INDIRECT ESTIMATES AND PERCEIVED CAUSES OF MATERNAL AND CHILDHOOD MORTALITY IN IWO LOCAL GOVERNMENT AREA, OSUN STATE, NIGERIA

BY

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BSc. (Hons) Microbiology

MATRIC NO.: 161086

A DISERTATION SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF MASTER OF PUBLIC HEALTH IN MEDICAL DEMOGRAPHY TO THE DEPARTMENT OF EPIDEMIOLOGY AND MEDICAL STATISTICS

NOVEMBER, 2016.

DEDICATION

This dissertation is dedicated to God Almighty, who made it possible for me to complete this programme and to my late siblings Dammy and Iyanu. May your souls rest in perfect peace.

CERTIFICATION

I certify that this work was carried out by Mr. Olaogun Ifeoluwa Kolawole in the Department of Epidemiology and Medical Statisics, Faculty of Public Health, College of Medicine, University of Ibadan, Ibadan, Nigeria.

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ABSTRACT

The data from the Vital Registration System, that can be used for estimating maternal and child mortality (MCM) using the direct method, is often either unavailable or incomplete and inaccurate where it exists in Nigeria. These indicators are important for monitoring and evaluation of various maternal and child health programmes on going in Nigeria. Alternative and complementary method for generating plausible estimates of MCM need to be explored. Therefore, an indirect technique was used in this study to estimate MCM and its perceived causes in Iwo Local Government Area (ILGA), Osun State, Nigeria.

A cross-sectional survey was conducted among 1250 women of reproductive age (15-49 years). A two-stage cluster sampling method was used to randomly select four wards out of the 15 existing wards in ILGA with each ward representing a cluster. All households were visited in each selected cluster and an eligible woman was randomly selected in each household. A pre-tested, semi-structured questionnaire was used to collect data on socio-demographic characteristics, children ever born and those surviving, maternal death experience and perceived causes of MCM. The Sisterhood method and the Trussell variant of the Brass indirect technique were used to estimate maternal and child mortality respectively. Perceived causes of MCM was assessed on a 13-point scale with score more than mean±1SD classified as right perception. Data were summarized using descriptive statistics, Chi square test and logistic regression model to investigate statistical significance of associated factors at p=0.05.

Age of the respondents was 29.7±8.3 years, 69.4% had at least secondary education and 9.8% had no formal education. Majority (62.5%) of the respondents were Muslims and 98.8% were of Yoruba ethnic group. The adjusted total fertility rate was 3.86. Number of reported maternal deaths was 56 and 1350 sisters were at risk. The lifetime risk of maternal mortality was 4.15%. The estimated maternal mortality ratio was 1,074 per 100,000 live births. The adjusted infant mortality rate was 99 deaths per 1,000 births and under-five mortality rate was 180 deaths per 1,000 births. About 60.0% of the respondents had right perception relating to the causes of MCM. Majority (71.0%) reported that pregnant and nursing mothers do not go for antenatal care because they lack the money to pay for transport and hospital bill. More than half (53.8%) of the respondents agreed that women died during pregnancy because they do not deliver in the health centers. Respondents who reported less than three children (OR=0.24, CI=0.11-0.57) were less likely to experience child loss compared to those who reported three or more. Young women who were aged 15-24 years (OR=1.89, CI=0.64-2.46) were more likely to experience child loss compared to those aged 25-34 years.

Maternal, Infant and Under-five mortality were high in Iwo Local Government Area. Poverty, place of delivery, age at child bearing and parity are factors that influenced maternal and child mortality. Therefore, integration of reproductive health services into existing health programmes especially primary health care is recommended to reduce maternal and child mortality.

