ADDIS ABABA UNIVERSITY

SCHOOL OF GRADUATE STUDIES

MATERNAL MORTALITY IN A RURAL COMMUNITY OF ETHIOPIA: THE CASE OF MAFUD DISTRICT IN NORTHERN SHEWA

MELAKU ESHETU

JUNE 1995

MATERNAL MORTALITY IN A RURAL COMMUNITY OF ETHIOPIA: THE CASE OF MAFUD DISTRICT IN NORTHERN SHEWA

by

Melaku Eshetu

A thesis submitted in partial fulfillment for the Degree of Master of Science in Demography in the Addis Ababa University

June 1995
Addis Ababa

ADDIS ABABA UNIVERSITY
School of Graduate Studies

Maternal Mortality in a Rural Community of Ethiopia: The Case of Mafud District in Northern Shewa

By
Melaku Eshetu

Demographic Training and Research Centre
Institute of Development Research

Approved by Examining Board

Chairman, Department Graduate Committee	Signature
Seyoum G. Selassie	Signature
Advisor	
External Examiner	Signature
Internal Examiner	Signature

Acknowledgments

It is with great pleasure that I acknowledge the help of all those who assisted me during the course of my study.

First and fore most I would like to express my immense gratitude to my advisor Dr. Seyoum Gebresillasie who with patience and utmost concern gone through the various drafts of the work and gave me the benefit of his insight into the broader fields of population studies and research methodology. His constructive criticisms, scholarly suggestions and thoughtful advice ,indeed, have been a source of invaluable input to the study.

I am also grateful to Dr. Willem I.H.E. Eijgenraan, Family Health Department of Ministry of Health and Dr. Tesfaye Shiferaw of the Department of Community Health, Jimma Institute of Health Sciences for their willingness to sacrifice their own convenience to go through the thesis and give critical comments, which undoubtedly contributed towards the improvement of the work.

I am also equally indebted to the following institutions: the Peasant Production and Development in Ethiopia (PPDE) project at the Institute of Development Research (IDR), the United Nations Fund for Population Activities (UNFPA), and the School of Graduate Studies, Addis Ababa University for their generous financial support without which the study would have not been possible.

I must also mention here that for the last four years that I have stayed in the programme I have greatly benefited from the ideas and encouragement of my colleagues at DTRC. I am specially grateful to Dr. Assefa Hailemariam, the coordinator of DTRC, who advised me to pursue a study on maternal mortality and has been of help to me through out. I seize this opportunity to thank Dr. Aklilu Kidanu, Ato Gebre-Egziabher Kiros, Ato Yohannes Kinfu, Ato Eshetu Gurmu, Ato Tilaye Negawo, Ato Genene Mekonnen, Ato Akalu Getaneh and W/t Ayni Umer for all their invaluable help at various stages of the work.

I wish also to express my thanks to Ato Addisu Asmare who facilitated the field work and made at ease my stay in the study area- "Mafud".

These acknowledgements can not be regarded as complete without expressing my thanks to the field assistants and respondents who respectively bear the burden of data collection and providing the information I needed for the study.

Melaku Eshetu

June 1995

ABSTRACT

Each year half a million women die from complications of pregnancy and childbirth and about 99 per cent of these deaths take place in developing countries. Moreover, in these countries complications of pregnancy and childbirth are the leading causes of death among women of childbearing age. However, detailed study on maternal mortality is scarce in many of these developing countries and ,if it exists, the available estimates are only rough indicators of the magnitude of the problem. Similar to other developing countries, in Ethiopia, there is no reliable information that indicates the level , causes and correlates of maternal death for the country at large except few studies conducted on the capital city, Addis Ababa, and one community based study in some rural communities in Illubabor region, South-Western Ethiopia.

With these as a background, the thesis is mainly concerned with estimating the level of maternal mortality in rural villages of Mafud district in Northern Shewa region of Central Ethiopia using a cross-sectional community-based survey conducted on 3274 eligible respondents (persons aged 15 years and above). Interviews with key informants is also another source of information for the study.

The principal technique employed in the study is, the Sisterhood method, an indirect technique recently developed to estimate indicators of the level of maternal mortality from information on survivorship status of sisters reaching reproductive ages. In addition, the study uses descriptive statistics and qualitative analysis to explain the risk factors of maternal death.

The findings of the study indicate a life time risk of maternal mortality of 0.48⁻ or 1 in 21 women. This approximates a maternal mortality rate of ⁻25 maternal death per 100.000 live births. Although it is difficult to ascertain the correlates maternal mortality from the available data, the background information on the study area suggest that risk factors such as delivery before age 18 and over 35, high fertility, home delivery with help of untrained traditional birth attendants, inaccessibility and lack of some equipment in health facilities might have contributed to the observed high level maternal mortality in the study area.

The study concludes by indicating the need for expansion of family planning, adequate training to traditional birth attendants, and strengthening the capacity of the existing health facilities. Furthermore, a possible means of data collection on maternal mortality and the need for further research particularly on causes and correlates of maternal mortality are indicated.

TABLE OF CONTENTS

LIST OF TABLES

APPENDIX TABLES

LIST OF FIGURES

Number

CHAPTER I

INTRODUCTION

Pregnancy and childbirth are universal events; the majority of women in every country, developed or developing, will bear at least one child during their lifetimes. However, there is a great disparity between women in developed and developing countries in respect to the phenomena of childbearing. Most women in developed countries enter into pregnancy as healthy individuals, receive adequate medical care, be treated for any potential complication, and deliver safely. But, women in developing countries can hold no such expectations. In most developing countries when a woman becomes pregnant, she runs a risk of dying as a result of pregnancy and childbirth. Complications of pregnancy and delivery are among the major causes of death for women of reproductive age in most developing countries whereas maternal death is negligible in most developed countries.

1.1 Statement of the Problem

Women, like other segments of any population, are subject to the common illnesses and causes of death. In addition, large numbers of women suffer and die from causes related to pregnancy and childbirth which could be prevented or treated with technologies within the reach of even the poorest countries willing to make a commitment to improve maternal health [Starrs, 1991:1]. WHO estimates that, at least, half a million women die from causes related to pregnancy or childbirth and complications associated with this every year. About 99 per cent of these takes place in developing countries [WHO, 1991:4]. In developing countries maternal death accounts for between 20 and 45 per cent of all deaths to women [Starrs, 1987:13] but it is much lower in developed countries. For instance, in the USA [WHO, 1987a] less than one per cent of women die of maternity related causes.

Further investigations into variations between developed and developing countries reveal that women in developing countries repeatedly face the risk of maternal death during the entire reproductive span, on average 6 to 8 times whereas it is only 2 to 3 times for women in developed countries [Sai, 1986:318]. Moreover, in developing countries the life time risk of dying from pregnancy related causes varies between 1 in 15 and 1 in 70 women whereas in developed countries it varies between 1 in 3000 and 1 in 10,000 women [Starrs, 1987:12]. In general, death of women due to pregnancy or childbearing in developing countries is on the average 100 to 200 times higher than women in developed countries [WHO, 1987:2]. Maternal mortality is ,therefore, a critical problem of women in developing countries that needs to be addressed. But, unfortunately, this is an area of health that has heretofore commanded little attention.

The past decade has seen a growing concern with women's health in developing countries. Professionals and experts have started to gather sufficient data to present the situation of thousands of women who undergo maternal deaths in developing countries. However, the seriousness of women's reproductive health problems were brought to the world's attention more forcefully during the UN Decade of Women [1976-1985] and subsequently the 1987 Nairobi International Safe Motherhood Conference [Symke, 1991:59] has greatly contributed in this regard. The conferences have also tried to initiate immediate action at the national and international levels to prevent the continued tragedy. United Nations agencies and Non Governmental Organizations alike are rallying around such global efforts as the Safe Motherhood Initiative. They are stepping up public information activities on this issue and pressing for action at the national level.

In Ethiopia ,too, a national seminar on safe motherhood was carried out between 18 and 20 September 1989 [MOH, 1989] where important recommendations have been made and implementation has been hampered by financial and organizational constraints.

This worldwide concern has created a demand for information that can provide a better insight about women's health needs in developing countries. Accordingly, some studies have been conducted. These studies were able to identify the main causes of maternal deaths in developing countries. The majority of maternal deaths are caused by: hemorrhage, sepsis, toxaemia, obstructed labour ,and unsafe abortion [Starrs, 1991:1]. These causes with anaemia now account for more than 80 per cent of all maternal deaths in developing countries [Royston and Armstrong.1989 as cited in Rooney, 1992:7].

In Ethiopia, there are some indications of increased awareness of the problem. Nevertheless, it is regrettable that there is no reliable information about the magnitude of the problem at national level. The existing national estimate is 500-1000 maternal deaths per 100,000 live births [NOP, 1994:63]. However, there are some studies conducted in Addis Ababa and some other areas that throw light on the level and causes of maternal mortality. The first study that did examine the level and causes of maternal deaths in the country was carried out in Tikur Anbessa Hospital, Addis Ababa by Olive Frost [1984]. The study identified 30 maternal deaths that had occurred during the year in the hospital though the number of deliveries was not indicated; sepsis and hemorrhage were the main causes of maternal deaths in this group of 30 women. Subsequently, similar hospital based studies by Horvath and Muletta [1982] and Seyoum and Getachew [1988] were conducted suggesting a maternal mortality rate of 960 and 964 per 100,000 live births, respectively and they identified that complications of labour, puerperal sepsis, and postpartum hemorrhage were the major causes. However, these hospital based maternal mortality estimates are not good indicators as they are not representative for the total population. It only explains the experience of women who were admitted to hospitals and does not include any information about the large number of births that take place at home, especially in rural areas. In this country the overwhelming majority of deliveries (over 80 per cent) are attended by traditional birth attendants at home [Almaz, 1991:17]. It is ,however, undeniable that there is valuable information to be gained from such hospital based studies. For example, they are the major sources of information on medical causes of death and they could also provide rough estimates of the level of maternal mortality.

In addition to the above mentioned hospital based studies, in 1983 Kwast and others, carried out a community based study to determine the level and causes of maternal mortality in Addis Ababa. This study suggested an estimated maternal mortality rate of 566 maternal deaths per 100,000 live births. Septic abortion was the most common cause of death followed by hemorrhage, hypertensive diseases, ruptured uterus, anaesthetic deaths, and puerperal sepsis, in this order [Kwast, et al, 1986].

There is, however, little documentation of the problem in other parts of the country, particularly in the rural areas where the majority of the population lives and where health services are inadequate. To the knowledge of this writer, there are only two sets of evidences available about the level of maternal mortality in rural Ethiopia: the first is the estimate suggested by Kwast [cited in Frost, 1984:144] for Endbir district (Southern Shewa). The estimate was 2120 maternal deaths per 100,000 live births. The study was based on the data from Attat Hospital. This estimate has problems similar to the above mentioned hospital based studies. In particular, the hospital is not accessible to the majority of the population living in the area. The hospital was expected to serve 1.5 million people but the immediate catchment area contains 300,000 people even these people need one to two days walk from an all weather road where transport can be obtained to the hospital in the event of an emergency [Frost, 1984:114]. The estimated maternal mortality ratio for the area is .therefore, not reliable. The second was the study conducted by Tesfaye and Fasil. They have carried out the first community based maternal mortality study in rural Ethiopia. It was conducted in some rural communities of Illubabor region, Southwestern Ethiopia. Their findings indicate a lifetime risk of maternal mortality of 1 in 23 women: and a maternal mortality rate of 570 per 100,000 live births [Tesfaye and Fasil, 1993: 239-250].

The purpose of this study is to provide some indicators of the level of maternal mortality such as maternal mortality rate and life time risk of maternal death in rural villages of Mafud district, Northern Shewa. It is expected that such a study at community level can give an indication of the magnitude of the problem in rural areas.

1.2 Definitions

Maternal Death: according to International Classification of Diseases, Injuries and Causes of Death (ICD9) maternal death is defined as a death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by pregnancy or its management but not from accident or incidental causes [Cited in Graham. et al. 1989.129]. This includes abortion related maternal death.

Maternal death, as defined above, is generally classified into two main groups [Kwast, 1984:4]:

1. **Direct Obstetric Death:** these are maternal deaths resulting from obstetric complications of the pregnant state, labour or puerperium, or from intervention, omission of necessary treatment, incorrect treatment, or combination of these causes.

2. **Indirect Obstetric Deaths:** there are maternal deaths resulting from previously existing disease or disease that developed during pregnancy, labour or the puerperium. It is not directly due to obstetric causes but is aggravated by the physiologic effects of pregnancy.

Maternal Mortality Ratio (MMR) is the number of maternal deaths per 100,000 live births [WHO, 1991]. It is usually called as maternal mortality rate but actually it is not.

Maternal mortality rate (MMR) is the number of maternal deaths divided by the number of women of reproductive age.

However, considerable confusion has arisen because of conflicting usage by writers of the sources used. In order to avoid the confusion, this thesis uses the term maternal mortality rate for both measures.

