasons may be the lower proportion of the sample belonging to the urban area.

4.1.3 Maternal Health Care Background Characteristics and Infant survival

The main objective of the study being to identify the variations in utilization of prenatal care and delivery care services and infants survival along with the certain other factors. The

following selected components of prenatal and delivery care background information are presented in Table 4.1c

Assistance of prenatal care

Antenatal care (ANC) refers to pregnancy related health care provided by doctor or heath worker in a medical facility or at home. The safe motherhood initiative proclaims that all pregnant women must receive basic, professional antenatal care (Horrison, 1990).

In the Ethiopian DHS survey mothers were asked whether they have received any assistance from health professionals or trained birth attendant during their period of pregnancy.

The results show that mothers in Amhara received antenatal check-up for only 17.3 percent of births during the five years preceding the survey; Mothers received antenatal check-ups from doctor/health professionals for 16.6 percent of births and from trained birth attendants for 8.7 percent of births. The infant mortality among the birth whose mothers did not receive prenatal care was 116.6 per 1000 live births and those mothers received was 80.9 per 1000 live births (Table 4.1c).

Accordingly 82.7 percent of birth given by mothers had no prenatal care while for 17.3 percent of the births to the mothers received prenatal care from health professional and trained birth attendants.

It is clearly seen that out of the total infant deaths a major proportion (86.4 %) correspond with no assistance of prenatal care and 13.4 percent to those who have been assisted by health professionals

In general for one out of five infants mothers received assistance of prenatal care, on the other hand 9 out of 10 infants die with no assistance of prenatal care.

Number of Prenatal Visits

The numbers of prenatal check-ups for the health of mother and the outcome of the pregnancy have important bearing on the survival of mothers and their newborn babies. The conventional recommendation for normal pregnancies is that once pregnancy is confirmed, prenatal check-ups should be scheduled at four-week interval during the first seven months then every two weeks until the last month and weekly there after (Mac Donald et. al. and Pritchard, 1980). However, four antenatal visits one each during the third, sixth, eights, and nine months of pregnancy have been recommended as the minimum necessary (Park and Park, 1989).

Table 4.1c shows the percentage distribution of births by the number of prenatal visits. In Amhara mothers of 82.8 percent of births have not received any prenatal checkups, and the mothers of less than one fifth of births received at least one antenatal checkups.

It is also indicated that out of the total infant deaths the proportion of infants death with no prenatal visit was (86.7 percent) with corresponding infant mortality rate of 116.8 per 1000 live births, while for mothers whose visited health facilities, the infant death was only (13.3 percent) with the infant mortality rate of 86.1 per 1000 live births.

It is pertinent to note that prenatal care is more beneficial in preventing adverse pregnancy wastage when it is sought early in pregnancy and continued throughout till outcome of birth. Health professionals recommend that the first antenatal or prenatal visit should occur within

the first 3 months of the pregnancy and continue on a monthly basis through the 28th week of pregnancy and fortnightly up to the 36th week (or until birth). If followed regularly there will be at least 12 or 13 antenatal visits (EDHS-2000).

Table 4.1 c

Birth, Death and Mortality Rate according to Selected Maternal Health Characteristics for Mothers who gave birth in the last five years preceding the survey Amhara (1996-2000)

Characteristics		Birth	%	Death	%	Infant mortality rate
3.0 Maternal-Health Care						
3.1 Assistance of Prenatal Care						
No one /others	(1)	3070	82.7	358	86.5	116.6
Health professional	(2)	618	16.6	50	12.0	80.9
trained birth attendants	(3)	25	0.7	6	1.4	240.0
Total		3713	100%	414	100%	
3.2 Number of Prenatal or Antenatal visits						
Atleast one ANC visit	(1)	639	17.2	55	13.3	86.1
No visit	(2)	3074	82.8	359	86.7	116.8
Total		3713	100%	414	100%	
3.3 Tetanus - Toxid Injections before birth						
No Injection	(1)	2741	73.8	324	78.3	118.2
1-2 Doses	(2)	719	19.4	82	19.8	114.0
3 (+) Doses	(3)	253	6.8	8	1.9	31.6
Total		3713	100%	414	100%	
3.4 Place of Delivery at						
At home	(1)	3613	97.3	405	97.8	112.1
Gov-Hospitals/Health Facilities	(2)	100	2.7	9	2.2	90.0
Total		3713	100%	414	100%	
3.5 Assistance at Delivery						
Relatives/untrained TBA/No one	(1)	2932	79.0	319	77.1	108.8
Health personnel's	(2)	780	21.0	95	22.9	121.8
Total		3713	100%	414	100%	

Source:- *Computed by the author based on 2000 DHS survey.*

* *Total number of birth = 3713*
* *Total number of infant death = 414*
* *Infant mortality rate calculated = 112.*

Tetanus Toxoid Injection given before birth

Tetanus Toxoid injections are given during pregnancy for the prevention of neonatal Tetanus an important cause of death among infants. For full protection a pregnant women should receive at least 2 doses during each pregnancy.

If a woman has been vaccinated during a previous pregnancy, however she may only require only one dose for the current pregnancy. Five doses are considered to provide lifetime protection (EDHS. 2000).

Table 4.1c shows the distribution of births, deaths and infant mortality rate by the number of tetanus toxoid injections given to mothers during their pregnancy. For births in the five years preceding the survey, 73.8 percent of mothers did not receive any tetanus toxoid injections during pregnancy, and another 19.4 percent received only one to two injections. The proportions of mothers who received three or more tetanus toxoid injections during their pregnancy were 6.8 percent. The numbers of tetanus toxoid injections received have shown clear influence in the pregnancy out-comes.

The percentage of infant death among the births whose mother did not receive TT injections was as high as (78.3 percent) followed with infant mortality rate of 118.2 per 1000 live births. However, there is substantial decline in the proportion of infant death whose mothers have received one or more doses of tetanus toxoid injections (114.0 and 31.6 per 1000 live birth) respectively.

Place of Delivery

An important thrust of the Reproductive and Child health program is to encourage deliveries under proper hygienic conditions and under the supervision of trained health professionals. Table 4.1c shows that almost all (97.3 percent) of births delivered at home and less than 3% took place in health facilities and government hospitals.

Accordingly 97.8% of the infant deaths occurred at home delivery while 2.2 percent of the infants death were in government hospitals and health facilities. The infant mortality rate of those delivered at home was found to be high (112.1) and for those delivered at Health facilities were comparatively low (90.0 per 1000 live birth).

Assistance at Delivery

Twenty one percent of births were attended by a health professional including trained traditional birth attendants and health assistants. About four-fifths (79percent) of births was attended by relatives and untrained traditional personnel (Table 4.1c).

Subsequently, 77.1 percent of the infant death was shown for those with no assistance while the rest 22.9 of the deaths were found to be of those infants delivered with assistance.

4.2 Prenatal Care services and infants survival

The experience gained, within the country and outside, has amply established that the health of women in the reproductive age group and small children (under 5 years of age) is of crucial importance for effectively tackling the problem of growth of population. The International Conference on population and Development 1994, proposed the unifications of programs for a Reproductive and Child health (RCH). The RCH approach seeks to underline that "People have the ability to reproduce and regulate their fertility; women are able to go through pregnancy and child birth safely; the outcome of pregnancy is successful in terms of maternal and infant survival and well being and couples are able to have sexual relation free of fear of pregnancy and of contracting diseases". This concept is aimed at improving the health status of women and children.

The different components of reproductive and child health services include provision of antenatal care, institutional deliveries, postnatal care, contraceptive services /supplies, treatment of RTI / STI and immunization of children and treatment of diarrhea and ARI among children. In the present study, few components of RCH, namely, prenatal care and delivery care services has been taken. In the present section, prenatal care services and survivals of infants by selected socio-economic and demographic characteristic of mothers have been analyzed.

The health care that a mother receives during pregnancy and at the time of delivery is important for the survival and well being of the mother and the child.

Table 4.2a and 4.2b shows infant mortality rate by selected socio economic and demographic characteristics with respect to utilization of prenatal care services.

In this particular analysis the infant mortality rate is computed for each category of a variable of interest and compared with each other.

4.2.1 Demographic characteristics and utilization of prenatal care: -

Mothers age at birth and prenatal care

The mother's age at birth are grouped into three categories 15-19, 20-34 and 35 years and above. The survival of their births during infancy has been examined for both users and non-users of prenatal care services. Among the users of prenatal care service the infant mortality rate was revealed to be highest (102.9) to mothers of the age group (20-34) while the infant mortality rate of mothers of age 35 and above and 15-19 was 51.9 and 47.6 respectively (Table 4.2a). However, the pattern of infant mortality was reversed in the case of non-users of prenatal services in age-groups, i.e., the level of infant mortality was highest for mothers aged 15-19 (179.6) followed by mothers of aged 20-34 (117.9) and the mothers age of 35 years and above (97.4) It was revealed from the table that the percentage of infants death to the mother aged 20-34 was 82.1% among users of prenatal services, in agreement with hypothesis number 4.

Birth order and prenatal care

Studies have shown that mortality rates by order of birth assumes a U-shaped pattern indicating greater risk to first and higher order births than births of intermediate group. The

infant mortality rate of the non-users of prenatal care presented in Table 4.2a reflects the same truth.