Keywords: Maternal mortality, Child mortality, Sisterhood method, Vital registration system

Word count: 491

Abbreviation

AIDS – Acquired Immune Deficiency Syndrome

ASFRs – Age Specific Fertility Rates

CEB – Children Ever Born

CI - Confidence Interval

CPR- Contraceptive Prevalence Rate

EAs – Enumeration Areas

FBHs- Full Birth Histories

HIV- Human Immunodeficiency Virus

ILGA- Iwo Local Government Area

IYCF- Infant and Young Child Feeding

JUTH- Jos University Teaching Hospital

LTR- Life Time Risk

MCM- Maternal and Child Mortality

MDG- Millenium Development Goal

MICS- Multiple Indicator Cluster Survey

MM- Maternal Mortality

MMR- Maternal Mortality Ratio

MMRate- Maternal Mortality Rate

NDHS- National Demographic and Health Survey

NPC- National Population Commission

OR- Odd Ratio

RAMOS- Reproductive Age Mortality Survey

SBHs- Summary Birth Histories

TBAs- Traditional Birth Attendants

UN- United Nations

UNFPA- United Nations Population Fund

UNICEF- United Nations Children's Fund

UNPD- United Nations Population Division

WHO- World Health Organization

ACKNOWLEDGEMENT

I am very grateful to Almighty God who created me to this world for His goodness and His mercy upon my life and for seeing me through my course of study successfully. This is the Lord's doing and it is marvelous in my eyes.

I would like to express my appreciation to my supervisor Prof. E.A Bamgboye for his advice and support during the course of this project.

My gratitude also goes to my co-supervisor Dr Akinyemi who contributed immensely to the success of this project. I would like to specially acknowledge Dr Adebowale for his word of encouragement during the course of the MPH programme. Thank you sir.

Furthermore, I appreciate the financial and spiritual support of my parents Mr and Mrs. E.O Olaogun. You are a parent indeed. May you live long to eat the fruit of your labour.

Finally, I appreciate my sibling Anuoluwa, my fiancée Titilope and my friends Samson, Kayode, Joy, Tobi and every one that has contributed to the success of this programme.

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CHAPTER ONE

INTRODUCTION

1.1 Background Of The Study

The health of mothers has long been acknowledged to be a cornerstone of public health and attention to unacceptably high level of maternal mortality has been a feature of global health and development discussions since the 1980s. The 1987 Safe motherhood Conference in Nairobi, Kenya established a global goal to halve maternal mortality by the year 2000 in all countries. This goal has been adopted in a series of International health and development Conferences. It is an integral component of the programmes of action following the 1990 World Summit for Children, the 1994 international Conference on Population and Development and the 1995 Fourth World Conference for Women. The goal captured the World's interest and many countries including Nigeria have developed strategies to achieve it as a national goal (WHO, 1997). However, ascertaining progress towards the goal is extremely difficult for two reasons: The data for measuring maternal mortality is difficult to generate particularly in developing countries and the information available at country level does not generally permit the establishment of good baseline data (WHO, 1996).

There is an increasing need for maternal mortality information at both national and sub-national levels (Bank, 1994). Estimate of maternal mortality offers a tool to enable health planners and providers to use existing information to guide maternal mortality reduction in their country (Campbell *et al.*, 2006). According to the World Health Organization (1987), an accurate estimation of the magnitude of maternal death is the first step towards reducing maternal morbidity and mortality.

In other to address these problems WHO and UNICEF have worked with Cynthia Stanton and Kenneth Hill of John Hopkins University to develop a new approach to estimating levels of maternal mortality in developing countries. The new approach has the dual objectives of generating improved estimates for countries with inadequate or no national data on maternal mortality, while at the same time providing better estimates of maternal mortality in 1990 as a baseline against which to measure progress of effect to reduce maternal mortality (WHO, 1996).

The results of the new approach indicate that globally there are 585,000 women who die each year from pregnancy related causes and the vast Majority (99%) of these deaths occurs in developing countries (WHO, 2004). This new estimate is about 80,000 deaths more than earlier estimates which have suggested and indicated a substantial underestimation of maternal mortality in the past. Globally, an estimated 287,000 maternal deaths occurred in 2010, a decline of 47% from levels in 1990. Sub-Saharan Africa (56%) and Southern Asia (29%) accounted for 85% of global burden (245,000) of maternal deaths in 2010. At the country level, two countries account for a third of global maternal deaths: India at 19% (56,000) and Nigeria at 14% (14,000). The maternal mortality ratio in developing countries (240) was 15 times higher than in developed regions (16). Sub-Saharan Africa had the highest maternal mortality ratio at 500,000 maternal deaths per 100,000 live births, while Eastern Asia had the lowest among the Millennium Development Goals developing regions, at 37 maternal deaths per 100,000 live births (WHO, 2010).