Eclampsia: A disorder characterized by sudden fits and coma, especially during late pregnancy and childbirth.

Toxaemia: Is a condition of high blood pressure which can lead to convulsions and death if not treated in its early stages.

Puerperal Sepsis: It is an infection. The major cause of puerperal sepsis is the entry of germs into the genital tract through the use of unwashed hands and unsterilized instruments during delivery.

Hemorrhage: Is heavy bleeding that occurs during pregnancy (antepartum) or after delivery (postpartum).

1.3 Significance of the Study

The level and pattern of maternal mortality are important indicators of the status of maternal health. Reliable estimates of the level of maternal mortality and knowledge of the causes and factors that contribute to maternal deaths are thus essential for successful planning of maternal health programs.

If there are to be effective policies and programs to reduce maternal death and to identify priority groups, it is important that more research is done regarding maternal mortality at a national and other levels that can generate pertinent information for planners and policy makers.

In Ethiopia ,however, studies on maternal mortality are generally lacking. The available few studies are often focused on Addis Ababa and relied mostly on hospital statistics which are hardly representative of the conditions in population of women. There is only a single community based maternal mortality study in a rural area of the country although 85 per cent of the population live there. Therefore, widespread community based studies in these areas are essential. It is in light of this apparent need that this study was carried out in a rural community of Northern Shewa region to come up with some information that could be of use to health planners and policy makers.

1.4 Literature Review

Introduction

A review of the available literature reveals a paucity of data on pregnancy related mortality in most developing countries. Recently ,however, maternal mortality is recognized as a major public health problem in developing countries, as evidenced by an increasing number of publications on the magnitude and significance of the problem [Rosenfield and Maine, 1985; Fathalla, 1986; Alauddin, 1986; Khan, et al. 1986; Kwast, et al, 1986]. In addition, efforts are now being made to sensitize health policy makers, so that reducing maternal mortality become one of their top priority.

The increasing interest in maternal mortality has led to a growing number of studies that provide useful information on the subject. Accordingly, it has been documented that maternal mortality has declined dramatically through out the developed countries whereas deaths associated with childbearing remain appallingly high in developing countries [Kwast, 1987; Beral, 1979].

Levels of Maternal mortality

// According to WHO estimates of maternal mortality at least 500,000 women die from pregnancy related causes each year. All but about 6000 of these deaths take place in developing countries which accounts for 99 per cent of maternal deaths [Starrs, 1987:10]. In particular, South Asia, Africa, Latin America, and East Asia, account for 59 per cent, 30 per cent, 7 per cent, and 3 per cent, of maternal deaths in the world, respectively, whereas it is only 1 per cent in developed countries.

The frequency of the risk of dying of pregnancy and child birth related causes is up to 200 times higher for women in developing countries [Viegas, 1992:39] than women in developed countries.

There are also variations in the level of maternal mortality among countries in the developing world. Available estimates for the year 1988 [WHO, 1991:4] show that maternal mortality rate is highest in Africa with 640 maternal deaths per 100.000 live births. Looking further into the variations among sub-regions of Africa, maternal mortality rates are greater in Western (760/100,000), Central (710/100,000), and Eastern Africa (680/100,000) than in Southern (270/100,000) and Northern Africa (360/100,000) [WHO, 1991:4].

Comparisons among countries are difficult and may be grossly misleading, as researchers use varying sources of data to estimate the level of maternal mortality. Rates are extremely high in some countries: In Benin, Burkinafaso, Ghana, Nigeria, and Somalia [UN, ECA, 1989:39] the rates are in excess of 1000 deaths per 100.000 live births. On the other hand, few African countries have rates of less than 100. These include Egypt, Libya, Mauritius and Togo [UN, ECA, 1989:39]. In general, the life time risk of dying from pregnancy and childbearing related causes in African is 1 in 21 [Starrs, 1987: 13].

Maternal mortality is also high in Asia 380/100,000 live births [WHO, 1991:4]. However, Asia is the continent with the greatest inter-country variations in maternal mortality rates. At one extreme, there are Hong Kong, Singapore and Japan whose

maternal mortality rates .4.7. and 11 per 100,000 live births .respectively. are comparable with the lowest in Europe. At other extreme there are countries like Indonesia and Yemen where the rate is above 700 [Fortney J.A. et al. 1986:134]. Among the sub-continents of Asia maternal mortality is particularly very high in Southern Asia and because of its dense population, accounting for 59 per cent of maternal deaths in the world. Maternal mortality in the sub-region was estimated at 570 in 1988 and life time risk of 1 in 35 women [WHO, 1991:4]. Studies in two rural districts of Bangladesh, Jamalpur [Khan. et al. 1986] and Tangail [Aluaddin, 1986] gave estimates of maternal mortality rates of 623 and 566, respectively. Moreover, a study in rural areas of Andra Pradesh, India in 1984-85 found a rate of 874 maternal deaths per 100,000 live births [WHO, 1991:4]. In contrast, the ratios in East Asia are quite low. A study in China showed a rate of 50 in urban and 115 in the rural areas [WHO, 1991:4]. In general, maternal mortality ratios are higher in the Southern Asia than in the other sub-regions of that continent. Estimates for the other sub-regions are 340 in the South Eastern, 280 in the Western, and 120 in the Eastern Asia sub-regions [WHO, 1991:7].

In Latin America 30.000 maternal deaths occur each year which account for 7 per cent of maternal deaths in the world [WHO. 1987a]. On average. maternal mortality in Latin America is 200 [WHO. 1991:4] which indicates that the risks of pregnancy and childbirth are lower in Latin America than in Africa and most of Asia.

Table 1 'Estimated Lifetime Chance of Dying from Pregnancy Related Causes by Region. 1975-84

Region	Life time chance of maternal deaths
Africa	1 in 21
Asia	1 in 54
South America	1 in 73
North America	1 in 6366
North Europe	1 in 9850

Source : STARRS: 1987:13.

The level of maternal mortality rates do not only vary between developing and developed countries, or from region to region or from country to country but there is considerable variation within a country particularly between rural and urban areas. Everywhere rates tend to be lower in urban areas than in rural areas. For example, a study conducted in Assiut city and three surrounding villages in Egypt [Abdullah, 1992] showed that there is increased risk of maternal death in rural villages than in Assiut. Also in China and India maternal mortality rates were lower in urban areas than rural areas [WHO, 1986b:176].

maternal mortality differentials

Correlates of Maternal Mortality

In developing countries on the average one-fourth of all deaths to women are maternity and child birth related [WHO, 1987a]. Why do these women die? There are many intertwined factors influencing maternal mortality. The most commonly recorded direct causes of maternal death are hemorrhage, puerperal sepsis, obstructed labour, toxaemia, abortion and eclampsia. These are the end points of the road to death. Behind these direct causes there are a number of factors that predispose women to serious complications and death. These include lack of trained personnel and medical equipment at health facilities, inaccessibility of medical facilities, lack of antenatal care; lack of family planning services, giving births when women are too young or too old, or have too many or too closely spaced births; pre-existing illnesses like anaemia, malaria, and heart diseases that can be aggravated by pregnancy and render the pregnant woman more

susceptible to death. The following section reviews the relevant literature on some of these risk factors of maternal death.

① Reproductive Factors

The risk of maternal death is related to age, the space between pregnancies, and the total number of pregnancies. It is higher in women who start childbearing very young, under 18, late in reproductive life, above 35, with high parity, four children and above and when short intervals exist between pregnancies, usually less than two years, [Abdullah, et al,1992; Sai, 1986; Teran, 1987]. In other words, pregnancy carries an extra risk if it is too early, too late, too many, or too close [Fathalla, 1990:223].

Bearing children before the age of 18 is a very different experience from having children in the prime reproductive years of 20-34. For teenage mothers there is a greater risk of direct obstetric complications such as obstructed labour (because the pelvis is not yet fully grown) and eclampsia, both of which can lead to death [Smyke, 1991:14]. High maternal death rates due to pregnancy and childbirth in adolescents have been shown in studies conducted in Tanzania [Arkutu, 1978], Egypt [Forteny, et al, 1988], Addis Ababa, Ethiopia [Kwast, et al, 1986], and West Bangal, India [Misha and Dawn, 1986].

Contrary to this, a review of the causes of maternal death occurring between January 1980 and December 1985 in Tikur Anbessa Hospital, Addis Ababa, Ethiopia [Seyoum and Getachew, 1988:115] revealed that deaths in women aged 18 or less accounted for only 14.4 per cent of the maternal deaths. However, this finding is biased because a hospital based study only explains the experience of women who were admitted to hospital.

Women who become pregnant after the age of 35 are again at a greater risk of death than those in younger ages [Starrs, 1987:15; Viegas, et al,1992; Smyke, 1991; Fathalla, 1990]. Studies from three developing countries, Indonesia [Viegas, et al, 1992:61], Bangladesh [Khan, 1985:327], and Egypt [Fortney, et al, 1988:21], permitted comparisons of maternal mortality rates among different age groups and showed that women aged 35-39 had a maternal mortality rate twice as high as women of 20-24 and for those over 40 the rate five times as high.

As far as parity is concerned, a progressively higher parity means a progressively higher reproductive risk i.e. there is strong correlation between parity and maternal mortality. It is known, in the obstetric literature that there is higher risk of death among high parity women. A study in Jamaica shows that those having their fourth or subsequent births were 43 per cent more likely to die than those with parity of two and in Portugal women having their fifth birth were three times as likely to die as women having their second baby, while women having their sixth or latter births were at even greater risk [WHO, 1986b:179]. This can be attributed to a number of factors.

High parity women are often affected by anaemia, a frequently contributing factor to maternal mortality [Viegas, et al,1992:62; Kwast, 1987:17]. The effect of anaemia ,in particular, is most severe in developing countries because of the frequent worm infestations. Anaemia is responsible for about 20 percent of maternal deaths in developing countries [WHO, 1991:9].

A further complicating factor contributing to high incidence of maternal death is short birth interval [Toure, et al, 1992:93; Abdullah, et al, 1992:200]. Apart from contributing to high maternal death short birth interval also contributes to high foetal, infant and child death.

Health Service Factors

The delivery of babies in hospital and good antenatal and postnatal care have been the major reasons for the decrease in maternal mortality in developed countries [Viegas, et al, 1992:62]. Of the 128.3 million births taking place in the world each year, only 55 per cent of the births are attended by trained personnel. The percentage for developed countries is 98 per cent and for developing countries, 48 [Fathalla, 1990:225]. In Ethiopia over 80 per cent of all deliveries are attended by untrained traditional birth attendants [Almaz, 1991:17]. This indicates that it is only less than 20 per cent of the deliveries that are attended by trained health personnel in the country.

Lack of necessary supplies and trained health personnel in medical facilities are also among the contributing factors to maternal deaths. In Tanzania, lack of blood for transfusions, drugs and equipment were factors in more than half of the deaths studied [WHO, 1986b:178]. Viegas and others [1992: 64] have also found that excessive blood losses accounted for 62 per cent of deaths in Indonesia, 55 per cent in the Philippines, and 40 per cent in Thailand.

Distance to health facilities, coupled with inadequate transportation, limits the access of people to maternity services. In many developing countries particularly in rural areas the nearest health post may be several days journey away from a village over a difficult terrain. There may be no transport to get a sick woman to health facility and no means of calling in help from outside. Studies in Cuba, Egypt, Indonesia, Jamaica, Turkey, and Tanzania [cited in WHO ,1986b:178] showed that maternal mortality rates are increased in areas where access to a health facility is difficult.

The availability of antenatal care is also among the factors affecting maternal mortality. Antenatal care can considerably reduce the risks. Studies in Nigeria [Efiong and Banjok, 1975:228] and Jamaica [Hay and Boyd, 1973:34] indicated that the risk of maternal death was reduced when good antenatal care was available.

Socio-Cultural Factors

Although some investigations note the impact of some local customs and the adverse health effect of harmful traditional practices on maternal health, few actually put forward a coherent explanation. Local customs in all parts of the world have a strong impact on women's health, both positive and negative. Bride price and dowry as well as the need for ensuring virginity at the time of marriage lead to early marriage and the risks that accompany early pregnancy. In a community, where early marriage and childbearing is the norm, a young woman starts childbearing early and continues till the end of her reproductive years. This situation compels a woman to undergo the risk of dying from a given pregnancy more frequently and over a longer period.

Some traditional beliefs surrounding childbirth frequently add to the risk of delivery. In some societies childbirth is considered impure and "polluting" and the woman in labour must withdraw to a secluded place [WHO. 1987]. In Kmaba, Kenya, if labour becomes difficult or prolonged, it may be taken as a sign of sexual infidelity, and the woman is neglected or castigated even in the midst of her suffering [M'Bede, 1985:367]. In Muiduguri, Northern Nigeria, there is a belief that a woman's first child should be delivered at home where there is no facility to handle if complication arises. This belief, indeed, prevents women from taking advantage of modern health services [Smyke, 1991:72].