The table shows that the prenatal care exerts a significant influence on infant mortality for each order of birth. A comparison of the percentage of the death of infants and infant mortality rate among users of prenatal care with non users of prenatal care for different order of births was found relatively lower in case of users of prenatal care services for the birth order one and five and above. In case of non-utilizers of the prenatal services, the infant mortality rate has been consistently declined with the increasing order of birth.

Birth Interval and prenatal care

It is well documented that the length of the interval between births has a great influence on infant's survival.

In this study also preceding birth interval was found to have a significant influence on infant's survival and utilization of prenatal care services.

The expected high risk of infant mortality for short birth interval (less than 2 years) among users (202.7) and non-users (171.8) has been shown in Table 4.2a.

It is evident from the table that infant mortality of users when compared with the same of non users for each of the preceding birth interval have shown consistently lower infant mortality in the presence of use of prenatal care besides the preceding birth interval of less than two years.

A preceding birth interval of users of less than 2 years with mortality rate was high (202.7) as compared to infant birth interval (2-3) and 4 and above mortality rate being 67.1 and 74.7 respectively.

This shows the influence of use of the prenatal care service increasing chance of infants survival in agreement with hypothesis six.

Table 4.2 a

INFANT MORTALITY RATES BY SELECTED DEMOGRAPHIC CHARACTERISTIC ACCORDING TO UTILIZATION OF PRENATAL CARE SERVICES OF AMHARA REGION FOR THE FIVE YEARS PERIOD (1996-2000) PRECEDING THE SURVEY.

CHARACTERISTICS	Births		INFANTS MORTAL RATE	
	Users	Non-users	USERS OF PRENATAL CARE	NON USERS OF PRENATAL CARE
Demographic characteristics				
1.1 Mothers-Age at birth (**)				
• 15-19	42	206	47.6 (2)	179.6 (37)
• 20- 34	447	2043	102.9 (46)	117.9 (241)
• 35 (+)	154	821	51.9 (8)	97.4 (80)
1.2 Birth - order (***)				
• 1	110	587	12.7 (8)	212.9 (125)
• 2-4	287	1244	104.5 (30)	85.2 (106)
• 5 (+)	247	1239	72.8 (18)	102.5 (127)
1.3 Proceeding birth interval (***)				
• < 2 years	74	384	202.7 (15)	171.8 (66)
• 2-3 years	328	1563	67.07 (22)	90.2 (141)
• 4 (+)	241	1123	74.7 (18)	135.3 (152)
1.4 Sex of the child (**)				
• Male	343	1633	87.5 (30)	133.5 (218)
• Female	301	1436	83.5 (25)	98.2 (141)

***Source**: Computed by the author based on the 2000 DHS survey*

Significance of P

** P < 0.1*

** * P < 0.05*

** * * P < 0.001*

Figures in ( ) ⟹ Infant deaths for each category

Total number of infants birth = 3713

Sex of the Child and prenatal care

The excess male over female infant mortality presented in table 4.2a does not show any peculiar feature beyond the general pattern observed in many societies.

The utilization of prenatal care also has shown the influence of the prenatal care on the sex differentials. For example comparative analysis of the mortality rate of male infants mortality among users and non users shows 87.5 occurring for the users and 133.5 for non users of the service. However, the general pattern shows male infant's death is higher than females in the region, though the chance of utilizing the service were found to have a better chance of survival of their new born babies, i.e. utilization of prenatal care has reduced the mortality rate of both sexes as compared to the non users.

4.2.2 Socio-Economic Characteristics and Prenatal Care

Maternal literacy status and Utilization of prenatal Care

There is ample evidence that maternal education exerting a very significant and independent positive impact on infant's survival, and utilization of prenatal care.

It is well indicated that majority of the births (81.4 percent), were given by illiterate mothers while only 18.6 percent of the births occurred to the literate mothers. Among the illiterate mothers using prenatal services, the percentage of infant death was 82.1percent, while 17.9 of the deaths were from those literate mothers and their infant mortality rates for these mothers were, 104.5 and 49.3 respectively.

Incase of non users of prenatal services, 84.7 percent of infant deaths belonging to the mothers who were illiterate and 15.3 percent infant deaths accounts to literate mothers with infant morality rates 117.6 and 113.2 deaths per 1000 live births respectively. By and large, the excess of infant mortality between illiterate and literate mothers of two groups, using and non-using of pre-natal services were found 64.2 percent and 69.4 percent respectively.

This expected pattern on infants death and utilizing of the service can be seen in Table 4.2b. It seems that maternal literacy status and infant mortality have indeed inverse relationship and the same holds true for the utilization of the prenatal service also.

Religion and prenatal Care

Religion wise the utilization of services and the infant survival are presented in the same Table 4.2b. Amhara region is predominantly follower of orthodox religion.

The table showed that infant's mortality rate varies among users and non-users between the orthodox followers and Moslems/others.

It is seen from the table that large differences existed in the infant mortality rates and percentage of infant deaths by the religious followers of Orthodox and Moslem/others between the users and non-users of prenatal services. Infant mortality of users of prenatal services was lower than non-users of services for both religious groups indicating that utilization of prenatal services was conducive to infant survival in each religion.

The comparison between Orthodox and Moslem others in terms of infant mortality and percentage of infant deaths clearly reveals the relationship between utilization of services and religion, as the high infant mortality rate (107.7) constitutes to Orthodox followers where as a

very low infant mortality rate (19.8) was for Moslem/others. The similar trends in infant mortality between two religious groups of non-users of services have also emerged (Table 4.2b)

Table 4.2 b

INFANT MORTALITY RATES BY SELECTED SOCIO- ECONOMIC CHARACTERISTIC ACCORDING TO UTILIZATION OF PRENATAL CARE SERVICES OF AMHARA REGION FOR THE FIVE YEARS PERIOD (1996-2000) PRECEDING THE SURVEY.

CHARACTERISTICS	Births		INFANTS MORTAL RATE	
	Users	Non-users	USERS OF PRENATAL CARE	NON USERS OF PRENATAL CARE
Socio-Economic Characteristics				
2.1 Mothers literacy status				
• Illiterate	440	2584	104.5 (46)	117.6 (304)
• Literate	203	486	49.26 (10)	113.2 (55)
2.2 Religion (**)				
• Orthodox	492	2588	107.7 (53)	108.2 (280)
• Moslem/others	151	482	19.8 (3)	161.8 (78)
2.3 Ethnicity (**)				
• Amhara (RC)	573	2788	85.5 (49)	120.9 (337)
• Oromo/Agew and others	70	282	100 (7)	74.5 (21)
2.4 Source of drinking water (*)				
• Well/spring/ river	480	2961	89.6 (43)	117.9 (349)
• Piped	163	109	79.8 (13)	82.6 (9)

***Source**: Computed by the author based on the 2000 DHS survey*

Significance of P

** $P < 0.1$*

*** $P < 0.05$*

**** $P < 0.001$*

Figures in ( ) ⟹ Infant deaths for each category

Total number of infants birth = 3713

Ethnicity and Utilization of Prenatal Care

Table 4.2b shows the infant mortality rate of the Ethnic groups by the utilization of prenatal care services. Ethnicity and religion are correlated in Amhara, for instance the Amharas are predominantly orthodox Christians where as the Oromos/ Agew and others are Moslems.

The major Ethnic group Amhara utilizing the prenatal care service the infant mortality rate was 85.5 and for those not utilizing was high to 120.9 The Oromo Agew/ other ethnic group utilizing the prenatal care service infant mortality was 100 and for those not utilizing was 74.5. A comparison of the infant mortality of users with in the Ethnic groups shows that the higher mortality rate (100) to the religion as such of Oromo/Agew and others and the lower (85.5) to the major Ethnic group of Amhara. On the average among users of services risk of dying of the infants of Amharas, for those utilizing is 16.9 percent lower than that of the Oromo/Agew and others. Among those not utilizing the services, on the average the risk of dying is 40.7 percent point lower for the survival of infants belonging to Oromo/Agew and other than the Amharas. The disparity between the users and non-users taking the major Ethnic group of Amhara shows that mortality rate of infants among service users is 29.3 percent lower than the non-users. While the disparity of the Oromos and others mortality rate utilizing the service is 34.2 percent lower than the non-users. Reasons for these differences may be related to cultural practices and religious taboos, which exerts a negative effect on the existing poor utilization of the service.

Source of Drinking water and Prenatal Care

Source of drinking water is one of the most important environmental variable that influences the infants' survival. Studies have revealed that those families with better facility tend to have lower mortality. The result obtained in this analysis reveals the same truth. Infants of women living in the housing unit with unsafe water are found to have comparatively higher infant mortality rate to families than those using safe water. An attempt was made to see the variation in the infants' morality rate for those utilizing and not utilizing the prenatal care service by the source of drinking water. It is revealed that the differential between the users and non-users of prenatal care services with unsafe water source shows the infant mortality rate of users of services (24.0 percent) lower than the non-users(Table 4.2b). While the differences between the users and non-user of the services with respect to the source of piped safe water shows the infant mortality rate of users of the prenatal care service was3.4percent lower than non-users.

4.3 Delivery Care service and Infants Survival

An important component of efforts to reduce the health risks of mothers and infants is to increase the proportion of babies delivered under the supervision of Health professionals. Proper medical attention and hygienic conditions during delivery can reduce the risk of complication and infections that may cause death or serious illness to either the mother or the baby or both. Delivery care by trained delivery providers is recognized as critical for the reduction of maternal and neonatal mortality. Births delivered at home are usually more likely to be delivered without assistance from a health professional where as births delivered at a health facility are more likely to be delivered by a trained health professional. Either an untrained or a relative or some other person attends the majority of births.