The statistics on mortality shows that less than 1% of maternal deaths occur in developed countries, which could be avoided if resources and services were available. Studies have revealed that the life-time risk of dying from pregnancy related diseases is 1 in 16 in Africa but only 1 in 4000 in some developed countries (Lucas and Gilles, 2008).

In particular maternal mortality ratio in Nigeria stood at 900 per 100,000 live births in 2005 as compared to Canada and Australia with reported cases of 12 per 100,000 live births and 8 per 100,000 live births respectively (WHO and UNCEF, 2008). Nigeria Demographic and Health Survey (2008) revealed that 545 maternal deaths per 100,000 live births occurred in Nigeria. In 2009, 580,000 women were reportedly dying yearly as a result of maternal deaths and Nigeria is believed to be having 2 per cent of the world population but account for 10 per cent of these deaths, estimated at 60,000 women a year. Also, 1 in 800 women die as a result of pregnancy-related complications in Nigeria (Steve, 2011).

The incorporation of maternal mortality reduction into the goals of the international community reflects its importance as a measure of human and social development. Maternal mortality is a particularly sensitive indicator of inequity. Of all the indicators commonly used to compare levels of development between countries and regions, levels of maternal mortality show the widest disparities. Maternal mortality offers a litmus test of the status of women, their access to

health care and the adequacy of the health care system in responding to their needs. Information about the levels and trends of maternal mortality is needed, therefore, not only for what it tells us about the risks of pregnancy and childbirth, but also for what it implies about women's health in general and, by extension, their social and economic status (WHO, 1996). Interestingly, most of these countries, have met their goals with relative success, showing that reductions in maternal mortality ratio are possible within existing available resources. However, in most cases it appears there is no evidence of significant reductions in maternal mortality ratio globally.

There are two targets for assessing progress in improving maternal health (MDG 5): reducing the maternal mortality ratio by three-quarters between 1990 and 2015, and achieving universal access to reproductive health by 2015.

The main indicators to measure universal access to reproductive health in Nigeria are contraceptive prevalence rate and antenatal care coverage.

Contraception is the use of substance or device to prevent conception. Modern techniques seek to interrupt the process of conception by impacting on the ovum, sperm, meeting of the sperm and ovum and implantation. Family planning is a primary health strategies with an important benefit for both maternal and child health. It is an important component of the strategies adopted to combat rising maternal mortality at the safe motherhood conference. Family planning also helps to control the number, interval and timing of pregnancies and births, and thereby reduces maternal morbidity and mortality and infant health (Parks, 2010).

However, contraceptive use in Nigeria is generally low. Current use of contraception in Nigeria has increased from 6% in 1990 and 13% in 2003 and 15% in 2008. There has been a corresponding increase in the use of modern contraceptive methods from 4% in 1990 and 8% in 2003 to 10% in 2008 (NDHS, 2008).

Contraceptive prevalence rate (CPR) which is defined as the percentage of currently married women who are currently using a method of contraception. It is a measure of actual contraceptive practice at the time of the survey. The country recorded prevalence rate has increased from 13% in 2003 to 15% in 2008 and to 16% in 20013 (NDHS, 2013).

It has been reported that good antenatal care is a sine qua non for a successful outcome for mother and child at birth (Ozumba, 2008). The major objective of antenatal care is to ensure

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optimal health outcomes for the mother and the baby (Parks, 2010). WHO (1990), reported that one million children worldwide are left motherless every year, primarily because their mothers had no access to or could not afford quality healthcare. These children are also more likely to die within two years of their mothers' death. Antenatal care from a trained provider is important to monitor the pregnancy and reduce morbidity risk of the mother and child during pregnancy and delivery.

According to the World Health Organization, a skilled health worker is "an accredited health professional- such as a medical doctor, or nurse who has been educated and trained to have proficiency in the skills needed to manage normal (uncomplicated) pregnancies, childbirth and the immediate post-partum period, and in the identification, management, and referral of complication in women and newborns".

The traditional birth attendants (TBAs), trained or untrained, are excluded from the category of skilled health workers (WHO, 1990) as they do not have the expertise to provide good antenatal care which include : 1) early detection of complication and prompt treatment (e.g detection and treatment of sexually transmitted infections); 2) prevention of diseases through immunization and micronutrient supplementation; 3) birth preparedness and complication readiness; 4) health promotion and diseases prevention through health messages and counselling of pregnant women (NDHS, 2008).