In most cultures of developing countries, female circumcision is a highly favored traditional practice, particularly in rural areas. By causing prolonged and obstructed labour, and hemorrhage during delivery, and circumcision could lead to higher incidence of maternal morbidity and mortality.

In Ethiopia, among traditional harmful practices, massaging the abdomen of the women in labour and shaking a woman to speed up deliveries of the placenta are common practices that could highly aggravate the risk of maternal death [Almaz, 1991:17].

1.5 Objectives

Information on maternal mortality is scanty in Ethiopia particularly in rural areas. This study was therefore undertaken to provide some information on maternal mortality in one rural community. The specific objectives of the study are:

1. To estimate the level of maternal mortality in the rural villages of Mafud district.
2. To estimate the life time risk of dying from pregnancy related causes.
3. To estimate the total fertility rate (TFR) for the district.

1.6 Research Questions

Due to the exploratory as well as descriptive nature of the study design, specific hypothesis was not set, but the study attempts to answer the following research questions:

1. What is the level of maternal mortality in the rural villages of Mafud?
2. What is the life time risk of dying from pregnancy related causes?

1.7 Organization of the Paper

The thesis is organized into five chapters. The remainder of this thesis is organized as follows. Chapter two presents the methodology used in this study. In particular it describes the selection of the study area, the sample design, the data collection procedures, methods of data analyses, evaluation of the data quality and the limitation of the study. In chapter three the background characteristics of the study population and area are discussed. Chapter four presents the estimated levels of fertility and maternal mortality. In the final chapter, a summary of the main findings and conclusions are set forth, and relevant research recommendations are forwarded. The references and appendices follow.

CHAPTER II

SOURCES OF DATA AND METHODS OF ANALYSES

2.1 The Study Area

Mafud is one of the districts of Northern Shewa Zone, Region 3, Ethiopia. In the North the district borders with Kewet . and in the South Mezezo. To the East is the Afar Region and to the West is "Sela-Dingay" district.

Similar to the topography of the Northern highlands of the country, the elevation of Mafud ranges from 1500 meters in the middle Awash valley to well over 3000 meters at the top of "Tamra Ber".

The selection of the district was based on convenience of the location. The study is partly funded by the Peasant Production and Development in Ethiopia (PPDE) a research station of the IDR located in the district. The district is predominantly rural and no attempt has so far been made to study maternal mortality. Moreover, accommodation for researchers were made available by PPDE.

FIG. 2 - MAP OF MAFUD [illegible]

LEGEND

SAMPLED PAS

2.2.2 Sampling Procedure

In order to achieve the desired sample size a two stage sampling procedure was adopted. The first stage dealt with the selection of peasant associations (PAs)[1]. In the study area, there are 37 PAs, of which 15 (40 per cent) were randomly selected. The second stage involved household selection from each PA. Before the selection of the required households, a list of all households in the 15 PAs was prepared. According to the listing, 3150 households having at least 2 persons aged 15 years and above were identified. Thus 1650 households were selected so that the desired sample size of 3300 could be obtained.

The number of households to be included in the study from each PA was constrained to be proportional to the total number of households in each PA. Once the number of the households to be surveyed within a peasant association has been determined, systematic sampling was used to select the required number of households.

Out of the expected 3300 persons to be interviewed, a total of 3274 persons (1647 female and 1627 male) were successfully interviewed, yielding a response rate of 99.2 per cent. A total of 21 (0.8 per cent) were not found at home and 5 respondents refused to be interviewed.

---

[1] Peasant Association is the lowest administrative unit in rural Ethiopia

2.3 Data Collection

The required data for the study were collected using a structured questionnaire, interviews with knowledgeable informants and personal observation. The details on each technique is given below.

The first draft of the questionnaire was prepared in English and given to the research advisor for comment and on the basis of the comments received certain modifications were made and finalized in English. Later on, it was translated into Amharic and pretested. A total of 30 questionnaires were completed during the pretest. Minor modifications to the questionnaire were made on the basis of the pretest.

The final questionnaire consisted of four parts. Part one consisted of questions on the socio-demographic characteristics of members of the households; part two consisted of questions designed to elicit information on maternal mortality. This part had 12 questions followed by 2 tables to record some basic characteristics of deceased sisters. In part three, nuptiality questions were asked. In the final part questions on birth history of female respondents aged 15-49 years were asked.[2]

As far as qualitative data are concerned, eighteen informants were interviewed. These included six traditional birth attendants (two trained and four untrained), one medical doctor, two nurses and three health assistants, and six persons from the families of deceased women.

---

[2] A copy of the final English version of the questionnaire is presented as Appendix IV

The field work for the data collection took a period of two months. Before commencing the actual field work, 3 supervisors and 30 enumerators with educational background of grade 10 and above were recruited and trained for 3 days. The training involved a detailed review of the questionnaire and discussion of the roles and responsibilities of supervisors and enumerators. Following the training, field work to collect data using the structured questionnaire began on 10th of May, 1994 and was completed by 8th of June. 1994. At the same time. the investigator was conducting the interviews with the key informants mentioned above. Later, in August 1994 and February 1995 for 15 days each, the interviews and observations to collect some qualitative data were continued.

2.4 Methods of Data Analyses

For the purpose of accomplishing the objectives of the study and answering the research questions stated earlier, the data were edited, coded and entered into the computer using SPSS/PC (Statistical Package for Social Scientists), and analyzed. For the data analysis, a combination of techniques were used: from simple descriptive statistics such as frequency distributions, ratios, percentages, etc., to the "Sisterhood Method" (complete description of method is given below). Moreover, description and case construction were attempted using some qualitative data.

The main sources of information on maternal deaths are vital registration, health service statistics, and community-based surveys. Although most of developing countries have some kind of vital registration system, levels of coverage and reliability are generally low, particularly outside the main urban canters. Health services statistics in developing countries are exceedingly unreliable in addition to suffering inadequate coverage. Maternity related services are even more inadequate. Between 60 per cent and 80 per cent of all deliveries are not professionally assisted [Eschen A., 1992:37].

The remaining sources are household surveys ,but little mention is made when these have been used to collect information on maternal mortality [Graham, et al, 1989:126]. The reason for this could be either very large sample sizes are needed to produce statistically reliable estimates or follow-up of the pregnant women over a period of time is required. For instance, the 1983 community based maternal mortality survey in Addis Ababa required visits to 32,125 houses to record 9315 pregnant women and

finally to detect 45 maternal deaths during the two years follow-up survey [Kwast, et al. 1986:288]. In a similar study carried out in Central Java, Indonesia, the researchers had to visit 150,000 households and record 15,000 births in order to identify 50 maternal deaths [WHO, 1991:20]. These studies clearly indicate the major drawback of using household surveys to measure maternal mortality i.e. the enormous expense involved and takes considerable time even though they can provide detailed information on circumstances surrounding each death.

Taking cognizance of the problems associated with above mentioned approaches and contemplating the financial as well as time constraints, this study uses a recently developed new indirect technique, the Sisterhood Method, for reaching at population based estimates of maternal mortality. The main advantage of the Sisterhood Method is that it can be used with a relatively small sample size to produce an acceptable estimate. One sibling in a family provides the opportunity to obtain information on all sisters. Thus, the number of households that need to be visited in order to obtain information on a large number of women is reduced; and it offers one possible means of gauging the level of maternal mortality that is straight forward, inexpensive, and quick by comparison with existing alternatives in most developing countries [Graham, et al. 1989:131]. The method provides a means of deriving indicators of maternal mortality from the reported proportion of sisters who reached the age of exposure to the risk of pregnancy related death, and who are either alive or have died during pregnancy, childbirth or the puerperium.

It is suggested that the proportion of sisters dying of maternal causes reported in a census or a survey by adult respondents (male and female) may be related to the probability of dying of maternal causes by the age of the respondents [Graham. 1989:128]. The relationship is influenced by the pattern of maternal mortality risks over the reproductive period and the distribution of differences between the ages of respondents. It is further indicated that for respondents who are under 30, the reports include only those sisters who have reached menarche excluding those sisters yet to enter the period. For respondents aged over 30 years, all sisters will have entered the period of exposure to the risk of maternal death.

The method uses a raising factor to adjust the reports of respondents in the younger age groups (15-19 and 20-24) since the number of sisters who have entered the reproductive period reported by respondents in younger age groups will exclude those sisters yet to enter the period. A raising factor can be obtained by dividing the number of sisters aged 25 and over by the number of respondents aged 25 and over. Once the raising factor is obtained an approximation of the expected number of sisters can be derived by multiplying the number of respondents in the younger age group by the raising factor.

The method depends on the following computational procedure required to obtain an estimate of the probability of maternal death of each age group by the end of the reproductive period **q(i)**. in other words, the lifetime risk of maternal death.

Computational Procedure Adopted from Graham et al [1989] are given below.

1. An adjustment factors, A_is, are applied to the number of sisters reached the reproductive age reported by respondents in each age group to derive sister units of exposure to the risk of maternal deaths over the whole reproductive period, B_i.

2. Taking the number of maternal deaths reported by respondents in each age group, r_i, and dividing by B_i, gives an estimate of probability of maternal death by the end of reproductive period (lifetime risk of maternal death) in each age group of the respondents **q(i)**.

   The conversion of the proportion of women who die of maternal causes into a lifetime risk requires the following three assumptions. First, the sisters of respondents are representative of women exposed to the risk of maternal death. Second, the age distribution of the siblings of the respondents is known and the average age of sisters is the same as that of the respondents. Third, the distribution of maternal deaths by age is known.

3. If the numbers of sisters in each respondent age group are large enough, each q(i) value can be taken as a separate estimate. However, it is suggested that the data need to be aggregated to give a more reliable single estimate **[Q]** which is less affected by reporting errors. Thus, an estimate of **Q** can be derived by summing over the r_i values for all age groups to obtain **r** (the total number of

maternal deaths to sisters) and over the B_i values to obtain B. the total adjusted sister units of risk exposure, and calculating r/B.

Data Required

The following four questions and the five-year age group of respondents form the basic data required for the Sisterhood Method.

1. How many sisters have you ever had (born to the same mother) who reached the age of 15 (menarche) ?
2. How many of your sisters who reached age 15 are alive now?
3. How many of these sisters are dead ?
4. How many of these dead sisters died during pregnancy, childbirth or in the six week (confinement) period after the end of pregnancy ?

These data are collected in terms of the aggregate experience of all sisters i.e. no information on individual sisters is asked.

The first field trial of the Sisterhood Method was carried out in The Gambia in 1987 [Graham, et al. 1989:127]. Subsequent trials in Lima, Peru, etc., were also carried out [cited in Timaeus and Graham, 1989]. The results from these studies were encouraging; for instance, in The Gambia, continuous population register maintained well over 25 years in two villages revealed maternal mortality ratios which are very close to the estimate obtained using the Sisterhood Method in the neighboring six villages. Moreover, the method was applied to estimate the level of maternal mortality

in Djibouti [David P. et al. 1991]. Bolivia [Sommerfelt. A.E. et al. 1991. cited in DHS. 1991] and Egypt [Sayed H.A.A. et al, 1989. cited in DHS, 1991] and results were comparable with the available estimates for each country given by UN and other sources. Recently, the method was used to estimate the level of maternal mortality in rural communities of Illubabor region, Southwestern Ethiopia by Tesfaye Shiferaw and Fassil Tessema [1993] and they found maternal mortality rate of 570 per 100,00 live births. Since there is no earlier community based studies for the rural areas of the country in general and for the study area in particular it is difficult to make comparison. However, this estimate confirms to the expected high level of maternal mortality, 500-1000 maternal deaths per 100,000 in the country [NOP, 1994:63].

Approximation of Maternal Mortality Rate (MMR)

Maternal mortality rate is the more conventional measure of maternal mortality. It can be estimated using the following formula:

$$MMR = 1-[1-\text{lifetime risk}]^{1/TFR}$$

Where TFR is the estimated total fertility of the study area (the procedure to estimate TFR is given in chapter iv) and lifetime risk of maternal death is the probability of maternal death by the end of the reproductive period [Q] ,in other words, it indicates the chance of death from pregnancy related causes during the reproductive period among women in childbearing ages. The required calculations to obtain Q is explained earlier in the step three of the computational procedure.

2.5 Data Quality

Demographic data from developing countries where the vital registration system has not been well developed, are subjected to various kinds of errors. In particular age data are severely affected by age misstatement and digit preference, which is mainly attributed to the high illiteracy rate. Most people are not age conscious, ignorant of their exact age and they are not issued with birth certificates.

Ethiopia is not an exception; a number of studies revealed that demographic data suffer from various types of errors [Assefa, 1989; Tesfayesus, 1985; Assefa, 1990]. In particular distortions in age data have been observed. These studies thus give a good indications that necessary care must be taken while collecting age data, particularly in rural areas where a sizeable proportion of the population is illiterate and does not know their exact age. In this study, enumerators were provided with calendar of historical events to get respondents to approximate their age as efficiently as possible. At times, when the respondent fails to approximate his/her age, the enumerators were allowed to guess the age by the mere physical appearance of the respondent.