Table 4.3a and 4.3b shows infant mortality rate by selected socio economic and demographic characteristics with respect to Assistance at delivery care.

In this particular analysis the mortality rate is also compared for each category of a variable of interest and compared with each other. Since infants death among women's by the birth of delivery assisted and non assisted are very minimal, therefore total births has been used to categorize the infant mortality rate for both the assisted and non assisted delivery care services.

4.3.1 Demographic characteristics and Delivery Care Service: -

The base sample for this study of maternal-care utilizations constitutes 3713 children born in the period 1-60 months prior to the survey. These were children born to ever married women aged 15-49 years for whom information on health was obtained in this section, maternal care

health utilization indicator namely, delivery care and other mothers' health care indicators (given in others section) is birth based, i.e., it is collected for each child born to respond in 5 years preceding the interview. Several independent variables, both socio economic and demographic, which could potentially influence birth order, previous birth interval, sex of child, mothers education, religion and ethnicity. The present section presents the utilization of delivery care and infant survival according to selected predictors.

Mothers age at birth and Delivery Care

Table 4.3a presents the survival of infants and total number of births by broad ages of mother. It is revealed from the table that the infant mortality in each category of mothers using delivery care were comparatively lower than that of non using delivery care services. Also differentials in infant mortality according to age groups of mothers between types of mother using and non-using delivery care are given in the same table.

It is evident from the table that among mothers using delivery care services, the infant mortality in the ages 15-19 was higher than 20-34 or 35 years and above age groups of mothers.

A comparison of the proportion of infants death among assisted and non assisted of mothers within the reproductive age 20-34 of assisted accounts 24.5% of the death and the non assisted constitute the 75.5 percent of the death, i.e., infants death rate of those utilizing delivery care service was lower by 67.6% than non-users.

Birth order and Delivery care

As discussed in the previous section that the utilization of delivery services is generally poor because of the access, especially for rural women. It is also found that majority of births (94.3%) belonged to rural women assisted by relatives and friends and untrained birth attendants. Table 4.3a also gives the differentials of infant mortality by order of births for mothers utilizing and non-utilizing delivery care services.

Studies have shown that a mortality rate by order of birth assumes a U-shaped pattern indicating greater risk to first and higher order births than births of intermediate group. The infant mortality rate of the non-assisted ones presented in Table 4.3a reflects the same truth.

The risk of dying of infants among the assisted and non assisted deliveries at the time of birth of child, 1st birth order shows three fourth of deaths for latter and nearly one fourth of deaths for the former category of mothers.

The birth orders have shown significant influence on the infant survival born to the mothers whether they were assisted at the time of delivery or not. Lowest infant mortality was found for the 1st birth order than to the 2-4 or 5 and above order of births for both the types of mothers. But the level of mortality were more than three times higher to each of the birth order to the mothers of who had not received assistance at the time of delivery than their counter part.

Table 4.3 a

INFANT MORTALITY RATES BY SELECTED DEMOGRAPHIC CHARACTERISTIC ACCORDING TO USE OF DELIVERY CARE SERVICE AMHARA REGION OF THE LAST FIVE YEARS PRECEDING THE SURVEY (1996-2000)

CHARACTERISTICS		INFANTS MORTAL RATE	
	BIRTHS	NOT ASSISTED	ASSISTED BY HEALTH PERSONNEL'S
Mothers-Age of birth (***)			
15-19	248	157.3 (39)	-
20- 34	2490	86.7 (216)	28.1 (70)
35 (+)	975	64.6 (63)	24.6 (24)
Preceding births interval (***)			
< 2 years	458	146.3 (67)	30.6 (14)
2-3 years	1890	59.3 (112)	27.0 (51)
4 (+)	1365	102.6 (140)	21.2 (29)
Birth order (**)			
1	1531	64.7 (99)	23.5 (36)
2-4	1240	65.3 (81)	26.6 (33)
5 (+)	942	146.5 (138)	26.5 (25)
Sex of infant (**)			
Male	1976	93.6 (185)	31.4 (62)
Female	1737	76.6 (133)	18.4 (32)

Source: *Computed by the author based on the 2000 DHS survey*

Significance of P

** P < 0.1*

** * P < 0.05*

** * * P < 0.001*

Figures in ( ) ⟹ Infant deaths for each category

Total number of infants birth = 3713

Birth Interval and Delivery care

It is well documented that the length of the interval between births has a great influence on infant's survival. In this study also preceding birth interval was found to have a significant influence on infants' survival.

The expected high risk of infant mortality for short birth interval (less than 2 years) among users (30.6) and non-users (146.3) is shown in (Table 4.3a)

A preceding birth interval of (less than 2 years) with mortality rate 30.6 compared to the birth interval (2-3) years with infant mortality (23.6) and 4 and above with infant mortality (21.2), the risk of infant death is higher by 11.8% and 30.7% respectively.

A look at the table further reveals that the infant death rate among users and non-users of delivery care services with in the highest risk of less than 2 years birth interval shows 17.3 percent of the deaths among the birth given by mothers of the former and 82.7 percent among later group of mothers non-utilizing delivery care services. This suggest that the chances of survival of infants born to mothers utilizing delivery care services seems to be 79% higher than of mothers not utilizing delivery care services.

Sex of the Child and Delivery care

The excess male over female infant mortality presented in table 4.3a does not show any peculiar feature beyond the general pattern observed in many societies.

Table 4.3a shows that the female mortality rates are lower irrespective of the use of delivery care services. It appears that the utilization of delivery care hasn't brought peculiar change on the general pattern of the survival of sex of the child. For example, comparative analysis of the deaths of male infants among users and non-users reveals 25.1 percent of the deaths occurring for the users and 74.9 percent for non-users of the service, with infant mortality rate of 31.4 and 93.6 deaths per 1000 live births respectively. Even if the risk of infant's death among non-users for both females and males is higher due to very low utilization of the service in the region, still those who got the chance of utilizing the service were found to have a better chance of survival. The studies further revealed that survival of infants were higher among the mothers who have utilized delivery care services than others irrespective of

the sex of child. By and large, the results showed that utilization of delivery care services has shown influence in reducing the mortality of both sexes of children by 70.4 percent as compared to the non-users of delivery care services.

4.3.2 Socio-Economic Characteristics and Delivery Care

Maternal Education and Utilization of Delivery Care

As found in review of literature section that maternal education exerting a very significant and independent positive impact on infant's survival, and utilization of delivery care.

It is already pointed out that 81.4 percent of births given by mothers were illiterate while only 18.6 percent of the births delivered by literate mothers. The influence of literacy seems to have a bearing on the survival of infants. High survivals of infants were found to literate mothers irrespective of delivery care services. However, after controlling the literacy, i.e., for both the illiterate and literate mothers, the survival of the infants were higher (low infant mortality) of those mothers who have utilized delivery care services than the mothers of not users of delivery care service (Table4.3b).

Religion and Delivery Care

Religion wise utilization of delivery services and infants survival is presented in Table 4.3b The Region of Amhara is predominantly follower of orthodox religion.

In the previous section it is seen that the infant's mortality rate varies among users and non-users mothers of delivery care services by the orthodox followers and Moslems/others religion. A comparison of the infant survival is drawn between the mothers of utilized and

not utilized delivery care services by their religion. It was observed that the Orthodox mothers who have utilized services, the infant mortality rate was 21.4 deaths per 1000 live births and percentage of infants' deaths out of total deaths accounted 19.8 percent.

The respective figures for the mothers belonging to Orthodox but not utilizing delivery care services were 86.6 and 80.2 percent respectively. Further a comparison of infants survivals among Muslim/ followers of other religious mothers utilizing and not utilizing delivery care services revealed lower infant mortality and accounted lower proportion of death of the former as compared to the latter.

Table 4.3 b

INFANT MORTALITY RATES BY SELECTED SOCIÓ - ECONOMIC CHARACTERISTIC ACCORDING TO USE OF DELIVERY CARE SERVICE AMHARA REGION OF THE LAST FIVE YEARS PRECEDING THE SURVEY (1996-2000)

CHARACTERISTICS		INFANTS MORTAL RATE	
	BIRTHS	NOT ASSISTED	ASSISTED BY HEALTH PERSONNEL'S
Education of mothers (**)			
Illiterate	3024	92.9 (281)	22.5 (68)
Primary (+)	689	55.2 (38)	39.2 (27)
Religion (***)			
Ortodox	3080	86.6 (267)	21.4 (66)
Musilim /others	633	82.1 (52)	47.4 (30)
Ethnicity (**)			
Amhara	3360	88.7 (298)	26.2 (88)
Oromo/Agew and others	353	56.7 (20)	22.7 (8)

***Source**: Computed by the author based on the 2000 DHS survey*

Significance of P

** $P < 0.1$*

** * $P < 0.05$*

** * * $P < 0.001$*

Figures in ( ) $\Longrightarrow$ Infant deaths for each category

Total number of infants birth = 3713

Ethnicity and Utilization of Delivery Care

Table 4.3b shows the infant mortality rate of the Ethnic groups according to the utilization of delivery care services. Ethnicity and religion are correlated in Amhara, for instance the Amharas are predominantly orthodox Christians where as the Oromos/ Agew and others are Moslems followers. Marked differences on the mortality levels are noted among the ethnic groups, namely, Amhara and Oromo/Agew and others between the two groups of mothers of users and non users of delivery care services. The level of infant mortality to the users of delivery services of Amhara (88.7deaths per 1000 live births) than that of Oromo / Agew (56.7). The similar is the trend for users of delivery services.