According to the World Health Organization in the year 2000, Nigeria was ranked 187th out of 191 United Nations member states in the provision of efficient and effective health care system. The health sector in Nigeria is generally in a dismal state. Antenatal care coverage in Nigeria is low and in those areas where they are available the quality of services is poor. Nigeria Demographic and Health Survey (2008), revealed that less than 60% of women who had a live birth in the five years preceding the survey received antenatal care from a health professional (58%); 23% from a doctor, 30% from a nurse or midwife and 5% from an auxiliary nurse. 3% from traditional birth attendants and 36% of mothers did not receive antenatal care services at all. It is known that pregnant women face considerable barriers in assessing orthodox antenatal care and delivery services throughout the country. These barriers are largely due to poverty at the household level which makes it impossible for women to access the increasingly expensive orthodox maternity services, especially in private health institutions. Reports on maternal deaths

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in Nigeria emphasize the strategic and imperative role made by adequate and accessible antenatal care in its reduction; yet more than 20% of the women receive satisfactory care during pregnancy. Antenatal care therefore should be emphasized to our women as being essential in all pregnancies and if provision of such services is free of charge, it will encourage the pregnant women to presents themselves for care (Benjamin, 2008).

1.2 Measuring Maternal Mortality

Maternal mortality is a crucial though complex measure of a country's overall health and development status. However, few developing countries have been able to establish comprehensive reporting of data needed for its estimation and even where such vital registration systems are in place, maternal deaths are often under-reported or misclassified as non-maternal (WHO and UNCEF, 1997). In Nigeria the situation is not different, as there is low reporting rate of births and deaths. Other data collection approaches such as household surveys can be problematic because maternal deaths are relatively rare events and large sample sizes are needed for precise results. Reports of specific causes of deaths from retrospective surveys are notoriously poor and are widely believed to produce serious underestimates, whilst prospective studies are expensive in terms of both time and resources (Graham, 1988). Results from hospital studies are rarely acceptable because neither the numerator (the women who died) nor the denominator (the births in the facility) is representative of the general population therefore the maternal mortality ratio is biased in an unpredictable ways (WHO and UNCEF, 1997).

A more cost effective approach for estimating maternal mortality is the Sisterhood method. It was originally developed during the late 1980s. The approach was designed to overcome the problems of large sample sizes required in retrospective household survey and thus reduce costs. It is similar to the kind of indirect measurement techniques frequently used to measure a variety of demographic parameters such as child and adult mortality (WHO and UNCEF, 1997). The term ''indirect'' used to qualify some of the techniques used in demographic estimation has its origin in the fact that such techniques produce estimates of certain parameters on the basis of information that is only indirectly related to its value (United Nations, 1983). Indirect methods of estimation focus on methods of extracting plausible or reliable estimates of fertility and mortality from deficient data that are indirectly related to the issue, inaccurate or both, such as the

estimation of maternal mortality from information on survivorship of sisters tabulated by age. Therefore, not only is the information used ''indirect'', but the procedure followed, although considerably simplified in practice, is by no means straightforward theoretically.

The extent of indirectness of estimating mortality and fertility varies greatly in terms of both the assumption underlying the models and the number of unwanted factors that have to be allowed for. The term ''Indirect'' is therefore used to describe any estimation method that depends upon models using conventional data in an unconventional way (United nations, 1983).

Faced with the increasing difficulty of obtaining reasonable measures of demographic parameters directly from the traditional data sources in the developing countries, demographers have focused on the development and refinements of the indirect estimation techniques. The development of the techniques has taken two main courses: either the search for robust methods to analyze data that have been collected from traditional system no matter how deficient or search for data from simple questions on retrospective survivorship that can be answered with reasonable accuracy in a one round demographic survey to provide enough information about certain demographic phenomenon that permits the indirect estimation of its level (Population and Demography Report No 6, 1981).

The only comparable indirect technique for providing community based estimates of maternal mortality is the sisterhood method. This was first tested in 1987 and has proven to be one of the feasible means for estimating maternal mortality in many different developing countries (Graham *et al.*, 1989).