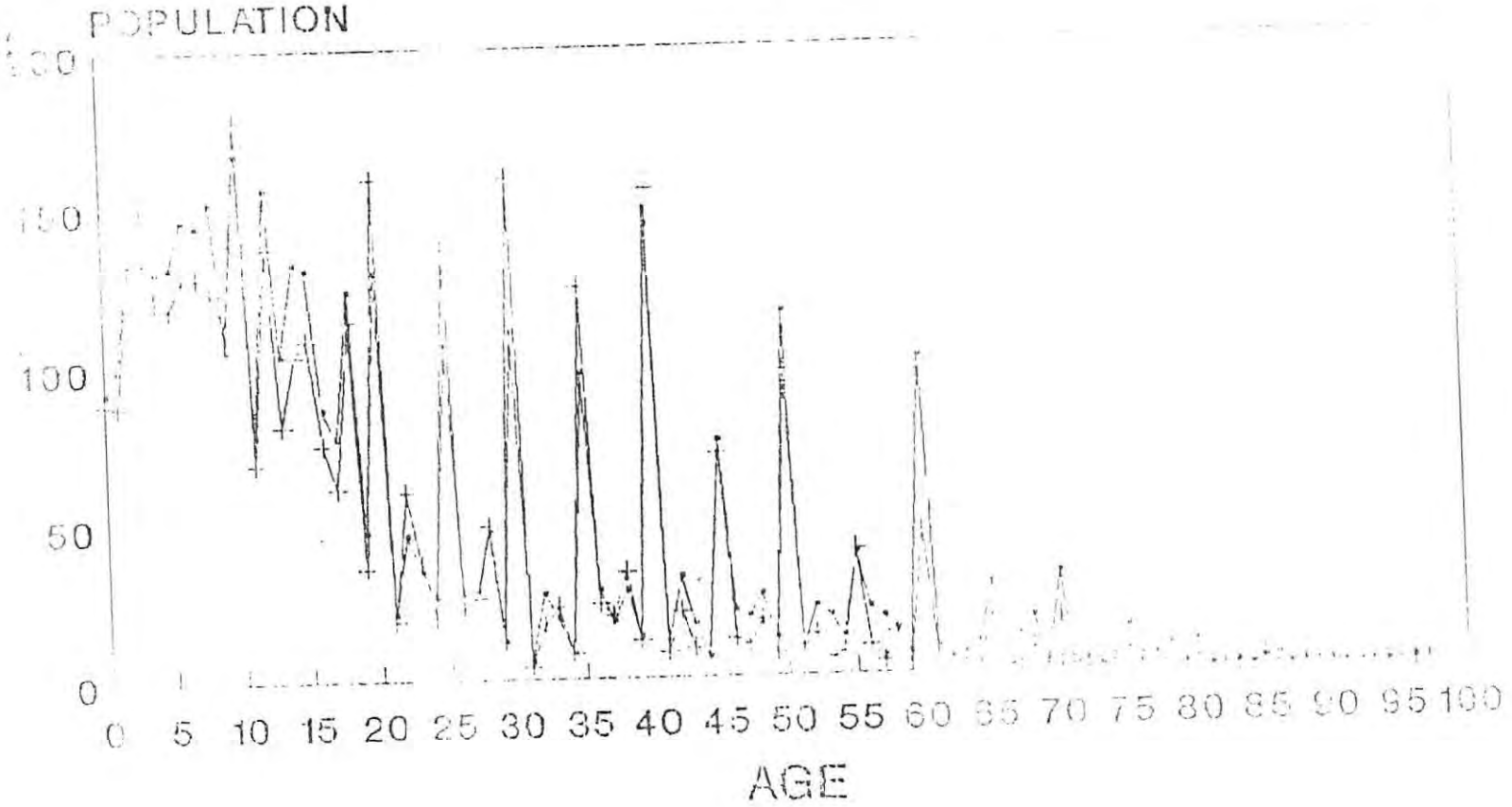
In the following paragraphs an attempt is made to assess the quality of the data used in this study. Particular emphasis is given to the assessment of the magnitude of errors in age reporting. This is important because age is the only criterion to determine the eligibility for the study and it is also vital in the estimation of the level of maternal mortality.

The methods of assessing the quality of age data employed in this study are graphical display of the single year age distribution (one of the graphic analysis methods) and Myers' Blended Index. These methods are selected from a wide variety of techniques devised to detect errors in data. This was done for the simple reason that these techniques are easy to compute and yield more or less similar results to others.

Single Years Age Distribution

Although attempts were made to minimize errors in age reporting, the results still show irregularities resulting from digit preference. As shown in Figure 2 single years age distribution of members of sampled households show very appreciable heaping at ages ending in 0 and 5; somewhat less marked concentration is found at ages ending in 8. The corresponding marked avoidance for ages ending in digits 1 and 9 is observed.

FIG.2 SINGLE AGE DISTRIBUTION OF MEMBERS
Of THE SAMPLED HOUSEHOLDS BY SEX



Myers' Blended Index

This method indicates the prevalence of digit preference or avoidance of ages ending in each of the digits 0 to 9 and provides a summary index of all ages. Myers' Blended Index has a theoretical range from 0 to 90. In this, the index value of 90 indicates the extreme case where all recorded ages end in the same digit while an index value of 0 indicates no age heaping [Shyrock and Siegel, 1976].

The application of Myers' method yielded indices of preference 28.55 and 34.64 for males and females, respectively [See table 2].

Table 2 Myers' Blended Index of Terminal Digit Preference by Sex of Members of Sampled Households: Mafud, 1994.

Terminal Digit (X)	Deviation from 10	
	Male	Female
0	18.5	21.46
1	-6.9	-7.1
2	-2.1	-2.24
3	-3.9	-4.73
4	-4.3	-5.3
5	9.2	12.35
6	-2.5	-4.1
7	-3	-4.6
8	0.9	0.8
9	-5.8	-6.6
Summary Indices	28.55	34.64

See appendix II for steps involved in computing the summary indices.

These summary indices indicate the existence of a substantial amount of digit preference/avoidance in age reporting. Note that preference for digits 0 and 5 together accounts for nearly a half (47.8 per cent) of the total age reporting against the one fifth expected. The conclusions drawn on the basis of Myers' index strongly support the findings obtained from graphical analysis . Moreover, it is observed that male age reporting is slightly better than female. In general, one can say that age reporting is poor in the study area.

In addition, under-reporting of maternal deaths is expected to occur due to various reasons: reluctance of people to talk about the deceased, the length of the reference period, deaths of unmarried women or those deaths resulting from the complications of abortion may often be attributed to another cause to avoid embarrassing the surviving family, among others.

2.6 Limitation of the Study

Age is an important item in this study ; however, the age data were subject to errors of age misreporting and digit preference.

Despite its merits indicated earlier the Sisterhood Method yields no information on the causes of the maternal deaths or of the circumstances surrounding them.

CHAPTER III

BACKGROUND CHARACTERISTICS OF THE STUDY POPULATION AND AREA

3.1 Age and Sex Composition

The total population enumerated in the sampled households was 7874. made up 4111 males and 3763 females. The over all sex ratio was therefore 109.

Table 3: **Age and Sex Distribution of Member of Sampled Households, Mafud District, 1994.**

Age Group	Male		Female		Total	
	Number	Percent	Number	Percent	Number	Percent
0-4	**587**	**14.3**	**578**	**15.4**	**1165**	**14.8**
5-9	678	16.5	609	16.2	1287	16.3
10-14	636	15.5	568	15.1	1204	15.3
15-19	463	11.3	394	10.5	857	10.9
20-24	257	6.3	295	7.8	552	7.0
25-29	220	5.4	246	6.5	466	5.9
30-34	169	4.1	211	5.6	380	4.8
35-39	184	4.5	214	5.7	398	5.1
40-44	209	5.1	200	5.3	409	5.2
45-49	153	3.6	118	3.1	271	3.4
50-54	177	4.3	132	3.5	309	3.9
55-59	98	2.4	69	1.8	167	2.1
60-64	127	3.1	59	1.6	186	2.4
65+	153	3.6	70	1.9	223	2.8
Total	4111	100	3763	100	7874	100

The sex ratio at birth was found to be 103 which is very plausible because it is consistent with the expected pattern that male births are greater than female births.

The broader age group classification of the population shows that the proportion of the population under age 15 years constituted 46.4 per cent of the total population which exhibits the main feature of the developing countries experiencing high birth rates and declining death rate.

Table 4: **Broader Age Group Distribution of the Members of the Sampled Households**

Age Group	Number	Per cent
0-14	3656	46.4
15-64	3995	50.7
65+	223	2.8
Total	7874	100

3.2 Ethnic and Religious Affiliation

Ethnic groups have different social and cultural practices which may have a bearing on maternal health. Religion, like ethnic origin, presents a variety of differences in attitudes, practices, and behaviour relating to demographic factors. Religious tenets

and practices can affect the system and conditions of marriage, attitudes to fertility and fertility related habits and health practices which in turn may have an impact on maternal health. Information on ethnic origin and professed religion of the members of the sampled households was collected.

As it is shown in Table 5 below, Orthodox Christians accounted for 97.8 per cent while Muslims constituted 2.2 per cent.

Table 5: **Percentage Distribution of Members of the Sampled Households by Ethnicity and Religion**

Ethnic and Religious Groups	Number	Per cent
Ethnic Background	**7874**	**100**
Amhara	7701	97.8
Argoba	170	2.1
Oromo	3	0.04
Religion	7874	100
Orthodox Christian	7701	97.8
Muslim	173	2.2

The ethnic distribution of the members of the households shows that the highest proportion of the population belongs to Amhara ethnic group (97.8 per cent) and Argobas' constituted about 2.1 per cent.

3.3 Marital Status

Marriage patterns ,particularly the age at first marriage, have an important influence on fertility in a society like Ethiopia, where most births occur within marriage and contraceptive prevalence is very low. This is because women who marry early are exposed to a relatively longer period of childbearing. In addition, early marriage often carries problems for young brides. Early pregnancy carries with it far greater risks than if they were able to wait until their bodies were more developed. Taking into consideration the importance of studying the marriage pattern, information on current marital status as well as age at first marriage was collected. The distribution of members of the sampled households aged 10 years and above into five categories as given in Table 6, 43.6 per cent were never married and 49.8 per cent were currently married.

Table 6: Distribution of the Members Sampled Households Aged 10 Years and Above by Current Marital Status, Mafud District, 1994.

Marital Status	Number Persons	Percentage
Never Married	2362	43.6
Currently Married	2700	49.8
Divorced	199	3.7
Separated	33	0.6
Widow	128	2.4
Total	5422	100

Age at first marriage for female respondents aged 15-49 is also examined. The median age at first marriage is found to be 16 years. 36.6 per cent of females got married before they reached the of age 15.

Table 7: The Distribution of Ever Married Female Respondents Aged 15-49 by Age at First Marriage, Mafud District, 1994

Age Group	Women	Percent
<15	511	36.6
15-17	409	29.3
18-19	324	23.2
20-24	102	7.3
25+	52	3.7
Total	1398	100

In general, marriage is early in the study area. Arranged marriage is predominant.

3.4 Place of Delivery and Birth Attendant

In Mafud, most births take place at home in the village as everyday life goes on all round. For instance, among 292 women who have given birth to their children during 12 months preceding the survey date 96 per cent of them delivered at home with the help of untrained traditional birth attendants who do not have the basic training to suspect labour to be abnormal or of high risk, who are unable to monitor the progress

of labour to detect at an early stage deviations from the normal course and who do not know how to take adequate safeguards in the management of labour. Only 3.4 per cent of the deliveries was attended by medical personnel at the health stations.

Table 8: Women who gave birth during 12 months before the survey date by place of delivery and birth attendant

Delivery took place:	Number of Women	Per cent
Home	**282**	**96.6**
Health Station	**10**	**3.4**
Total	**292**	**100**
Attended by:		
Family Members	4	1.4
Untrained Traditional Birth Attendant	272	93.2
Trained Traditional Birth Attendant	6	2.0
Medical personnel	10	3.4
Total	292	100

The available evidence suggests that around 10 per cent of pregnancies develop complications (in a deprived population, the incidence of complications may be as high as 30 per cent), even under ideal circumstances there will always be women who will require highly skilled assistance such as delivery by caesarean section, vacuum or forceps delivery, blood transfusion, or anticonvulsant therapy, without which they will die [Kauntiz, et al, 1984:826-831].

In Mafud where the majority of deliveries take place at home and are attended by family members and untrained traditional birth attendant, one can expect high risk of dying of complications because when complications do arise they have no adequate way of dealing with them.

In this connection, it is worth mentioning some of the activities of traditional birth attendant (TBA) in the district. Traditional birth attendants are often the ones to assist women at child birth. They are trusted and respected members of the community. However, some of their activities are dangerous to women in labour, like massaging of the abdomen of the woman in labour, holding up and shaking the mother to speed up the delivery when placenta is retained.