The disparity between the users and non-users taking the major Ethnic group of Amhara shows that mortality rate of users is 70.5 percent lower than the non-users. While the disparity of the Oromos and others mortality rate utilizing the service is 60 percent lower than the non-users. Reasons for those differences may be related to cultural practices and religious taboos, which exert a negative effect on the existing poor utilization of the service.

4.4 Bivariate Results on Status of Infants Survival

The aim of the present section is to assess and examine the differentials in infant mortality by the selected prenatal and delivery care utilization factors along with the set of socio economic, demographic and cultural factors. For the purpose the descriptive analysis of the chi-square test for the independent variables associated with the status of infant survival is presented in Table 4.4

4.4.1 Demographic variables and infant survival

Bivariate results indicate that demographic variables such as birth order, preceding birth interval, duration of breast-feeding, mother's age at birth and sex of infants were found to be significantly associated with the status of infant survival. The mothers' age at birth was found to be significantly associated with infant survival (p. value = 0.00611). The highest proportions of infant's death were in the youngest mothers of age 15-19 years (15.7%). However, the proportion of infant death consistently increased with the increase in birth order, which suggests a significant association between infant survival (p-value = 0.0000) and birth order.

The sex of Infant was included as independent variable in order to assess whether there was a differential in survival of male and female babies. Sex of the child, however did show little difference in infant's survival (p = 0.00397).

The preceding birth interval was classified into three categories, less than 2 years, 2-3 years and 4 years and above. The proportion of infant deaths varied within categories with higher

proportion associated with birth interval less than 2 years and followed by interval of 4 years and above.

The level of significance for birth interval on infant's survival was high with probability value (p=0.0000). The highest death rate observed according to the Table 4.4 is indicated for infants of birth interval of less than 2 years (short birth interval) (17.9%) followed by the highest birth interval 4 years and above (12.5%) birth occurring in the latest reproductive ages of mothers. There was also a strong association with breast-feeding and infants survival (p value = 0.0000). Those infants who are not breast-fed were found in the highest risk of death (22.1%).

Birth order has also shown a significant effect on infant survival as shown in Table 4.4 a strong association of birth order with survival as revealed with the highest significant P-value (0.000). Specifically the first birth order and highest birth order 5 and above were found to have the highest proportion of infants death 19.0% and 9.8 % respectively.

Table 4.4

BIVARIATE RESULTS OF INFANT'S SURVIVAL BY SELECTED SOCIO -ECONOMIC AND DEMOGRAPHIC CHARACTERISTICS OF AMHARA REGION FOR THE LAST FIVE YEARS PRECEDING THE SURVEY (1996-2000)

CHARACTERISTICS		DEAD		ALIVE		X^2
		FREQ	%	FREQ	%	
1.0 Demographic characteristics						
1.1 Mothers-Age-At Birth						
15-19	(1)	39	15.7	209	84.3	
20-34	(2)	287	11.5	2203	88.5	.00661(**)
35 (+)	(3)	88	9.0	887	91.0	
1.2 Birth - order						
1	(1)	132	19.0	564	81.0	
2-4	(2)	136	8.9	1395	91.1	.00000 (***)
5 (+)	(3)	146	9.8	1339	90.2	
1.3 Proceeding birth interval						
< 2 years	(1)	82	17.9	377	82.1	
2-3 years	(2)	163	8.6	1727	91.4	.00000 (***)
4 (+)	(3)	170	12.5	1195	87.5	
1.4 Sex						
Male	(1)	248	12.5	1729	87.5	.00397 (**)
Female	(2)	166	9.6	1570	90.4	
1.5 Breast feeding						
Not fed	(1)	169	22.1	594	77.9	.00000 (***)
Yes, breast fed	(2)	244	8.3	2705	91.7	
1.6 Size of the child						
Average	(1)	147	10.9	198	89.1	
Small or v-small	(2)	184	10.6	1555	89.4	.18813
Large of v-large	(3)	83	13.2	545	86.8	
2.0 Socio-Economic Characteristics						
2.1 Mothers literacy status						
Illiterate	(0)	349	11.5	2674	88.5	
Literate	(1)	65	9.4	625	90.6	.10963
2.2 Work status of mothers						
At home/Not working	(0)	124	13.3	808	86.7	.0157 (**)
Away/working	(1)	290	10.4	2491	89.6	
2.3 Religion						
Orthodox	(1)	332	10.8	2748	89.2	.1133
Moslem/others	(2)	82	13.0	551	87.0	
2.4 Ethnicity						
Amhara	(1)	386	11.5	2974	88.5	.0434 (**)
Oromo/Agew and others	(2)	28	7.9	325	92.1	
2.5 Source of Drinking water						
Well /spring/ river (Not-pipes)	(1)	391	11.4	3051	88.6	.1480
Piped	(2)	23	8.5	248	91.5	
2.6 Sanitation facilities						
Pit-Latrine	(2)	15	10.6	127	89.4	.8294
No Facility/Bush	(1)	399	11.2	3172	88.8	

Contd.

CHARACTERISTICS		DEAD		ALIVE		X^2
		FREQ	%	FREQ	%	
2.7 Access to Mass Media						
Not-At All	(0)	334	10.7	2773	89.3	.0794 (*)
Radio/TV/News Paper	(1)	80	13.2	526	86.8	
3.0 Maternal-Health Care						
3.1 Assistance of Prenatal Care						
No one /others	(1)	358	11.7	2711	88.3	
Health professional	(2)	50	8.1	568	91.9	.00430 (**)
Un trained tradition birth attendants	(3)	6	24.0	19	76.0	
3.2 Number of Prenatal or Antenatal visits						
Once or more	(1)	55	8.6	583	91.4	
No visit	(2)	359	11.7	2716	88.3	.02572 (**)
3.3 Tetanus - Toxid Injections before birth						.00014 (***)
No Injection	(1)	324	11.8	2417	88.2	
1-2 Doses	(2)	82	11.4	637	88.6	
3 (+) Doses	(3)	8	3.1	246	96.9	
3.4 Place of Delivery at						
At home	(1)	405	11.2	320	88.8	0.48864
Gov-Hospitals/Health Facilities	(2)	9	9.0	91	91.0	
3.5 Assistance at Delivery						0.30550
Relatives/No one	(1)	319	10.9	2613	89.1	
Health personnel's	(2)	95	12.2	685	87.8	
4.0 Place of Residence						.00602 (**)
Urban	(1)	36	16.9	177	83.1	
Rural	(2)	378	10.8	3122	89.2	

Source: *Computed by the author based on the 2000 DHS survey*

**** Total number of Infants birth = 3713***

**** Total number of Infants death = 414***

Significance of Bivariate – X^2 – Test

(***) – P < 0.001 ⇨ 1%

(**) – P < 0.05 ⇨ 5%

(*) – P < 0.1 ⇨ 10%

4.4.2 Socio-economic and Environmental variables and infants survival

Among the selected socio-economic factors, ethnicity of mother, her work status and mother's education were found to have a significance association with the survival of infants born to the mothers.

In the demographic literature the discussion of the relationship between women's work and infant mortality has always focused on paid employment outside the home, which is believed to be a possible cause of infant and child neglect and infant/child malnutrition due to abandonment of breast feeding (Ware, 1984).

But work outside home is likely to be associated with modernity and with higher family income, both of which probably increases the chance of survival (Hobcraft et al., 1984).

This may be true also for the region of Amhara where mothers working away from home have the lower death rate (10.4%) than the non-working mothers and the result is found statistically significant at five percent level.

A finding of the bivariate results given in Table 4.4 indicates that the ethnic variation having a moderate association on infant survival. More deaths were observed in the major ethnic group of the Amhara (11.5%) than Oromo/Agew and others (7.9%) (P value = .0434)

4.4.3 Maternal Health Care and infant survival (Prenatal and Delivery Care)

The over all objective of this study is being to examine and assess the effect of selected factors of utilization of prenatal care and delivery care on infants survival, the bivariate results revealed a positive significant association of the assistance of prenatal care, number of prenatal visits, and Tetanous Toxoid injection given to pregnant mothers before birth on survival of infants.

Though the relative importances of the independent variables are not identified by bivariate analysis the independent association of delivery care was not found significant on infant's survival.

Many studies and literature review have revealed that assistance of prenatal care by health professional has a protective significant effect on infant survival. The bivariate results (Table 4.4) has shown the same truth for the assistance of prenatal care (p value = 0.00430) describing a very low death rate (8.1%) for those assisted by health professionals. But prenatal care is most effective if the prenatal visits are started early during pregnancy and continue at regular intervals through out pregnancy till birth. Number of prenatal visits showed a positive association on infant survival (p value = 0.02572) The highest death rate was observed for those who have not made any prenatal visit (11.7%) indicating that prenatal visits have exerted significant association with survival of infants. Tetanous Toxoid injections given before birth of child to women have revealed a strong association exerting a positive significant effect on infant survival. (p value = 0.00014). Those mothers who haven't received any injection the proportion of infant deaths was comparatively higher (11.8%) than those who received three or more doses (3.12%).