A more reliable method of measuring maternal mortality in the absence of vital registration system is to identify and investigate the causes of all deaths of women of reproductive age – the Reproductive Age Mortality Survey (RAMOS). This method has been applied in countries with good vital registration systems to calculate the extent of misclassification, and in countries without vital registration of deaths, such as Jamaica and Guinea. Multiple sources of information – civil registers, health facility records, community leaders, religious authorities, undertakers, cemetery officials, school children - are used to identify all deaths. Subsequently, interviews with

household members and health care providers and facility record reviews are used to classify deaths as maternal or otherwise (verbal autopsy) (WHO, 1996).

Although RAMOS studies are considered to be the "gold standard" for estimating maternal mortality, they are also time consuming and complex to undertake, particularly on a large scale. Because of the difficulties and costs involved, only ten developing countries have carried out RAMOS or household studies to estimate maternal mortality at the national level. As a result, the sisterhood method has to be devised to provide broad estimates of the extent of the maternal mortality (WHO, 1996).

Whatever method countries adopt for measuring maternal mortality, one may argue that it is imperative to remember that the absolute value of the maternal mortality ratio is not as important for programme or planning purpose to analysis of "**why**" women are dying from pregnancy-related conditions. Is it because they cannot reach appropriate services? Is it because the services do not exist or are they inaccessible for other reasons such as distance, cost, social or cultural barriers? Are women dying because the care they receive in health services is inadequate, inappropriate or substandard?

Answering some of these questions is more important than knowing the precise level of maternal mortality (WHO, 1997). However, the knowledge of the magnitude of maternal mortality is equally important as an indicator of the effect of efforts by a country to reduce mortality from pregnant related causes.

1.3 Concepts and Definitions

In the International Statistical Classification of Diseases and Related Health Problems, 10th revision (ICD-10) (9), defines maternal death as the 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 the pregnancy or its management but not from accidental or incidental causes (WHO, 2010). This definition allows identification of maternal deaths, based on their causes, as either direct or indirect.

Direct maternal deaths are those resulting from obstetric complications of the pregnant state (pregnancy, delivery and postpartum), interventions, omissions, incorrect treatment, or a chain of events resulting from any of the above (WHO, 2010). Deaths due to, for example, obstetric

haemorrhage or hypertensive disorders in pregnancy, or those due to complications of anaesthesia or caesarean section are classified as direct maternal deaths.

Indirect maternal deaths are those resulting from previously existing diseases, or from diseases that developed during pregnancy and that were not due to direct obstetric causes but aggravated by physiological effects of pregnancy. For example, deaths due to aggravation of an existing cardiac or renal disease are considered indirect maternal deaths (WHO, 2010).

Pregnancy-related death is defined as the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the cause of death.

Late maternal death is defined as the death of a woman from direct or indirect obstetric causes, more than 42 days, but less than 1 year after termination of pregnancy.

1.4 Measures of Maternal Mortality

The number of maternal deaths in a population is essentially the product of two factors: the risk of mortality associated with a single pregnancy or a single live birth, and the number of pregnancies or births that are experienced by women of reproductive age.

Maternal mortality ratio is defined as the number of maternal deaths in a population divided by the number of live births. It depicts the risk of maternal death relative to the number of live births.

By contrast, maternal mortality rate is defined as the number of maternal deaths in a population divided by the number of women of reproductive age. It reflects not only the risk of maternal deaths per pregnancy or per birth (live birth or stillbirth), but also the level of fertility in a population.

The adult lifetime risk of maternal mortality for women in a population is the probability of dying from a maternal cause during a woman's reproductive life span. Each time a woman becomes pregnant she risks dying of a maternal cause. The higher the level of maternal mortality the greater is that risk. The risk is cumulative: the more times she becomes pregnant the chances of dying increase.

An alternative measure of maternal mortality, the proportion ascribed to maternal among deaths of females of reproductive age (PMDF), is calculated as the number of maternal deaths divided by the total deaths among females aged 15-49 years.