These and other related practices could lead to various complications which result in maternal morbidity and mortality.

3.5 Lack of Training to TBAs

Facilities of modern maternity care are not likely to expand as rapidly as desired under present conditions in Ethiopia. Only 47 per cent of the population has reasonable access to modern health facilities [NOP, 1994:40]. Thus TBAs are likely to continue to be the major sources of maternity care. However, in order to make the contribution of TBAs as effective as possible they need to have some basic training.

In this regard, in the district 46 TBAs were given training between 1982 - 1989 by the Mafud district health office in collaboration with Save the Children (USA). TBAs to be trained were drawn from each peasant association in the district. Since 1990 there have not been any training programmes, even refresher courses were not conducted. The impact of a single and short training does not help much to avoid age old traditional practice. Currently, one finds little difference between trained and untrained TBAs.

3.6 Health Service Factors

Among the most significant factors that determine a pregnant woman's risk of maternal deaths are lack of essential equipment, trained personnel at health facilities. In Mafud, there are two health stations and a health centre. In the following an attempt is made to assess the availability of necessary equipment and personnel in the health stations and the health centre and their accessibility is also examined.

3.6.1 Medical Equipment and Personnel

The health assistants in the two health stations and nurses who are working in the MCH unit of the Debre-Sina Health Centre were asked about availability of medical equipment, necessary to give delivery service in their health station and health centre, respectively. They reported that some essential medical equipment is not available to provide proper delivery service. In particular, the Debre-Sina health centre did not have vacuum extractors and speculum. The situation in Debre-Sina is very unfortunate

because it is the nearest health facility to which the two health stations refer patients. In addition to the above mentioned shortages the centre does not have a trained midwife [See Appendix IV Case I].

3.6.2 Accessibility of Health Facilities

The Debre-Sina Health Centre is the only health centre available in the district and it is expected to serve about 96,551 people [CSA, 1990] who are living in 37 peasant associations. Except the few, the majority of the peasant associations (PAs) are on an average 10-15 kilometres away from the centre. Since there is no road from all PAs to the centre people have to walk about 6-8 hours on ragged mountain terrains carrying patients on home-made stretcher to reach the centre.

As indicated earlier, under the Debre-Sina Health Centre there are two satellite health stations: the Agamber and Armania Clinics. The health centre gives services to referrals from these stations. It is about 10 km and 20 km from Armania and Agamber Clinic, respectively. Those women who are referred from Agamber clinic have no alternative except to be carried on foot to the health centre but those from Armania clinic have better access to road transportation. The people do not only walk from the health stations to the health centre but they have to walk a similar or even a greater distance on ragged mountain terrains which are difficult even for animal transportation to reach the health stations before they can be referred to the health centre.

As far as antenatal care is concerned. it is noted that both health stations and the health centre provide it. However, most of the women do not avail themselves of such care. For instance, among 292 women who gave birth during the 12 months preceding the survey 47 women were reported to have visited the health stations at least once to receive antenatal care. However, none of them were reported to have delivered at the health stations.

3.7 Reproductive Factors

The risk of maternal mortality varies with, the age at childbirth, the number of previous pregnancies and the interval between pregnancies.

Women who become pregnant before their bodies are really able to cope with pregnancy and childbirth are at greater risk of complications. For instance , at menarche women have approximately 4 per cent more height and 12-18 per cent more pelvic growth ahead of them [Moerman. 1982:89-106]. This is a very important risk factor. Among other Risk factors are: pregnancy over the age 35. grand multiparity (more than 4 children). and interval between births of less than 2 years. If they get pregnant under these unfavorable conditions there is a great risk of complications that can cause maternal morbidity and death.

Childbirth the age of 18 is common in the study area; 68.9 per cent of the women had their first birth before they reached the age of 18. Risk associated with early motherhood are also found in the study area. Among 154 maternal deaths

identified in the study area 51 (33 per cent) died while delivering their first babies in their early teens. As indicated earlier the median age at first marriage is found to be 16 years in the study area. In a non contracepting population, early age at first marriage indicates onset of childbearing at an early age, before a woman is physiologically mature to manage child birth [See Appendix IV Case VI].

Older women (35 years and above) are also at increased risk of death compared with women in prime childbearing age. Child birth at an older ages is also practiced among women in the study area. Of the total number of women who gave birth during the 12 months preceding the survey 27 of them were aged 35 years and above [See Appendix IV Case II, III, IV, and V].

In addition, the risk of complications and maternal death increases steadily after the fourth birth [WHO, 1987:10-13]. Obstructed labour, ruptured uterus and post partum hemorrhage represent serious risks in high parity women [Kwast, 1987:17]. Moreover, anaemia is more frequently seen in women of high parity. Anaemic women do not tolerate blood loss well and are therefore more likely to die if they start to bleed profusely. Moreover, anaemia lowers resistance to puerperal infection.

High parity is common in the study area; among the interviewed women aged 15-49 years about 40 per cent of them have given birth to five or more children. In addition, the total fertility rate of the study area shows a woman would bear about 7 children before the end of her reproductive period. This indicates that women in the

study area encounter the hazards of childbearing more often [See Appendix IV Case II, III, IV, and V].

3.8 Female Circumcision

Female circumcision is the partial or complete removal of female external genitalia [Smyke: 1991:77]. Female circumcision causes immediate and long-term medical and other complications. The immediate effects include: pain, shock, hemorrhage, retention of urine, infection and fever. Delayed complications include: painful scars, urinary tract infections, cysts, difficulty in passing menses, among others [Smyke, 1991:78]. Moreover, circumcised women are likely to face problem during labour because their vagina can not dilate due to scarred tissue.

Female circumcision is practiced in almost all countries in Africa, as well as in some countries in Asia, South America, and part of Australia [El Doreer, 1982]. Female circumcision is widely practiced in Ethiopia, too. For instance, the surveys conducted in Eritrea, Arssi, Hararghe, Gojjam and Addis Ababa by Alasebu and others [1985] revealed that over 85 per cent of the interviewed women had undergone circumcision.

Circumcision is a common practice, a deep-seated custom in the study area. It is performed on the 7th and 8th day after birth for male and female babies, respectively. However, very few will remain uncircumcised if they are found to have shorter external genitalia, which is a rare occurrence. These women are considered to be circumcised by St. Mary (Mariam Girz). As much as possible parents want to have their

children circumcised on the above given dates because they think that circumcision will have much bleeding if it is performed after those given dates. Moreover, they believe that uncircumcised women will face problem during delivery because of the uncircumcised clitoris that they think could hinder normal births.

CHAPTER IV

INDICATORS OF THE LEVEL OF MATERNAL MORTALITY

4.1 Introduction

The main objective of the study is to estimate some indicators of the level of maternal mortality. Maternal mortality rate is one of the indicators of the level of maternal mortality. In order to estimate maternal mortality rate using the formula indicated earlier ,however, requires an estimate of the total fertility rate of the study area. An attempt was therefore made to estimate the total fertility rate of the study area before commencing the computation of maternal mortality indicators.

4.2 The Level of Fertility

4.2.1 Reported Total Fertility Rate

The number of births to women twelve months prior to the survey date can be used to obtain the level of current fertility. Women respondents aged 15-49 years were asked whether they have given birth to a child in the 12 months preceding the survey date. As Table 8 shows a total of 292 births were reported as occurring in the 12 months prior to the survey. The distribution of these births by age of women is presented in column 3 of Table 8.

Table 9: Reported Age Specific Fertility Rates (ASFRs), Total Fertility Rate (TFR), and Mean Parity, Mafud District, 1994

Age Group	Women	Births	ASFR	Children Everborn	Average parity /woman
15-19	204	30	0.1471	66	0.324
20-24	247	70	0.2834	390	1.579
25-29	224	69	0.3080	673	3.004
30-34	210	46	0.2190	920	4.381
35-39	209	46	0.2201	1124	5.378
40-44	191	22	0.1152	1035	5.419
45-49	113	9	0.0796	662	5.858
Total	1398	292	1.3724	3835	
TFR			6.86		3.7

The age specific fertility rates (ASFR) are computed by dividing the number of births in each age group by the number of women in the corresponding age group. The sum of age specific fertility rates multiplied by 5 gives the total fertility rate (TFR) of 6.86.

This rate is similar to rate obtained in the 1990 National Family and Fertility Survey (6.88) for rural Ethiopia [CSA, 1993:117]. It is ,however, greater than the reported TFR (6.3) of Mafud obtained in 1993 survey conducted by Tilaye [1993]. This

difference may be attributed to ,among other things, variation in the sample size between the two surveys.

However, indirect techniques of fertility estimation were employed to adjust the reported total fertility rate and arrive at an estimated rate very close to the true level of fertility for the population under study. To this end, the adjustment of the level of current fertility was attempted using the Coale and Demeny method and Relational Gompertz Fertility Model (RGM). However, the estimated TFR obtained using these methods were found to be lower than the reported TFR and do not reflect the expected level of current fertility. The Brass P/F Ratio method subsequently modified by Coale and Trussell [UN, 1983:32-40] was also applied (the detail is given below).

4.2.2 P/F Ratio Method and Plausible Estimate of the Level of Fertility

The P/F Ratio method, originally developed by Brass and latter modified by Coale and Trussell is used to evaluate as well as adjust reported fertility rates.[3]

The basic assumptions involved in applying the P/F ratio method are:

1. The average parity reported for younger women is accurate;
2. Fertility patterns have been constant in recent past;
3. The reported ASFRs are approximately correct in age structure;

---

[3] Detailed explanation of the method is presented as Appendix III.

4. The fertility experience of those women who die is the same as those who survive;

5. Errors in the data are uniformly distributed and that the average error in the reference period is independent of the age of women;

Given the above assumptions, the ratio of the synthetic cumulative fertility derived from the reported ASFRs (F) to the reported mean number of children (P), commonly known as P/F ratio should be close to unity. The ratios greater or lesser than unity indicate the prevalence of errors in fertility data.

In this procedure the ratios that are close to unity are recommended to be applied as adjustment factors. In most cases the P/F ratios of the younger age groups are very close to unity and can be used to adjust the current fertility rate. In this study too the ratios of the age group 20-24, 25-29, and 30-34 are found to be very close to unity and the average of the ratios of these age groups are taken as plausible adjustment factor.

Table 10: P/F Ratios, Reported and Adjusted Age Specific Fertility Rates and Total Fertility Rates by Age Group of Women, Mafud District, 1994

Age Group	P/F Ratio	Reported	Adjusted
15-19	0.963	0.1471	0.1716
20-24	1.016	0.2834	0.2907
25-29	0.985	0.3080	0.3042
30-34	1.009	0.2190	0.2176
35-39	0.962	0.2201	0.2154
40-44	0.883	0.1152	0.1036
45-49	0.865	0.0796	0.0736
TFR		6.86	6.88

As presented in the above table the reported fertility rate remains virtually unchanged after the adjustment is made, employing the above technique. This suggests that either there has been constant fertility in recent past or the data on current births are of good quality. As far as constant fertility is concerned there is no evidence that supports the argument of constant fertility in rural Ethiopia in the recent past. Rather there are studies revealing the prevalence of a trend towards an increase in the level of fertility in rural Ethiopia [Assefa, 1990; Yohannes, 1994]. The results here obtained, using the P/F ratio method suggest that there was good reporting in current fertility data. Therefore, the reported total fertility rate can be considered as plausible.

4.3 Maternal Mortality Rate (MMR) and Lifetime Risk of Maternal Death

As indicated earlier a total of 3274 respondents were interviewed to obtain required information for the study. These respondents reported that they have had a total of 5891 sisters, of which 5506 were at least 15 years old [See Table 10]. Among those sisters aged 15 years and above, 4744 were alive and 762 dead; of the dead sisters, a total of 154 maternal deaths were identified [See column 4, Table 11].

Table 11: The Distribution of the Total Number of Sisters, Sisters Aged 15 Years and Above, Sisters Age 15 Years and Above Alive and Dead by Age of Respondents, Mafud, 1994

Age Group of the Respondents	Number of Sisters	Number of Sisters Reaching Age 15	Number of Sisters Reaching Age 15	
			Alive	Dead
15-19	337	331	298	33
20-24	677	596	549	47
25-29	756	703	656	47
30-34	779	724	672	52
35-39	809	747	673	74
40-44	794	740	627	113
45-49	488	478	400	78
50-54	488	473	386	87
55-59	227	221	174	47
60+	536	493	309	184
Total	5891	5506	4744	762

The maternal mortality estimates using the Sisterhood Method are given in Table 11. As presented in Table 11, the total lifetime risk of maternal death for all ages is found to be 0.0442[4] (95 per cent CI, 0.03744-0.510)[5] or the lifetime risk of dying of pregnancy related cause of 1 in 23 women (it is the reciprocal of the lifetime risk of maternal death). The maternal mortality rate is approximated to be 657 maternal deaths per 100,000 live births (95 per cent CI, 554-760)[6]

---

[4] The procedure to obtain the life time risk of maternal death is given as note (f) of Table 11.