4.5 Multivariate results on infants survival

In the previous chapter the effect of each of the demographic, socio-economic environmental and maternal health indicators on infants survival was examined one by one.

Therefore in this section the individual effect of independent variables on infant survival in general and the impact of maternal health variables in particular will be examined by making use of logistic regression.

The Model Used

As discussed in data analysis section (3.3) in previous chapter, the relative importance of the independent variables are not identified by bivariate analysis. Inorder to capture the relative importance of the explanatory variables by controlling the confounding effects of the variables, a multivariate analysis was employed. The logistic regression method of analysis is used for the purpose.

The logistic regression method is used when the dependent variable is dichotomous (binary). In dichotomous outcomes there are only two forms "yes" or "no". As stated earlier, for this study, since the dependent variable is infants survival, there are only two possible responses, either "dead" for those infants who are dead ('0' if dead), and "alive or survived", for those who are alive ('1' if not dead).

The equation of the logistic regression model is given as:

$p/1\text{-}p = e^{B_oX_o} * e^{B_1X_1} * e^{B2X2} * \ldots\ldots\ldots * e^{BnXn}$ or equivalently,

$\ln (p_i/1\text{-}pi) = B_0 + B_1 X_1 + B_2X_2 + \ldots\ldots\ldots\ldots + B_nX_n$

Where, p_i = chance of an infant surviving

$1\text{-}p_i$ = chance of an infant not surviving

ln (pi/1-pi) = is the probability or risk of event occurring which is the odds of surviving.

X_i = independent variables

B_i = regression coefficients

B_o = constant

In the logistic regression model estimates of relative risk have been computed based on the odds ratios from the logistic regressions, the log of odds ratios (which in this study is the ratio of proportion of infants who are alive to those who are not) is expressed as a function of the various explanatory variables (predictors). The odd ratios greater than 1.00 indicates an increased risk (or likelihood) for the outcome, while its value less than 1.00 indicates a decreased risk (or likelihood) for the outcome.

For each variable, there is a reference category against which all other values are compared. By default, the values of these reference categories are given a regression estimate of 1.00, and back ward-wald step wise method was used to select the variables. The results of other

variables will either be higher or lower than the reference category. Significant levels of regression coefficients are determined using p-values. The statistical package for social sciences (SPSS) was used for all the analysis of this study.

Before running a multivariate analysis, in the bivarate analysis a Chi-square test has been made to examine whether there exist significant associations (gross or uncontrolled effect of the explanatory variables on infants survival) between those explanatory variables and infant survival. The Chi-Square test has shown that all variables (except size of infants, religion, toilet facilities, source of drinking water, exposure to mass media, place and assistance at delivery) are important factors affecting infant's survival in the region.

The multivariate analysis assessed the probability of infants survival examining the independent strength of maternal Health Care factors alone in (model 1), socio economic and Demographic factors in (model 2) and the effect of the whole variables in (model 3). The independent variables considered for the analyses are shown in the Appendix.

Table 4.5

Results of Logistic Regression of Maternal Health, Socio Economic & Demographic factors on Infants Survival for Amhara Region (1996-2000).

CHARACTERISTICS	MODEL (1)		MODEL (2)		MODEL (3)	
	B	Exp (B)	B	EXP (B)	B	EXP (B)
1.0 Maternal-Health factors						
1.1 *Assistance of prenatal care*	- (*)	-				
• No-one (RC)	-	-	-	-	-	-
• Health-Professionals	.2976 (*)	1.3466	-	-	.0745	1.0774
• Trained birth attendants	-.7173	.4881	-	-	1.2388(**)	.2897
1.2 Number of prenatal visits	-	-	-	-	-	-
• One or More	3.2682	26.2632	-	-	-	-
• No visit (RC)	-	-	-	-	-	-
1.3 Tetanous- Toxoid	(**)					
• No Injection (RC)	-	-	-	-	-	-
• 1-2 Doses	-.0249	.9754	-	-	-.0108(***)	.9893
• 3 (+) Doses	1.3086 (***)	3.7010	-	-	1.5781 (*)	4.8459
1.4 Place of Delivery	-	-				
• Home (RC)	-	-	-	-	-	-
• Gov-Hospitals	.3033	1.3544	-	-	.9748 (**)	2.6506
1.5 Assistance at Delivery	-	-				
• Relatives/No One (RC)	-	-	-	-	-	-
• Healths Professionals	.2351 (*)	1.2651			.2364 (*)	1.2666
2. Demographic Characteristics						
2.1 Mothers Age at birth						
• 15-19	-	-	-.2938	.7454	-.3148	.7299
• 20-34	-	-	-.3657(**)	.6937	-.4081 (**)	.6649
• 35 (+) (RC)	-	-	-	-	-	-
2.2 Birth order						
• 1 (RC)	-	-	-	-	-	-
• 2-4	-	-	1.4100(***)	4.0961	1.3477(***)	3.8487
• 5 (+)	-	-	1.1871(***)	3.2777	1.1229(***)	3.0738
2.3 Preceding birth interval						
• < 2 years (RC)	-	-	-	-	-	-
• 2-3	-	-	.8002 (***)	2. 2260	.8488(***)	2.3367
• 4 (+)	-	-	1.2885(***)	3.6275	1.2603(***)	3.5266

CHARACTERISTICS	MODEL (1)		MODEL (2)		MODEL (3)	
	B	Exp (B)	B	EXP(B)	B	EXP (B)
2.4 Sex of the child						
• Male (RC)	-	-	-	-	-	-
• Female	-	-	.3468(**)	1.4146	.4073(**)	1.5028
2.5 *Breast* - feeding						
• Not fed (RC)						
• Yes, breast fed	-	-	-	-	-	-
	-	-	1.2415(***)	3.4608	1.3160(***)	3.7284
3.0 Socio-Economic Characteristics						
3.1 Mothers Literacy status						
• Illiterate (RC)	-	-	-	-	-	-
• Literate	-	-	.4199(**)	1.5218	.3434 (**)	1.4098
3.2 Ethnicity						
• Amhara (RC)	-	-	-	-	-	-
• Oromo/Agew and Others	-	-	.5761(**)	1.7791	.5958(**)	1.8145
3.3 Source of Drinking water						
• (Well/spring/river)	-	-	-	-	-	-
Not piped (RC)	-	-	-	-	-	-
• Piped	-	-	1.3861(***)	3.9991	1.1409(***)	3.1285
4.0 Place or residence						
• Rural (RC)	-	-	-	-	-	-
• Urban	-	-	1.2511(***)	3.4942	1.1975(***)	3.3117
5. Constant	2.2119 (***)	-	2.0466(***)	-	2.4105(***)	-

Source: Computed by the author based on the 2000 DHS survey

B = Regression coefficient

Exp (B) = Odds Ratio (Probability of Infant survival)

RC = Reference category

Significant at p

(*) P < 0.1

(* *) P < 0.05

(*) P < 0.001**

Model 1= selected characteristics of utilization of prenatal and delivery care services on infants survival

Model 2 = selected characteristics of socio-economic and demographic factors on infants survival

Model 3 = The whole selected characteristics on infants survival

4.5.1 The effect of prenatal and Delivery Care Factors on infants survival

The multivariate analysis assessed the probability of infant survival examining the independent strength of maternal health care factors alone is presented in Table 4.5 (model 1). As compared to no one assisted for prenatal care, assistance provided in prenatal care by health professional shows an increase of chance of survival, while those for trained birth attendants shows the declining survival of infants. However, the effect is only statistically significant in case of health professionals. The B-coefficient suggest that when assistance for prenatal care provided by health professional, log odds of infant survival increases by a factor of 0.2976 as compared to no assistance given to mother for prenatal care. Also, the multiplicative estimate indicate that the survival of infants in the presence of assistance given by health professionals for prenatal care are 1.3466 times (i.e. 34.66 percent) higher than odds of surviving without any assistance for prenatal care. As in the model 1, only maternal health factors are included as predictors and no other variables has been incorporated for control except maternal health indicators. It is therefore more likely to be unadjusted effects of maternal health factor on infant survival. Prenatal visit has also shown insignificant impact on infant survival. This is because prenatal care visits are likely to be correlated with socio-economic back ground variables such as urban / rural residents and mothers literacy which are included in model 3 for adjusted effects. The result shows that the survival of infants is influenced by access to prenatal and delivery care. Among the selected factors for the study Tetanus Toxoid injection given before birth, assistance of prenatal care and delivery assistance by health personnel's have exerted a significant positive effect on infant's survival.

The probability of infants' survival when delivery assisted by Health professionals was 26.5 percent higher compared to the non-assisted ones and the effect is statistically significant.

Tetanus Toxoid injection given to mothers during pregnancy is also found to have a significantly high positive effect on infant's survival.

It is important that mothers deliver their babies in health facilities, where proper medical attention and hygienic conditions can reduce the risk of complication and infections which may cause death to either the mother or the baby.

Controlling the effect of other factors of maternal health, the probability of infant survival is 3.7 times higher when the pregnant mothers have been given 3 or more doses of tetanus toxoid, as compared with those mothers who have not taken any dose of tetanus toxoid injection, and the effect is highly significant. However, the infant survival of those mothers declined to13.43 percent who have received 1or 2 doses of tetanus toxoid as compared to those who have not taken any dose, but the decline of survival is found statistically insignificant, meaning may be that whether mothers given only 1 or 2 doses of tetanus toxoid or not doesn't make any significant impact on survival of infants. It would be effective only if tetanus toxoid doses given 3 or more.