1.5 Childhood mortality

Infant and child mortality rates are basic indicators of a country's socioeconomic situation and quality of life. The rates are important for identifying population groups at risk; planning, monitoring, and evaluating population and health programmes and policies; and monitoring progress towards the Millennium Development Goal 4 to reduce child mortality by two-thirds by the year 2015 (NDHS, 2008). Over the years, studies have revealed that the progress countries have made toward reaching their goals of reducing by two- third child mortality based on the 1990 progress has been mixed, with a few countries on-track toward achieving the target, others having little or no success, and some countries actually losing ground (Li liu et al., 2012). For about two decades, the annual number of under five deaths only fall from around 12.4 million to about 8.1 million in 2009 - nearly 22,000 per day or 15 every minute (UNICEF,1990) which suggest clearly that under-five mortality had been fallen slowly. This is also an evidence that progress on child mortality is being made across all regions of the world, with many regions having reduced the under-five mortality rate by 50% or more (UNICEF, 2010).

However, evidence from UNICEF, WHO, the World Bank, and the UN Population Division report(s) shows that the highest rates of mortality in children under age 5 years continue to occur in sub-Saharan Africa. In 2009, one in every eight children (129 per 1000 live births) was reported to have died before their fifth birthday-a level nearly double the average in worldwide developing regions (66 per 1000) and about 20 times the average for developed regions (6 per 1000) (UNPD, 2010). Indeed under-5 mortality is increasingly concentrated in the developing countries as 70% of the world's under-5 deaths in 2009 occurred in only 15 such countries and half of the deaths occurred in only five countries. India, Nigeria, Democratic Republic of the Congo, Pakistan, and China, but India and Nigeria together account for nearly one third of the total number of under-5 deaths worldwide (21% and 10%, respectively) (UNICEF *et al.*, 2010).

The leading causes of infant mortality globally remain infectious diseases, specifically, acute respiratory infectious diseases and diarrhoea (UNICEF, 2008). In Nigeria, preventable diseases such as malaria, pneumonia, diarrhoea, measles and HIV/AIDS accounted for the cause of more than 70 per cent of the estimated one million under-five deaths (UNICEF *et al.*, 2010)

Currently, about 5.9 million babies are born in Nigeria every year, and nearly one million children die before the age of five years. One quarter of all under-five deaths are newborns - 241,000 babies each year (Ojewumi, 2012). Many deaths occur at home and are therefore unseen and uncounted for in official statistics (Ojewumi, 2012). Though, when considering the mortality trends in Nigeria since 1960, it is very clear that child deaths are falling, but not quickly enough as the current rate of progress is well short of the MDG target of a two-thirds reduction by 2015. Report from 2008 NDHS also revealed that currently, 75 children per 1,000 live births die before their first birthday (40 per 1,000 before the age of one month and 35 per 1,000 between one and twelve months). Overall, 157 children per 1,000 live births or about 1 child out of 6, die before reaching age five (NDHS 2008).

Monitoring the levels of infant and child mortality has become a high priority to access the impact of various on-going child health programs in Nigeria. Hence, the need for accurate child mortality estimates is ever greater. Most developing countries lack the complete civil registration data from which measures of child mortality are derived in developed countries, relying instead on reports from women about the survival of their children in censuses or household surveys.

There are two main approaches to estimating child mortality: direct and indirect methods. Direct methods are based on full birth histories (FBH) collecting dates of birth and ages at death for each child a woman has given birth to. Indirect methods are based on summary birth histories (SBH - numbers of children ever born and children dead). SBHs are widely used in censuses, where complete population coverage can support estimates for small geographic areas, and are sometimes used in sample surveys as well (for example, Unicef's MICS surveys), since they are much less expensive to collect than full birth histories. Methods of estimating child mortality from SBHs require assumptions, and may also be affected by selection bias (Livia and Kenneth, 2003).