[5] The confidence interval (CI) is calculated using the following formula:

$$Q \pm Conf.level\,100(1-\alpha)\sqrt{\frac{Q(1-Q)}{B}}$$

Where Q is the total lifetime risk of maternal death (0.0442)
B is the total sisters units of risk exposure

[6] The CI for maternal mortality ratio can be found using the following formula:

$1-(1-Ql)^{1/TFR}$ to obtain the lower limit
$1-(1-Qu)^{1/TFR}$ to obtain the upper limit

Where Ql = the lower limit of the CI of the lifetime risk of maternal death
Qu = the upper limit of the CI of the lifetime risk of maternal death

Note:- the formulas indicated in the fotenote 3 and 4 are obtained from Tesfaye and Hanley [Unpublished]

Table 12: Maternal Mortality Estimate Using the Sisterhood Method, Mafud, 1994

Age Group of Respondents (1)	Number of Respondents (2)	Number of Sisters Aged 15 Years and Above (3)	Maternal Deaths r_i (4)	Adjustment Factors (A_i) (5)	Sisters Unit of Risk Exposure (B_i) (6)	Lifetime Risk of Maternal Death q(i) (7)	Proportion of Dead Sisters Dying of Maternal Causes (8)
15-19	336	598*	8	0.107	64	0.125	0.313
20-24	364	648*	8	0.206	133	0.060	0.170
25-29	392	703	11	0.343	241	0.046	0.234
30-34	360	724	19	0.503	364	0.052	0.365
35-39	386	747	20	0.664	496	0.040	0.270
40-44	397	740	23	0.802	593	0.039	0.201
45-49	264	478	24	0.900	430	0.056	0.308
50-54	300	473	18	0.958	453	0.040	0.207
55-59	148	221	6	0.986	218	0.028	0.138
60+	327	493	17	1.000	493	0.034	0.055
Total	3274	5506	154		3485	0.0442**	0.202

Notes: (a) * is obtained by multiplying the reported number of sisters in age group 15-19 and 20-24 by 1.78 which is the average number of sisters aged 15 years and above per respondents in the age group 25+. i.e. 4579/2574 = 1.78 (The detail about this raising factor is indicated on page 30, paragraph 2).

(b) column (5) A_i values are adjustment factors (given)

(c) column (6) = column (3) X column (5)

(d) column (7) = column (4)/column (6)

(e) column (8) = column (4)/column (5) of Table 9 (number of sisters dead)

(f) * * is obtained by dividing the total of column (4) by the total of Column (6)

On the other hand, the total lifetime risk of maternal death for respondents under age 50 is 0.0487 (95 per cent CI, 0.0399-0.0575), or a risk of dying of pregnancy related causes of 1 in 21. Maternal mortality rate was estimated at 725 maternal deaths per 100,000 live births (95 per cent CI, 592-860). These estimates can be considered as plausible estimates compared with the estimates obtained for all ages that include the reports of the respondents in higher age groups (50 and above) because the reports from respondents in higher age groups are likely affected by recall error since the majority of the deaths reported might have occurred many years ago. In addition, of the total 154 maternal deaths identified in the survey 113 (73 per cent) maternal deaths were reported by respondents under age 50. This gives further justification for concentrating on the reports of the respondents of under 50 age groups.

CHAPTER V

SUMMARY AND CONCLUSION

In Ethiopia, maternal mortality is a problem that has received little attention in mortality studies. There are a limited number of studies carried out on maternal mortality and that most of these studies were conducted on Addis Ababa and relied mostly, if not exclusively, on hospital based statistics which are hardly representative of the entire population. There is only one community-based study in rural Ethiopia where 85 percent of the population live.

The main purpose of this study ,therefore, is to contribute to the stock of knowledge in the area of maternal mortality which is little known about in the country by undertaking systematic investigation of the level of maternal mortality in the rural villages of Mafud district in the Northern Shewa region of Central Ethiopia.

The study was primarily based on a community-based cross sectional survey conducted on 3274 eligible respondents that is persons aged 15 years and over. These individuals were selected from a list of 11,350 potential eligible persons identified from 15 peasant associations in the study area. However, the total number of respondents surveyed from each peasant association was determined on the basis of probability proportional to size.

Before commencing the estimation of maternal mortality, the quality of the data were critically assessed, giving particular attention to the age data. The graphic method and Myers' Blended Index were used to assess the quality of age data. From the analyses, It was observed that the age data of the sample population were affected by heaping on digits ending in 0 and 5 and to lesser extent on 8. And ages ending in digits 1 and 9 were substantially avoided. Nevertheless, in order to reduce the effects of heaping on the study outcome the age data were cumulated into five-year age groups.

The study employed an indirect technique, the Sisterhood method, to estimate the lifetime risk of maternal mortality and maternal mortality rate in the study community. The method was recently developed at the London School of Hygiene and Tropical Medicine by Wendy Graham, William Brass, and Robert W. Snow [Graham et al, 1989]. This estimation procedure provides a means to estimate various indicators of maternal mortality in developing countries where direct methods of estimating maternal mortality are often not feasible either due to absence of vital statistics records or due to the fact that hospital records in most cases hardly provide sufficiently representative sample, or because large scale longitudinal surveys are expensive and therefore unattractive to most developing countries, like Ethiopia, where resources are quite meager. Its validity was also tested in Gambia [Graham, et al. 1989], Djibouti [David et al, 1991], Egypt [Sayad et al, 1989, cited in DHS, 1991], among others, and proved to be dependable.

The findings of the present study indicate that the 3274 respondents interviewed in the survey had 5506 sisters aged 15 years and above; among whom 762 were reported to have died; of these deceased sisters 154 were from maternal related causes. An

application of the Sisterhood Method using this information gave the life time risk of maternal mortality of 0.0487 or .in other words, a 1 in 21 chance of death among women in the study area from pregnancy related causes during the reproductive period. This approximates to a maternal mortality rate of 725 maternal deaths per 100, 000 live births. Theoretically, this estimate refers to a period about 12 years prior to the survey date. However, as commonly argued, in areas like the study population where the general mortality level and that of maternal mortality in particular show no substantial improvement since that point in time [Graham, et al, 1989] the estimate could be taken to represent the current situation.

Due to the absence of similar estimates for the nearby districts in general and for the study area in particular validation of the results was carried out on the basis of comparisons with the reported maternal mortality rate for Addis Ababa 566 per 100,000 live births [Kwast, et al, 1987] and the estimated maternal mortality rate of the country 500-1000 per 100.000 [NOP, 1994]. Comparisons support the validity of the results of this study because the estimated maternal mortality rate of the study areas falls in the estimated range of the level of maternal mortality of the country and as expected it was found to be higher than the reported maternal mortality rate of Addis Ababa that conforms the results of many studies conducted in developing countries [Abdullah, 1992; Bhatia, 1990; WHO, 1986b] that revealed higher maternal mortality in rural than urban areas.

The prevalence of higher maternal mortality in Mafud district may further be justified with reference to prevailing high risk factors. For instance, health facilities in

the district are in most cases inaccessible, poorly staffed and often lack necessary equipment. Most women in the study community also have higher fertility (6.86) which indicates women frequently face the risk of maternal death. Moreover, women give birth while they are too young (below age 18) or too old (over age 35) to deliver safely. In addition, although no fewer than 10 per cent of pregnancies require higher level obstetric care almost all women deliver at home with the help of untrained traditional birth attendants who can not detect trouble and take the necessary action before matters get worse and who are also associated with some dangerous practices such as massaging of the abdomen of the pregnant woman and shaking the woman to speed up the delivery of retained placenta. Furthermore, women in the study area are exposed to problems arising from female circumcision which is a universal phenomenon in Mafud district.

In light of the above discussions it is believed that the following measures can play pivotal role in reducing maternal mortality in the district.

1. Expansion of family planning services. Family planning has a crucial role to play in reducing high risk pregnancies: pregnancies before age 18 and over age 35, pregnancies after four or more children, and pregnancies spaced less than two years apart. Family planning would help teenage women postpone pregnancy and would enable those aged 35 or over to avoid undesired exposure. In other words, family planning through promotional and educational information, counselling and provision of means for women to space, regulate and or limit childbearing can help reduce significant proportion of pregnancies some of which would have been associated with maternal mortality.

2. Providing adequate training for traditional birth attendants (TBAs) should also be given appropriate attention. TBAs assist almost all births in the district and hoped that they will continue to perform similar task given the inadequacy of health facilities in the area. However, some of the activities of TBAs are observed to be detrimental to the health of the pregnant woman. It is ,therefore, necessary to provide TBAs with sufficient training so as to up-grade their skill. In addition, providing them with basic equipment and supplies, and continuous refresher course could enable them to give safe assistance during labour and delivery.

3. Strengthening the capacity and efficiency of the community level health facilities and strengthening referral facilities with staff, essential equipment and supplies are also important measures that should be adopted to lower the observed high maternal mortality in the area.

4. The age at first marriage should also be raised at least to 18 years to enable the potential mother attain physical and mental maturity to better cope with pregnancy and childbirth. In this regard, legal measure coupled with effective IEC would play an important role to break deep rooted tradition regarding marriage practices.

5. In Ethiopia where complete registration of deaths remains a distant goal using alternative sources to obtain necessary information on maternal mortality should be considered. In this connection, it is worth to suggest that an inclusion of a

couple of questions in single-round surveys or census can provide the required data to estimate the level of maternal mortality at national and sub-national levels using the Sisterhood method.

6. Finally, similar community based studies should be done in different areas to indicate the magnitude of the problem and particular emphasis should also be given to study on determinants of maternal mortality.

REFERENCES

Abdullah S.A.,et al (1992). "Maternal Mortality in Assuit." International Journal of Gynecology & Obstetrics. Vol.39(3). pp:197-204.

Alauddin M. (1986). "Maternal Mortality in Rural Bangladesh: Tangail District." Studies in Family Planning. Vol.17(1).pp: 13-21.

Alasebu G.Silassie, et al (1985). Harmful Traditional Practices Affecting The Health of Women and Children In Ethiopia. MOH, Addis Ababa.

Almaz H. (1991). "Traditional Practices and Maternal Health" .International Day of Midwives: "Safe Birth" Conference Report. Addis Ababa, Ethiopia, May 7, 1991. PP: 2-40.

Arkutu A.A. (1978). "A Clinical Study of Maternal Age and Parturition in 2791 Tanzanian Primiparae." International Journal of Gynecology and Obstetrics, Vol. 16, pp. 20-23.

Assefa Belay (1990). Age Mis-reporting and Its Impact on Fertility Estimation: The Case of Selected Sub-Saharan African Countries. Unpublished M.Sc. Thesis. SGS/AAU.

Assefa Hailemariam (1990). Fertility Trends and Differentials in Central Ethiopia. Unpublished Ph.D Dissertation, London School of Economics and Political Science.

Beral V. (1979). "Reproductive Mortality. British Medical Journal. Vol.1(6164). pp:632-634.

Bhatia J.C. (1990). "Light on maternal mortality in India." World Health Forum. Vol.11. pp:188-192.

Boerma J.T. (1987). "Level of Maternal Mortality in Developing Countries." Studies in Family Planning. Vol.18 (4).pp: 213-221.

Brass W. et al (1968). The Demography of Tropical Africa. Princeton, Princeton University Press.

Brass W. (1975). Methods for Estimating Fertility and Mortality from Limited and Defective Data. USA. The Calorins Population Centre. Laboratories for Population Statistics.

Casley D.J. and Lury D.A. (1982). Data Collection in Developing Countries. London.Clarendon Press Oxford. pp. 61-68.

Cochran G.W (1977). Sampling Techniques. New York. John Wiley & Press.

CSA (1990). Ethiopian Statistical Abstract 1990.

_____ (1991). Ethiopia: Population and Socio-Economic Data Sheet. Addis Ababa.

David P. et al (1991). "Estimating Maternal Mortality in Djibouti: An Application of the Sisterhood Method." International Journal of Epidemiology. Jun. Vol. 20(2). pp. 551-7.

Demographic and Health Surveys World Conference, August 5-9,1991, Washington, D.C. Proceedings, Vol.III.

Efiong. E.I. and Banjoko. M.O. (19755). "The Obstetric Performance of Nigerian Primigravidae Aged 16 and Under." British Journal of Obstetrics and Gynecology, Vol. 82, pp. 228-233.

Eschen A. (1992). Partnership for Safe Motherhood: Acting to Save Women's Lives. Report of the Meeting of Parents for Safe Motherhood at the Word Bank.

Fathalla M.F. (1990). " The Challenge of Safe Motherhood. Health Care of Women and Children in Developing Countries. Oakland. Third Publishing Company.pp:219-228.

Faveau V.,et al (1988). "Causes of Maternal Mortality in Rural Bangladesh, 1976-85." Bulletin of the World Health Organization.Vol.66(5).pp:643-652.