Controlling for the effect of other variables related to mothers health, the probability of infants survival if delivered at government hospitals was 35.4 percent higher compared to those delivered at Home. However, the effect is not statistically significant. Children delivered at the medical facility are likely to experience lower mortality than children delivered at home, because such facilities usually provide a sanitary environment and medically correct birth assistance. If complication develops during childbirth medical health

professional can attend to the problem immediately. Likewise, the odds of infants survival in case of assistance at delivery provided by health professional has been 26.5 percent higher than the assistance given at time of delivery by relatives or no one.

4.5.2 The effect of socio-economic and demographic factor on infants survival

To measure the net effect of socio economic and demographic factors on infant survival, a logistic model is used and the results are given in table 4.5 (model 2).

In a developing country like Ethiopia the health status of the population particularly in the region of Amhara is at a low level because of the low level of socio economic development as well as the low level of literacy in the population.

Perhaps the net effect of the socio-economic and demographic factors on infant survival could be highly significant than health care factors which are indeed inter linked.

Assessment of the selected socio-economic and demographic factors revealed that all variables exerted the expected beneficial positive effects on infants' survival. Among the factors considered in the study, mothers age at birth, birth order, preceding birth interval, duration of breast feeding, source of drinking water, sex of the child, mothers education, ethnicity and place of residence have shown a significant effect on infants survival and are presented with respect to their relative order of importance.

From the selected variables, effects of some of the factors that have contributed the maximum net effect on infant survival are discussed. Controlling the effect of other factors among selected socio-economic and demographic variables the probability of infant survival

corresponding to those mothers using pipe water for drinking was 3.99 times higher compared to those using unsafe sources of drinking water. Looking the effects of breast-feeding elevated infants mortality may be attributable to termination of breast-feeding within a few months after birth among a small minority of women, which could result in both shortened birth intervals and poor child health (Palloni and Mill Man 1986).

The probability of infants surviving who were breast-fed was 3.46 times as high compared to those infants weaning, and effect of breast-feeding was found to be highly significant.

Preceding birth interval is also found to be a significant predictor variable of infant survival after controlling the effects of other socio economic and demographic variables. The risk of infant's death was found more than double for short preceding birth interval (i.e., less than 2 years)

Further controlling the effects of the confounding factors considered in the model 2, the probability of infants survival for birth intervals 2-3 years and 4 years and above were found 2.22 times and 3.62 times as high compared to the short birth interval of less than 2 years respectively, i.e., the higher the length of birth interval higher will be the chances of the infants surviving.

Survival differential by sex of child is found statistically significant, and it is found that an odd of surviving female infants is higher by a factor of 1.4146 times than the odds of male infants survival.

Ethnicity has also shown a relatively high significant effect on infant's survival. The multiplicative estimate indicates that the odds of infant survival is increased by 77.9 percent

for infants whose mothers belong to Oromo /Agew and others ethnic group as compared to the odds of infant survival of mothers of Amhara, after controlling the effects of variables included in the model.

In developing countries mothers' educational level, as indicated here by literacy status tends to have a strong effect on the mortality of young children (Hobcraft, McDonald, and Rustein, 1984; Mosely and Chen, 1984;United Nations, 1998).

Literate mothers usually give birth to healthier babies because they themselves tend to be healthier than mothers who are illiterate. In addition literate mothers are likely to have more information about health care facilities, nutritional aspects etc. These traits are likely to result in lower mortality of children at all ages under 5 (World Bank, 1993).

Infants of literate mothers have experienced a significant lower risk of infants' death as compared to those infants whose mothers illiterate. The effect of mother's literacy status is statistically significant at 0.01 levels. The estimated coefficient of mothers' literacy suggests that literacy of mothers increases the likelihood of infant's survival by 52.18 percent.

Lastly, logistic regression output have also revealed, controlling for the other confounding factors of socio-economic and demographic characteristics, the probability of the odds of infants survival of the urban area was 3.5 times higher than that of the rural areas, the residence effect has also been highly significant.

4.5.3 The effect of maternal Health care, socio economic and Demographic factors on Infant Survival (Model 3)

In this section we examine the effects of maternal health care indicators namely, prenatal care, number of prenatal visits, immunization of pregnant women against tetanus, delivery in medical facility and assistance provided at the time of delivery on infants survival, after controlling the selected socio economic and demographic factors.

Model 3, Table 4.5 shows the adjusted odd of infant survival. Model 3 may be compared with Model 1 for infant survival with regard to the effects of each one of the mother's health indicators. Also Model 3 may be compared with model 2 for infant survival to identify the independent effect of socio economic and demographic factors. It is seen from the table that the multiplicative effect of odds of infants survivals to the mothers who have received prenatal care from health professional, have increased to 1.07 times higher than odds of surviving of infants to the mother who have not yet given care after controlling all other variables of mothers health care and socio economic and demographic characteristics.

A comparison of the odd ratios of infant survival with regard to maternal health care for Model 1 with Model 3 clearly showed higher odd ratios incase of model 3, when mothers received maternal health care services from health professionals. Therefore it is the result of utilization of prenatal care and delivery care services given to pregnant mothers, as the effects of other factors have been controlled.

Likewise, mothers who received 3 or more doses of tetanus toxoid injections during pregnancy showed that effects emerged in both the model 1 and model 3 are statistically

significant, reflecting the importance of protection conferred by tetanus immunization. The finding suggests that immunizing pregnant women against tetanus if given at least three doses, is an important program intervention for reducing infant mortality in the study region.

Children delivered at a medical facility are likely to experience lower mortality than children delivered at home because such facilities usually provide a sanitary environment and medically correct birth assistance. Generally poor women only deliver their children in a medical facility if they anticipated a complication. In this situation delivery in medical facility would be expected to reduce infant mortality when measured independently, but after adjusting for socio economic variables, the effects would be expected to disappear or to reverse direction. Table 4.5 Model 1, shows that unadjusted odds (controlling only for other maternal health variables) of infant survival is 1.3544 for children delivered in medical facility than for children delivered at home, but the result is not statistically significant. After controlling the set of socio economic, demographic and maternal health factors, the adjusted odds (Model 3) of infant survival for the same has been changed to 2.6506, and the effects now become statistically significant at 5 percent level. The apparent advantage of delivering in medical facilities is due to the influence of other socio-economic variables, with place of delivery acting as a proxy. Similarly, after controlling for the socio economic variables and other predictors, the odds of survival of infants whose mothers has received assistance at delivery shown a slight increase from 1.2651 to 1.2666 for the children at the time of their delivery assisted by health professional. However the level of significance declined. It is expected that the adjusted effect of the most socio economic and demographic variables will be smaller than the effects (if lesser numbers of predictors controlled), because socio-economic and demographic characteristics being examined tend to be correlated, with each

other. For women who live in urban areas are more likely to be literate, to have access to a flush or pit toilet and own relatively large number of household goods.

It is noted that the adjusted odds of infants survival in case of birth order, preceding birth interval, sex of child and duration of breast-feeding have substantially declined after controlling for the socio economic variables.

However, in both the models (Model 2 and Model 3) the effects are statistically significant. Controlling for other factors, effect of birth order changes considerably, probably because of the high correlation between birth order and mothers age at childbirth. With adjustment for other factors the odd ratio of infant survival decreases linearly with increasing birth order. The adjusted effect of the odds ratio for the mothers aged under 20, or 20-34 years age at birth of child, compared to the odds of infants born to mothers aged 35 years have been increased after controlling for other factors (Model3). The adjusted effect of previous birth interval on infants' survival is somewhat smaller after controlling the variables than the effects on infants' survival without controlling the effects are statistically significant. The finding clearly shows that previous birth interval has a large and statistically significant effect on infant survival. It provides a strong rational for advocating child spacing to improved infant survival.

Among the demographic variables namely, birth order, preceding birth interval, duration of breast-feeding, and sex of the child have contributed the highest positive effects on infants survival followed by mother's age at birth.

Availability of safe drinking piped water is potentially a very important environmental determinant of infant mortality. The odds of infant survival for users of piped water is found

to decrease from 3.9991times to 3.1295 compared to users of well/ spring/ rivers, after controlling for the effect of other factors. However, the effects are highly significant before and after the control. The effects of mothers' ethnicity and education have also remained significant. But the magnitudes of the effects and the level of significance have diminished. In general the effect and direction of association of socio economic and demographic variables are found to be consistent with the results obtained in model 2, except in case of maternal health factors, the effects were found to have increased.

The probability of infants surviving of those breast-fed was 2.72 times higher compared to those infants terminating breast-feeding. The risk of infant's death was also high almost doubled due to short preceding birth interval, after controlling other factors. The effects are declined due to interaction of the other variables.

Ethnicity has also shown a relatively significant reduced effect on infant's survival after control.

The literacy of mothers and the utilization of prenatal and delivery care services had the most favorable impact on infant's survival as shown in Table 4.2 and 4.3. By and large the survival of the infants residing in rural areas are found being highly affected than the urban areas. It is evident from Table 4.5 (Model 3) that the effect of residence of mothers on infant survival has reduced after controlling for the effects of other predictors. Even though the effects of residence on the survival of infants are still found to be present, as the results revealed that the probability of infant survivals in urban areas was 3.31 times higher as compared to the rural areas after controlling for the other confounding factors.