Feifer C.N. (1990). "Maternal Health in Jamaica: Health Needs. Services. and Utilization.The Word Bank.WPS 539.PHN. pp:1-22.

Frost O. (1984). "Maternal and Perinatal Deaths in an Addis Ababa Hospital in 1980." Ethiopian Medical Journal.vol.22. No.3.pp.143-146.

Fortney J.A. et al (1986). "Reproductive Mortality in Two Developing Countries." American Journal of Public Health. No.76(2):134-136.

Graham W. et al (1989). "Estimating Maternal Mortality: The Sisterhood Method." Studies in Family Planning. Vol.20 (3). pp. 125-135.

Hay. D. and Boyd. J.J. (1973). "A study of the Obstetric Performance of the Adolescent Jamaican Primigravida." American Journal of Obstetrics and Gynecology, Vol. 116(1). pp. 34-37.

Hayes R., et al 1989. "Causes of Adult Deaths in Developing Countries: A Review of Data and Methods." World Bank.WPS 246.PHN. pp: 2-26.

Horvath.B. and Muletta. E (1982). Maternal Mortality in Black Lion Hospital (1981,1982).Addis Ababa. Department of Gyne-cology and Obstetrics (Unpublished document).

Howard M.L. (1990). "Supporting Safe Motherhood: A Review of Financial Trends." World Bank.WPS413.PHN.pp:1-9.

International Day of Midwives: "Safe Birth" Conference Report. Addis Ababa, Ethiopia, May 7, 1991. PP: 2-40.

Khan A.R. (1985). "Maternal Mortality in Rural Bangladesh." World Health Forum. Vol.6(4). pp:325-328.

Kwast B.E., et al (1986). "Maternal Mortality in Addis Ababa. Ethiopia."Studies in Family Planning. Vol.17,No.6,Part1. pp. 288 -301.

_____ (1987). Health Interventions and mortality Change in Developing Countries. A paper presented on the Conference of British Society for Population Studies, 9-11 september. (Unpublished Monograph).

Maine D., et al (1990). "The Demography of Maternal and Child Health in Developing Countries." Health Care of Women and Children in Developing Countries. Oakland.Third publishing Company.pp:26-35.

M'Bede,J. (1985). Adolescent Pregnancy in Africa. Bulletin of the International Paediatric Association. Vol.6(3). pp:376-371.

Mhango C., et al (1986). "Reproductive Mortality in Lusaka. Zambia.1982-1983." Studies in Family Planning. Vol.17(5).

Mishra. S. and Dawn. C.W. (1982)"Retrospective Study of Teenage Pregnancy and Labour During 5 Years Period from January 1978 to December 1982 at Durgapur Sub-divisional Hospital." Indian Medical Journal. Vol. 80(9). pp. 150-152.

MOH (1989). National Seminar on Safe Motherhood: Seminar Report and Recommendation. 18 - 20 Sept..1988. Addis Ababa.

National Office of Population (1994). The Plan of Action for the Implementation of the National Population of Ethiopia (1994-1999). Addis Ababa.

_____ (1994). Population Situation in Ethiopia and Its Impact on Major Socio-Economic Sectors. Addis Ababa. Ethiopia.

Rosenfield. A. D. Maine (1985). "Maternal Mortality: A Neglected Tragedy. Where is M in MCH?" The Lancet Vol 2. pp. 83-85.

Safe Motherhood Initiative. International Conference. Nairobi. 10-13 February 1987.

Sai F.T. (1986). "Family Planning and Maternal Health Care: a common goal." World Health Forum.Vol.7(4). pp:315-323.

Seyoum Y. and Getachew k. (1988). "A Six-Year Review of Maternal Mortality in a Teaching Hospital in Addis Ababa." Ethiopian Medical Journal. Vol.26. No.3. pp.115-120.

Shyrock S.H. and Siegel J.S. (1976). The Methods and Materials of Demography. New York, Academic Press Inc.

Smyke R. (1991). Women & Health. London, Zek Books Ltd. pp.59-126.

STARRS A. (1987). "Preventing the Tragedy of Maternal Deaths." A Report on The International Safe Motherhood Conference, Nairobi, Kenya.pp.1-43.

_____(ed). (1991)."The Challenge of Survival:Safe Motherhood in the SADCC Region." Family Care International (FCI). pp:1-30.

Steine Z. and Maine D. (1986). "The Health of Women." International Journal of Epidemiology. Vol.15(3). pp:303-305.

Teran M.M. (1987). some Aspects of the Interrelationship between Fertility Patterns and Health: The Case of Mexico. Geneva, WHO, World Health Statistics Quarterly Report. Vol.40 (1).pp:4153.

Tesfaye S. and Fasil T. (1993). "Maternal Mortality in Rural Communities of Illubabor, Southwestern Ethiopia: As Estimated by Sisterhood Method". Ethiopian Medical Journal.vol 31.pp:239-249.

Tesfaye and Hanley (1994). Estimates of the maternal mortality ratio obtained via the sisterhood method: a note on calculating their statistical uncertainty and related issue. (Unpublished).

Tesfayesus M. (1986). Mortality Levels and Differentials in Ethiopia with Reference to Mettu, Alemaya and Addis Ababa. Unpublished Ph. D Dissertation. The University of Dar Es Salam. Tanzania.

Tilaye Negawo (1993). The Effect of Selected Proximate Determinants and Socio-Economic Factors on Fertility Rates of Rural Women in Northern Shewa: The Case of two Districts. Unpublished M.Sc. Thesis. SGS/AAU.

Timaeus L. and Graham W. (1989). Measuring Adult Mortality in Developing Countries: A review and Assessment of Methods.

Toure B. .et al. (1992). "Levels and Causes of Maternal Mortality in Guine (West Africa). International Journal of Gynecology & Obstetrics. Vol.37(2).pp:89-95.

UN (1983). Manual X : Indirect Techniques for Demographic Estimation. New York.

_____ (1990). World Population Chart.

UN,ECA. (1989). The impact of Maternal And Child Health and Family Planning Programmes on Fertility, Infant and Childhood Mortality and Maternal Health. ECA/POP.TP/89.2(1.3). pp:1-48.

WHO (1986b). "Maternal mortality:helping women off the road to death. Report based on the Interregional Meeting on the Prevent ion of Maternal Mortality,November 1985." WHO Chronicle 40(5):175-183.

_____ (1987). Women's Health and the Midwife A global Perspective: A report of a collaborative progress workshop. Geneva. WHO, Maternal and Child Health Unit, Division of Family Health. PP:2-10.

_____ (1987a). "Measuring Maternal Mortality." Paper prepared for the Safe Motherhood Conference, Nairobi, 10-13 February 1987.

_____ (1989). The Risks to Women of Pregnancy and Childbearing in Adolescence: A Selected Annotated Bibliography. Geneva.WHO. Family Health Organization. pp:2-36.

_____ (1991). Maternal Mortality Ratios and Rates: A Tabulation of Available Information,3rd ed. Geneva: WHO, Division of Family Health. pp:1-12.

Word Bank, Population and Human Resource Department, Population, Health and Nutrition Division, WPS 155. pp. 1-46.

Viegas.O.A.C..etal.(1992)."Safe childbirth needs more than medical services." World Health Forum. Vol.13.PP: 59-65.

Yohannes Kinfu (1994). Fertility in Ethiopia: A study of Levels, Trends and Correlates. Unpublished M.Phil. Thesis. RIPS. University of Ghana.

Zurayk H..etal.(1993). "Concepts and measures of reproductive morbidity." Health Transition Review. Vol.3(1). pp:17-40.

APPENDIX I

Sample Size Determination

The sample size is determined using the following formula given by Cochran [1977]:

$$d=Z_{\frac{\alpha}{2}}\sqrt{\frac{PQ}{n}\frac{N-Q}{N-1}}$$

After simplification "n" is solved as:

$$n=\frac{Z^2_{\frac{\alpha}{2}}\frac{PQ}{d^2}}{1-\frac{1}{N}Z^2_{\frac{\alpha}{2}}\frac{PQ}{d^2}-1}$$

Where :- Alpha is equal to 0.05 for the 95 Per cent Confidence interval.

$Z_{\alpha 2}$ = 1.96 (obtained from random table).

d = The permissible margin of error in the expected level of MMR i.e. 0.35 percent.

P = The proportion of the expected level of maternal death in the study area i.e. 1500/100.000 = 0.015

Q = 1 - P

N = Total eligible persons (11.250).

APPENDIX II

Calculation of Preference Index for Terminal Digits by Myers' Blended Method

The calculation procedure involves the following steps:

1. Sum the populations endings in each digit over the whole range, starting with the lower limit of the range (eg. 10, 20, 30, 40....80; 11, 21, 31....81).
2. Ascertain the sum excluding the first population combined in step (1) (eg. 20, 30, 40,...80; 21, 31,...81).
3. Weight the sums in steps (1) and (2) and add the results to obtain a blended population (eg., weight 1 and 9 for the 0 digit; weights 2 and 8 for the 1 digit).
4. Convert the distribution in step (3) into per cents.
5. Take the deviation of each per cent in step (4) from 10.0, the expected value for each percent.

Table I and II below show the calculation of the indexes of preference for terminal digits in the age range 10 to 90 for Mafud district based on Myers' blended method, for female and male, respectively.

Table 1. Calculation of Preference Indexes for Terminal Digits Using Myers' Blended Method, for Female Members of the Households, Mafud, 1994

Terminal digit, (a)	Population with terminal digit a		Weights for..		Blended population		Deviation of percent from 10
	Starting at age 10+a	Starting at age 20+a	Column 1	Column 2	Number (1x3) + (2x4)	percent distribution	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
0	813	635	1	9	6528	31.46	21.46
1	115	46	2	8	598	2.9	-7.1
2	257	120	3	7	1611	7.76	-2.24
3	158	77	4	6	1094	5.27	-4.73
4	149	46	5	5	975	4.7	-5.3
5	507	399	6	4	4638	22.35	12.35
6	145	70	7	3	1225	5.9	-4.1
7	125	64	8	2	1128	5.4	-4.6
8	236	122	9	1	2246	10.8	0.8
9	71	35	10	0	710	3.4	-6.6
Total					20753	100	69.28 (signs disregarded)
Summary index							34.64*

* - the summary index is derived as one half the sum of the deviations from 10, each taken without regard to sign.

Source: adopted from Shryock and Siegel [1976].

Table II: Calculation of Preference Indexes for Terminal Digits Using Myers' Blended Method, for Male Members of the Households, Mafud, 1994

Terminal digit, (a)	Population with terminal digit a		Weights for..		Blended population		Deviation of percent from 10
	Starting at age 10+a	Starting at age 20+a	Column 1	Column 2	Number (1x3) + (2x4)	percent distribution	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
0	804	637	1	9	6517	28.5	18.5
1	133	55	2	8	706	3.1	-6.9
2	290	134	3	7	1808	7.9	-2.1
3	201	98	4	6	1392	6.1	-3.9
4	197	65	5	5	1310	5.7	-4.3
5	490	360	6	4	4380	19.1	9.2
6	197	111	7	3	1712	7.5	-2.5
7	176	99	8	2	1606	7.0	-0.3
8	263	140	9	1	2507	10.9	0.9
9	97	50	10	0	970	4.2	-5.8
Total					22928	100	57.1 (signs disregarded)
Summary index							28.55

* :- the summary index is derived as one half the sum of the deviations from 10, each taken without regard to sign.
Source: adopted from Shryock and Siegel [1976]

APPENDIX III
P/F Ratio Method

Details of the computational procedures of the P/F ratio method as adopted from United Nations [1983] are given below

Table III: Estimating the Level of Fertility Using P/F Ratio Method

Age Group	i	Reported Average Parity	ASFR (fi)	Qi	Estimated Parity equivalent (Fi)	Pi/Fi	w(i)	Fertility rate for conventional age group (Ff)	Adjusted ASFR (f*)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
15-19	1	0.324	0.1471	0.7353	0.335	0.963	0.0582	0.1711	0.1716
20-24	2	1.579	0.2834	2.1523	1.555	1.016	0.0407	0.2898	0.2907
25-29	3	3.004	0.3080	3.6925	3.120	0.985	0.0372	0.3033	0.3042
30-34	4	4.381	0.2190	4.7877	4.342	1.009	0.0048	0.2169	0.2176
35-39	5	5.378	0.2201	5.8882	5.478	0.962	0.0192	0.2146	0.2154
40-44	6	5.419	0.1152	6.4641	6.135	0.883	-0.153	0.1033	0.1036
45-49	7	5.858	0.0796	6.8623	6.769	0.865	-----	0.0734	0.0736
TFR			6.86						6.88

Notes:

a. Column (4) is obtained by cumulating fi values of column (3).

b. Column (5) is obtained by the relation
Fi = Qi-1 + a(i)f(i) + b(i)F(i+1) + c(i)Q(7)
Where the coefficients a(i), b(i) and c(i) are standard values (given).

c. Column (8) ff obtained using equation Ff(i) = (1-w(i-1)) f(i) + w(i)f(i+1)
Where f(i) is unadjusted age specific fertility rate
w(i) is the weighing factor. It is calculated as
w(i) = x(i) + y(i)f(i)/Q(7) + z(i)f(i+1)/Q(7)
The values x(i), y(i) and z(i) are given standard values.
Q(7) = 5 times the sum of f(i) values.

d. Column (9) f* is obtained by multiplying each value in column (9) by the correction factor of 1.003, which is equal to 1/3 (P2/F2 + P3/F3 + P4/F4) where the P/F ratios are taken from column (6).

APPENDIX IV

Case Histories of Women who Died of Maternal Related Causes

Case I

In the Mafud district of the Armania Kebele peasant association lived Mitik Demissie. She was born in 1958 E.C and married at the age of 17 and the marriage was arranged by her family. She subsequently gave birth to her first son safely. However, the second child led to her death. This happened when she was nineteen years old or one year after her first child.

The labour started at 8 p.m. in the evening. All relatives and neighbors were summoned and they were appealing to St. Mary for safe delivery . In the mean time the traditional birth attendant was called to help the woman in labour. The fetus was only five months old. Mitik ,the pregnant woman, once had gone to Armania clinic for checkup and the health assistant at the clinic told her that she would face no problem and there was no point to worry.

After one hour the traditional birth attendant inserted her hand into her vagina to remove the fetus. But her actiones were to no avail. This was repeatedly tried through out the night. Finally they took her to the clinic at the day break. At the clinic the health assistant told them that the fetus was in good condition and the mother was

attacked by yellow fever. He gave them medicine and then they took her back home. Unfortunately the pregnant woman showed no sign of improvement. Finally, they took her to a wizard and he told them not to take her any where. As a result they kept her at home for fifteen days. Eventually she gave birth to a son baby and died soon after at the age of 19. (Informant: Almaz Begashaw ,the sister)

Case II

In the Mafud district of Armania kebele peasant association was born Yeshi Admassu in 1954 E.C. and married at the age of 16. She gave birth to her first child exactly a year after her marriage. Then she gave birth to another son and two daughters. After 18 months of her last delivery she conceived her fifth child. Exactly at the eighth month approximately at 7:00 in the evening then came her labour. All members of her family were shocked and immediately called for the neighbors and started to appeal to St. Mary for a quick and swift delivery. At 10:00 in the evening when they found that things were not going in the right direction, they called for the traditional birth attendant nearby. She started to give help. She told them that the fetus had a wrong direction and she said to have managed to put it in the right path by massaging the belly of the pregnant woman with butter. She then made her sit on a flat stone and tried her best all through out the night. All relatives and the neighborhood stayed around begging St. Mary.

In the morning, when the woman was totally exhausted, they took her to Armania clinic. The health assistant after getting angry for not bringing her as quickly as possible, immediately ushered the pregnant woman to the delivery room. Then after 5 hours of labour she gave birth to an eight month baby son. The next day she started bleeding, accompanied with diarrhoea and vomiting. They immediately reported this to the clinic. Although the health assistant told them the need for higher treatment, they could not do so, because they had neither the means nor the money. Instead they took her to a nearby witch doctor who told them that every thing is going to be alright. After staying five days in such a condition she died at the age of 25 the new born baby soon also died forty days after the death of its mother.

Informant : Muluemebet Teferra, sister of the deceased.

Case III

Adanech W/Mecheal was 44 years old and lived in the village near to Debre-Sine health centre. She had given birth to seven children who were delivered safely at her own house. During her 8th pregnancy, contractions started when she was nine months pregnant and went to Debre-Sine health centre where the nurse identified malpresentation of the baby and referred her to Debre-Birhan hospital which is 70 km from the centre. However, she could not go to the hospital owing to financial problem. After two days when labour starts she went once again to the health centre. Nevertheless, there was nothing the doctor and the nurses could do to help her because facilities for emergency obstetric operations were not available rather they insisted her to go to the hospital.

Later on, her neighbors and villagers contributed some money and took her to Debre-Birhan Hospital where the doctor confirmed that labour was obstructed and the baby in her womb was dead and referred her to Black Lion Hospital, Addis Ababa. This meant another journey of 135 km. After she arrived at Black Lion Hospital Caesarean section was immediately performed to remove the dead baby. However, she died 7 hours following surgery in the intensive care unit at Black Lion Hospital.

Informant: Abeba W/Michael (sister of the deceased)

Aklilu Mitke (health assistant at Armania Clinic)

Case IV

Wolete-Amanuel Beyen was born in 1944 E.C. at a place called Neb-Amba in the district of Mafud. She got wedded at the age sixteen. Eventually, she bore four male and a female children in her own home with the help of a untrained traditional birth attendants without any difficulty. Wolete Amanuel, for the sixth time, at the age of Thirty-five, conceived the child who, later, became the cause of her death. By the appropriate time, labour followed. Soon after, neighbors and her folks were called in to entreat St. Mary's help which they did. Then the traditional birth attendant was called in. The midwife laid Wolete Amanuel on a bed. She started to massage her stomach with butter and set the unborn baby's position right. She then brought a millstone and seated Wolte Amanuel on it and continued her midwifery task. Although everything possible was tried all day long, the situation of the woman never showed any change or

improvement. Her husband was sent to a wizard. a person thought to have a magical ability in such matters. The wizard warned the husband if his wife were to be touched by metal and metal-like objects (to imply a syringe). or if she were to cross-over Mt. Tarmaber, she would die right away. The wizard added that the woman in labour suffered so much because she has failed talk to her grandparents' beads . Now, do talk to her grandparents' beads. They spent the third day in talking to their grandparents' beads. Nevertheless, it was no solution. In fact, the abdomen of the woman began to swell. Without eating for three days on end: with untold suffering from the labour: with her stomach distended and before she delivered the baby, she passed away.

Informant : Mesfin Bekele, husband of the deceased.

Case V

Yetm Worq Kebede was a resident "Agamber" the peasant association of Mafud district. She was born in 1930 E.C in this Kebele Peasant Association. She was wedded at the age of fifteen and her marriage was arranged by her parents. She then gave birth to six male and two female children one after the other with little or no problem. She bore all her children in her own house with the aid of traditional midwife. She conceived her ninth child at the age of forty. At the end of the ninth month ,as anticipated. she started to labour. She started to labour at one o'clock in the afternoon. As it was time of harvest, none of her neighbors were around. Her neighbors and midwife came in the evening. The midwife spent sometime in massaging pregnant

woman's stomach in order to set the baby in the womb in its proper position. When the pain of the labour was getting more excruciating, the midwife inserted her hand into the woman's womb to pull the baby out. With all the midwife's unstinted efforts, my sister delivered a baby-boy at four o'clock after midnight, ninth months after conception. Blood continued to spill out of her womb for fifteen days after delivery. Even if she was given a leaf called "Yedem Abenet", (a leaf believed to cause blood-clotting), the flow of blood would not stop. The baby-boy died three days after his birth. The mother also died fifteen days after delivery due to continued bleeding.

Informant: Kelemua T/Aregegn, sister of the deceased.

Case VI

Wolete Kidan Teklewold lived in Woja Kebele Peasant Association in Mafud District. She was wedded in the same Kebele Association at the age of sixteen. Right at the end of the ninth month of her pregnancy, she started laboring. The labour started roughly at 2 p.m. after midnight. Neighbors were then called to say their prayer's to St. Mary who is held to be helpful in this matter. The local midwife was then called as the labour got more serious. The midwife seated my sister on a millstone after massaging her stomach. As my sister was writhing with pain, the midwife had a powerful person to press my sister's shoulder down. With no hope in sight, day broke. On the morrow, around 10 A.M., she delivered. As the baby-boy was born dead, it was taken to backyard and buried. Eventually, the mother's breathing tempo started to slow down. Just fifteen minutes after the baby was delivered, the mother passed away. In midst of

all this, they, her folks, had two different views. On one hand, they thought that St. Mary would arbitrate and on the other, they believed that the midwife would do the job; sad enough though, the their sister passed away.

Informant: Birke T/wold, sister of the deceased.

APPENDIX V

DEMOGRAPHIC TRAINING AND RESEARCH CENTRE
INSTITUTE OF DEVELOPMENT RESEARCH
ADDIS ABABA UNIVERSITY

Maternal mortality survey questionnaire

Part one: 101. Identification

1. Region
2. District
3. Name of the peasant association (PA)
4. Number of the peasant association
5. Household number
6. Name of the respondent
7. Line number of the respondent

102. Interviewer Visits

Interviewer calls	1	2	3
Date			
Interviewer name			
Time started			
Time ended			
Duration			
Result*			
Final visit: Date Time			

*Results codes 1. Completed 2. Not at home 3. Deferred 4. Refused 5. Partly completed 6. Other (specify)___

103. Household Information (ask the head of the household or any other elder person).

No.	Name of usually Residents of the household	Relationship 1. Head of the household 2. Husband/wife 3. Child	Sex 1.M 2.F	Age	Religion 1.orthodox 2.Muslim 3.Other	Ethnicity 1.Amhara 2.Oromo 3.Afar 4.Argoba 5.other	Marital Status 1.Never married 2.Currently married 3.Divorced 4.widowed 5.Separated

Part two: Ascertaining Maternal Deaths

No.	Question	Answer	Skip
201	What is your name?	_____	
202	How old were you at your last birth day?	_____	
203	Sex	_____	
204	In what month and year were you born?	Month_ Year__	
205	Have you ever had sister(s) born to the same	1. Yes 2. No	
206	How many sisters (born to the same mother) have you ever had? (both ever-married and single)	_____	
207	How many of your sisters are aged 15 years and above?	_____	
208	How many of your sisters alive now?	_____	
209	How many of your sisters are dead	_____	
210	How many of these dead sisters died while they were pregnant, or during childbirth, or during the six weeks after the end of the pregnancy? (it does not include deaths due to accident)	_____	

Interviewer:- If the respondent has a sister or sisters who have died while they were pregnant, or during childbirth, or during the six weeks after the end of the pregnancy (see 210) separate answer to question number 211 to 214 is required for each deceased sister. Use the following tables for each dead sister.

Information about the first dead sister

No.	Question	Answer	Skip
211	Does the child alive after the death of his/her mother?	1. Yes 2. No	213
212	How many months or years did he/she stay alive?	Months_____ Years_____	
213	Was it her first time to give birth?	1. Yes 2. No	301
214	How many children have she ever had?	_____	

Information about the second dead sister

No.	Question	Answer	Skip
211	Does the child alive after the death of his/her mother?	1. Yes 2. No	213
212	How many months or years did he/she stay alive?	Months_____ Years_____	
213	Was it her first time to give birth?	1. Yes 2. No	301
214	How many children have she ever had?	_____	

Interviewer:- The following parts namely part three and four should be directed to female respondents only.

Part three

Nuptiality (Ask ever married women)

No.	Question	Answer	Skip
301	**What is your current marital status?**	**1.Single** **2.Married** **3.Divorced** 4.Separated 5.Widowed	**end**
302	**In what month and year were you first married?**	**1.Month_____** **2.Year_____**	
303	**How old were you when you first got married?**	_____	
304	Who arranged your first marriage?	1.Parent 2.With the help of relatives 3.Myself **4.Other(specify)**	
305	Has your menstrual cycle started at the time you were married for the first time?	1.Yes 2.No	

Part four - Fertility (Ask women aged 15-49 years)

No	Question	Answer	Skip
401	Have you ever given birth ?	1. Yes 2.No	
402	How old were you when you gave birth to your first child? (age at the birth of the first child)	_____	
403	How many children have you ever born alive?	1.Male___2.Female_____ 3.Total_____	
404	How many of these are living with you?	1.Male____ 2.Female____	
405	How many of these are living else where?	1.Male____2.Female____ 3.Total_____	
406	Are all your children alive?	1.Yes 2.No	408
407	How many of your children died?	1.Male 2.Female 3.Total	
408	Have you given birth to any children during the last month?	1.Yes 2.No	
409	In what month and year did you give this last birth?	1.Month 2.Year	
410	Where was the place of delivery?	1.At home 2.Clinic 3.Hospital 4.Other(specify)	 412 412 412
411	Who was the birth attendant?	1.Trained traditional midwife. 2.Untrained traditional birth attendant 3. A health personnel 4. Other, please specify	
412	What was the sex of the child?	1.Male 2.Female	
413	Is the child living or dead?	1.Living 2.Dead	
414	When you were pregnant with your last child, did you ever visit a hospital or clinic for antenatal check-up?	1. Yes 2. No	
415	How many times did you visit hospital or clinic for antenatal care?		
416	How old were you at your last birth?		

DECLARATION

I, the undersigned, declare that this thesis is my original work, has not been presented for a degree in any other university and that all sources of material used for the thesis have been duly acknowledged.

Name : Melaku Eshetu

Signature : _____

Place and Date of Submission : A.A.U.

June, 1995