CHAPTER 5

5.1 Discussion and Policy Implications of the Findings

The overall impression given by this study was that infants mother in Amhara region receive some prenatal and delivery care services but the larger part of the study population is not adequately covered.

The observed low estimate of prenatal care coverage and its effect on infant's survival may be accounted for different reasons. It may differ in terms of their prenatal care behavior attributed to differentials in areas of residence, socio cultural, socio economic, demographic and prenatal service factors. This study attempted to assess and examine the effects of utilization of maternal health services in relation to selected socio economic, cultural and demographic factors on infants' survival. A study designed for Gulele district of Addis Ababa has shown the prenatal behaviour of pregnant women i.e. the likelihood of starting prenatal care lately even after 6^{th} months of pregnancy (Misganaw et. al 1992). Utilization of maternity care is very low in Ethiopia and worse as described in the Amhara region. Nearly three fourths of mothers who had given live births in the five year preceding the survey did not receive prenatal care in Ethiopia. Access to professional maternity care during pregnancy is very low in Amhara. In the five years preceding the survey (1996-2000), only one in five mothers received prenatal care from health professionals for their most recent birth. During the same period more than four out of five mothers did not receive any prenatal care.

But according to the world health organization (WHO) data, the proportion of the study women who use prenatal care in health facilities was average for a developing country,

WHO (1992) reports, the proportion of women who had at least one prenatal examination from a trained persons were found to range from low value of 20% in Honduras, 33% in Thailand and 35% in Iraq, to high value of 80% in Colombia, 83% in the Philippines and 98% in China.

Moreover WHO recommends providing prenatal care for all pregnant women (WHO, 1993). Ideally each pregnant woman should first be seen before the 10^{th} week of pregnancy (MOH, 1998). The advantages of this early visit are that a base line can be assessed and any abnormalities can be identified before they have a detrimental effect on both mother and fetus. Therefore a vast majority of pregnant women in the study area have lost the most of the benefits of prenatal care. On the other hand an over whelming majority of births (97%) in the region that occurred in the five years preceding the survey took place at home. Even from those delivered with assistance, most of them were delivered by trained traditional birth attendants "Data from Demographic and Health surveys conducted in many African Countries since the mid-1980's shows that many mothers still fail to take advantage of prenatal care and delivery care with qualified assistance, (Africa's population and development bulletin, Sala-Diakanda , 2000)."

Maternal and infants health care issues continue to occupy a prominent place on the public health agenda even in the developed country like USA. Despite substantial improvements over the last decades in some traditional indicators of infant's health, efforts to improve infant's health and survival focus largely on the prenatal care component of the health care delivery system. The objective of prenatal care is to reduce the risks of adverse pregnancy outcomes; extensive contact with prenatal care providers also can promote a healthy family environment during the first years of life of the newborn babies. Various expert panels

concur, "prenatal care provides a foundation for improving the health of the pregnant women, infant and family . . ., the prenatal care system is a corner stone of Health care delivery in our society" (Oropesa. et al., 2000). Attention to the Region is of high priority because of the relatively low proportion of prenatal and delivery care utilization.

In order to identify the impact of important factors of the maternal health of utilization of prenatal and delivery care services, multivariate analysis was performed on status of infant's survival. Results of the multivariate analysis identified an independent effect of several factors along with utilization of health care service on the status of infant's survival.

Controlling for the effects of other factors, multivariate results indicate all the selected maternal health care indicators; socio economic and demographic factors exert a significant effects on infant survival. For setting priority attention results found with respect to each factor is of great importance for the analysis. Among utilization of prenatal and delivery care factors considered, tetanus toxoid injection given to mothers during pregnancy being highly significant, assistance of prenatal care, place of delivery and delivery assisted by health personnel's were also found to be statistically significant variables. In agreement with the finding of the study carried out in India titled action plan to reduce prenatal mortality has also revealed improvement in the maternal health care, reducing the strenuousness work during pregnancy, improved prenatal care, prenatal tetanus toxoid immunization, identification of high risk factors during pregnancy, delivery...as factors to reduce the infant and mothers mortality (Bhakooon, Kumar.R., 1990).

Moreover several studies carried out in Ethiopia revealed also lack of antenatal care and prematurely as the most important factors determining infants death indicating possible

solutions to the problems and retrospective studies recommended to include the assessment of demographic factors in order to make community based studies. (Taddese, Afework, Surafel and Mehari, 1989).

The socio economic and demographic factors examined namely birth order, preceding birth interval, breast feeding, sex of the child, source of drinking water, ethnicity, mothers literacy status and mothers age at birth were found exerting significant effect on infants survival respectively. The geographical variation with respect to the place of residence has also shown a significant impact.

In agreement with the hypothesis mothers utilizing the prenatal and delivery care services would be beneficial for at most increasing chances of survival of newborn babies.

Findings of several studies and a study carried out in India with a goal set to reduce infant death showed requiring attention to social, economic and behavioral factors as well as improvements in maternal health system on inadequate prenatal care (Bhakooon, Kumar, 1990).

The results from multivariate analysis imply that factors considered in the utilization of health care services were found reducing the risk of infants' death. The hypothesis that educated mothers would benefit most from increased utilization of prenatal and delivery care was found true in the study. The finding showed that infants born to literate mothers were more likely to have an increased chance of survival than infants born to illiterate mothers. In agreement with the hypothesis previous analysis of utilization of maternal health services during pregnancy and delivery has also shown that literacy as an important factor influencing women to seek prenatal and maternal care. The lower the education status of the women the

less they use the maternal care services efficiently and the higher the risk of mothers and infants death (Sala, Diakanda, 2000)

The finding of the study also has revealed demographic factors such as, birth order, birth interval, and duration of breast-feeding as the significant proximate determinant of infant survival. Several studies in many countries and a study conducted in the northern region of Sudan have also indicated these variables exerting significant effects on infants' survival (Ali ED, 1994; Samuel O.M. Manda, 1999).

In agreement with the hypothesis though maternal health factors has a significant effect on infants' survival. The level of significance clearly indicates that the socio-economic and demographic factors in general exerting considerable effects on the chances of infant survival. As noted above recommendation of several studies have also suggested the demographic and socioeconomic factors to be included for assessment of related studies.

5.2 SUMMARY

Today maternal health care and its effect on infant survival have become one of the major health and social problems of the society in developing as well as in developed countries.

Realizing this problem of infant and maternal health care this study has dealt in detail with the factors affecting infant survival related to prenatal and delivery care services.

The finding of the study attributed univariate results of the general background characteristics, the maternal health care utilization (prenatal and delivery care) and infants survival, followed by bivariate cross tabulation results and further multivariate analysis results of the logistic model.

The objective of the study was to assess and examine the status, relationship and variations of prenatal and delivery care on infant survival after controlling for social economic, cultural and demographic factors in the Amhara region of Ethiopia. Knowing the extent to which lowest status of maternal health care utilization of services and high infant mortality rate, contributing to the problem, assessment of prenatal and delivery care factors affecting infant survival after controlling social, economic, cultural and demographic factors were analyzed.

The study has certain possible hypothesis to be tested. The dependent variable in the study has been a risk of death at infancy, which is a dichotomous variable, (survived or dead.) The independent variables of the study are categorized into three major groups: demographic, socioeconomic and maternal health care factors. About 19 independent variables have been identified at the background stage; however some of them were excluded from the analysis part of the study due to non significant association with dependent variable. The data used in

this study is that of the 2000 Ethiopian Demographic and Health Survey (DHS), which, is conducted by Central Statistical Authority (CSA). The total sample sizes of the infants of mothers' aged 15-49 are 3713 out of which 414 or 11.2 percent of them were found dead. The infant mortality rate of the region was found to be 112.4 per 1000 live births in the year 2000.

In the data analysis the univariate, bivariate cross tabulation and chi-square test and multivariate analysis with logistic model were applied with the help of SPSS software. In the univariate analysis the percentage distribution of respondents by background characteristics was shown. The analysis showed the largest proportion of the respondents (94.3 %) is from the rural area and (5.7%) from the urban area of the region. Sex distribution of infants shows males having the high proportion (53.2%) than females (46.8%). The survival status of infants was found to be higher for males, female and male deaths were 40%(166) and 60%(248) respectively.

Access to professional maternity care during pregnancy was found to be very low in Amhara. In the five years preceding the survey, only 1 in 5 mothers received prenatal care during her pregnancy from health professionals for the most recent birth. Within the same period only 19% of the mothers of infants received 1 to 2 doses of tetanus toxoid for the most recent pregnancy. The majority of births (97%) that occurred in the five years preceding the survey took place at home.

The bivariate cross tabulations and chi-square test were used to examine the existence of association between each independent and the dependent variable. Among the sampled infants of the region there exists a significant association between mothers age at birth, birth

order, birth interval, sex of the child, duration of breast feeding, work status of mothers, ethnicity, assistance of prenatal care, number of prenatal visits, tetanus toxoid injection given before birth and infant survival respectively. The highest effects exerted on infant survival were found to be due to birth order, preceding birth interval, breastfeeding, tetanus toxoid injection given before birth and assistance of prenatal care given during pregnancy.

The multivariate analysis using the logistic model was used since the dependent variable (outcome) of the study is dichotomous (binary): that is an event can either occurs or doesn't occur. The analysis of the result is presented in the form of odds ratio (exponential beta) i.e., the ratio of the probability that the event will occur to the probability it will not. Regression estimates greater than one indicates that the risk of infant survival is higher than the reference category, whereas estimates less than one indicates the risk of infant survival is less than that of the reference category.

The multivariate analysis assessed the probability of infant survival examining the independent strength of maternal health care factors alone in Model 1; socio economic and demographic factors in Model 2, and the effect of the whole factors in Model 3. The result showed the significance of infant survival after controlling the effect of other predictors. In Model 1 only maternal health factors are included as predictors and no variable has been incorporated for control except maternal health indicators. Among the factors for the study tetanus toxoid injection given before birth, assistance of prenatal care and delivery by health professionals have been found exerting a significant positive effect on infant survival. Prenatal visits likely being correlated with socio economic background variables included in Model 3 showed insignificant impact on infant survival. The general result of Model 1 revealed that the survival of infant is influenced by access to prenatal and delivery care.

Model 2 showed (as described earlier) the net effect of socio economic and demographic variables on infant survival. Assessment of the selected socio economic and demographic factors revealed that all the variables exerting the expected positive effects on infants' survival. Among the factors considered in the study namely, mothers age at birth, birth order, preceding birth interval, breast feeding, source of drinking water, sex of the child, mothers education, ethnicity, and place of residence have shown a significant effect on infants survival and are presented with respect to their relative order of importance. The net effect of the whole factors maternal health care, socio economic and demographic factors on infant survival was assessed in Model 3, showing the adjusted odd ratios of infant survival. Since the maternal health factors and socio economic and demographic variables are examined in Model 1 and Model 2 respectively, this model 3 results examined the effects of maternal health indicators namely, prenatal care, number of prenatal visits immunization of pregnant women against tetanus, delivery in medical facility and assistance provided at the time of delivery (i.e. Model 3 compared to Model 1). Comparison for infant survival controlling the independent effect of socio economic and demographic status of infants' mothers for each of the above noted a maternal health indicator has shown the following results. A comparison of the odd ratio of infants' survival with regard to prenatal care (model 1 with model 3) showed high odd ratio in the case of mode 3 when mothers received prenatal services from health professionals.

It is also noted that the multiplicative effects of odds determined infants survival to the mother who have received prenatal care from health professionals have increased to 1.61 of times higher than odds of surviving of infants to the mothers who are not yet given care after controlling all the maternal health and socio-economic and demographic variables.

Like wise mothers receiving 3 or more doses of tetanus toxoid injections during pregnancy showed that effects emerged in both Model 1 and Model 3 being statistically significant, reflecting the importance of protection by tetanus immunization during pregnancy.

It was also found that infants delivered at a medical facility are likely to experience lower risk of death than infants delivered at home.

The adjusted odds (Model 1) controlling for other maternal health variables, of infant survival is 1.3544 for those infants delivered in medical facility than for children delivered at home, but the result is not statistically significant. However, after controlling the set of socio economic, demographic and health factors the adjusted odds (Model 3) of infants' survival for the same has been changed to 1.6466 and the effects became statistically significant.

Similarly, after controlling for the socio economic and demographic predictors the odds of survival of infants has declined from 1.2651 to 1.1380 for those infants delivered assisted by health professionals, the level of significance remained unchanged.

The direction of association of socio economic and demographic variables in (Model 3) except birth order, mothers age at birth are found to be consistent with the results obtained in Model 2,however, in the case of maternal health factors the effects were increased.

In general it is observed that the effect of tetanus toxoid injections given before birth, assistance of prenatal care and delivery during birth by health professionals under the maternal health care factors (Model 1) were found statistically significant on infants survival. Socio economic and demographic variables (Model 2) have exerted the high significant effect on infants' survival.

Therefore it is important to mention the efforts expected to change the present situation of maternal health care utilization and its impact on infant survival in Amhara region with respect to the factors considered in this study.

5.3 Conclusions and Recommendations

This study has presented the results using the data set from DHS 2000 of Ethiopia, the first of its kind carried out in Ethiopia.

In conclusion the analysis presented in this study has assessed utilization of prenatal and delivery care factors affecting infants survival after controlling for socio-economic, and demographic factors in the Amhara region of Ethiopia.

The importance of utilization of prenatal and delivery care services in reducing infant deaths was recently acknowledged in most of the developing countries. In addition the utilization of service coverage rates provide information on various aspects of how successful a health care system is in providing the prenatal and delivery care to infants mothers.

Utilization of prenatal and delivery care service is the most powerful interventions to improve the infant and mothers survival. Therefore prenatal and delivery care service coverage is considered as a good indicator of the degree of utilization of health services at individual level.

On the other hand lack of maternal health care data on assessing the level and pattern of coverage services and their barriers has been and continue to be a major obstacle to improvement. Existing sources of utilization of service data examined from the perspective of infants and mother's survival could help to fill this gap.

The summary of key findings from the analysis has several policy implications. Clearly the utilization of prenatal and delivery care service is an important factor in predicting the service coverage.

- The finding of this study showed the access to utilize the service is very low and its impact on infant survival is adverse. The federal and regional government of the Amhara should set policy with a specific objective of reducing maternal, infant and child morbidity and mortality rates and promoting the level of general welfare of the population.

- ✓ Improving significantly the access to prenatal and delivery care at health facilities by encouraging governmental and non-governmental agencies and the community to be involved in social and economic development programs. The net effect of Tetanus Toxoid injection during the period of pregnancy is very high and hence expanding the access of immunization of pregnant women. Tetanus is very important to promote the level of general welfare of the population.

- ✓ Moreover the Regional office of water resource, non governmental agencies and the community should give priority attention by improving the quality and quantity of the sources of drinking water so as to reduce the high risk of infants death in the region.

- ✓ The regional education bureau, Non-governmental organizations and the community should give more attention to improve the educational status of females by increasing their participation at the levels of the educational system.

- ✓ The finding of this study also has indicated demographic factors such as birth order, birth interval and the breast-feeding, mothers' age at birth and sex of child exerting a significant effect on the status of the infant's survival.

- Hence taking sound policy measures on program development and implementation is highly vital. Regional heath bureau, family planning program services, non governmental agencies regional bureau of education and social affairs and the community should plan and implement counseling services in the family life related education of family planning in order to promote breast feeding, improving the birth spacing, raising the mothers age at birth and the minimum age at marriage.

- Poor coverage of utilization of services is probably the result of not knowing the importance as well as where and when these services are available and limited access to these services. In this respect policy makers and health professionals can play a major role in providing these information while the increase in number of health institutions will no doubt increase the accessibility of these services.

In general utilization of prenatal and delivery care service is the most effective means of reducing infant child and maternal mortality and efforts should be made to overcome the barriers that lower the access of utilizing them. This study has not examined about quality of services and other related factors affecting the services. More research on these aspects is necessary to gain a better understanding of the relationship between the use of prenatal and delivery care services and the quality of care to the services. Moreover much remains to be done strengthening the utilization of services in order to improve and realize a sustainable program with a capacity to significantly minimize the risk of infant mortality.

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Appendix 1

	Category	Classification
1. Dependent variable		
1.1. Did the child has a risk of death at infancy	Survived	1
	Dead	0
2. Independent-Variables		
2.1. Demographic characteristics	Age Group	
2.1.1. Mother's age at -delivery	15 - 19	3
	20 - 34	2
	35 - 49	1
2.1.2. Birth -order		
	1	1
	2-4	2
	5 (+)	3
2.1.3. Sex of a child	Male	1
	Female	2
2.1.4. Birth - interval (spacing)	< 2 Years	1
	2 –3	2
	4 or more	3
2.1.5 Breast-Feeding	not fed	1
	yes, breast fed	2
2.1.6 Size of the Child	Average	1
	Small/V. Small	2
	Large/v. large	3
2.2.Socio-economic and environmental characteristics		
2.2.1. Mother's literacy status	- Illiterate	1
	- Literate	2
2.2.2Work status of mothers		
	At home/Not working	0
	Away/working	1
2.2.3. Religion of mother	- Orthodox	1
	- Muslim/Others	2
2.2.4. Ethnicity of mother		
	- Amhara	1
	- Oromo/Agew and other	2

2.2.5. Sources of drinking water

- Well/spring River/ pond/lake 1
- Piped 2

2.2.6. Sanitation- facility

- No facility /bush 1
- Pit -toilet 2

2.2.7 Exposure to Mass Media

- Access to Radio/TV 1
- Not at all 2

2.3. Maternal -care

2.3.1. Prenatal care/ Antenatal care

Number of visits
- One or more 1
- No visits 2

2.3.2 Availability of Tetanus toxoid
- not used 1
- one-two doses 2
- 3 (+) doses 3

2.3.3 Attendant of prenatal care

- No one 1
- Health-professional 2
- Un-trained Birth-attendant (TBA) 3

2.4. Delivery care

2.4.1 Place of Delivery -care

- At home 1
- Gov-Hospital/Health facility 2

2.4.2 Attendant at the time of Delivery

- Health-professional 1
-No one 2

2.5. Regional –differentials (place of residence
- Urban 1
- Rural 2

Declaration

d declare that this thesis is my original work, has not been presented for a degree r university and that all sources of material used for the thesis been duly ed.

Name Alemayehu Gebre

Signature 

Place Addis Ababa University

Date of Submission June 2002

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or

Signature

26.06.2002

Date