Perhaps the most widely used indirect method for child mortality was developed by Brass (1975) using proportions of children dead by age group of mother, and has been extended by others including Sullivan (1972); Trussell (1975), Preston and Palloni (1978). The method relies on two pieces of information: the number of children ever borne, and the number of children surviving. Hill and Figueroa (2001) proposed using the time since first birth instead of age to reduce selection bias. Using this information along with assumptions of an underlying distribution of age specific fertility (or time since first birth), child mortality rates can be estimated. The indirect

method does not, however, provide estimates of age patterns of mortality or mortality for specified time periods, distinct disadvantages of the method

1.6 Problem Statement

Maternal and child deaths still remain unacceptably high in developing countries including Nigeria, despite the significant decline in most part of the developed world. In terms of absolute number India and Nigeria contribute significant proportion to the total number of maternal and child deaths recorded in the world per annum. The World Health Organization (2010) reported that about 40,000 women die annually in Nigeria. The situation of children is even worse, more than 5.9 million babies are born in Nigeria every year, and nearly one million children die before the age of five years old. In response to this menace facing population and development in Nigeria and other developing countries, United Nations Millennium Declaration was signed by 189 countries including Nigeria in September 2000. Its aim was that poverty eradication and sustainable development should be achieved in the world by 2015. This resolution listed a total of 8 goals of which goals 4 and 5 directly address the issues of child and maternal mortality respectively. However, maternal and child mortality is difficult to assess for various reasons. First of all, mortality is a rare event; even in areas with high ratios, the absolute number of death is relatively low. Secondly, misclassification of maternal deaths and under reporting in the case of child mortality by the mother to avoid sad memories that comes along with it (WHO, 1997). According to WHO (1987), an accurate estimation of the magnitude of maternal and child deaths is the first step towards reducing maternal mortality ratio and child mortality rates. However, in Nigeria there is paucity of data on maternal and child mortality and serious doubts surrounding the available estimates, both from routine and non-routine sources (Maudlin, 1994). The statistics of the levels of child mortality estimates currently available, either now or going back 10-15 years are due primarily to the efforts of large-scale household survey programmes such as the World Fertility Survey and the Demographic and Health Surveys (DHS, 1994) and there are few reliable demonstrations of programme impact and time series data on maternal mortality in developing countries (Campbell and Graham, 1990).

Moreover, death is a vital event and its incidence along with some ancillary information about the deceased is usually recorded through the vital registration system. Though the system has

been introduced in many countries, the quality of registered data especially in underdeveloped and developing countries is inadequate both in its content and coverage.

Furthermore, facility-based data usually suffer from serious bias owing to selectivity as such data sources may produce over or underestimates of the level of mortality rate (Adebowale *et al.*, 2010).

In the light of this, demographers have devised a method to obtain reliable estimates of maternal mortality ratio and child mortality rates from simple questions that can be answered with reasonable accuracy to provide enough information that permits the indirect estimation of its level (Tablin, 1984).

In addition the method has been widely adopted and has become an important tool in developing countries. The international organizations have used the method to provide national estimates of mortality rates for developing countries where data gathering system is poor.

The indirect technique of estimating maternal mortality using sisterhood method and childhood mortality using Brass method would be adopted because both methods provide an appropriate and cost-effective tool in a limited resources geographical area like this. Also, most studies carried out in the western region of the country have been health facility based, which provide less accurate and biased estimates of maternal mortality ratio, infant and under-five mortality rate. This present population-based study has not been done in Iwo before and should provide more representative estimates of mortality.

1.7 Justification

Traditionally, demographic estimation has been based on data collected by censuses and by a vital registration system. A vital registration system usually has the task of recording vital events as they occur. When this system is coupled with the periodic counts of the population (censuses), the calculation of demographic parameters becomes possible. Unfortunately many developing countries including Nigeria lack fully functioning vital registration system that can accurately record all birth and deaths and where it exist the data is incomplete (WHO and UNCEF 1990).

The main deficiency in the Nigerian vital registration system is its failure to record all vital events as they occur. For example it is well known that births may go unregistered for several

years. The same may be true of the births of children who die very young, in such cases the parents may consider the registration of either the birth or the death to be futile. Adult deaths are likely either to be reported near the time of their occurrence or not at all. Generally death registration is very low, perhaps due to public apathy towards the reporting of this events and the low awareness of the importance of registering the events. This registration was as low as 13.5% in the year 2007 (NPC, 2008). The vital registration system may also be deficient in recording characteristics of events such as age at death, age of mother at a birth or mother's parity after a birth.

Censuses, the second component of the traditional demographic input are also far from yielding reliable data. They suffer mainly from two types of errors: the failure to enumerate all the members of the relevant population and poor age-reporting on the part of the population canvassed. While the lack of reliable vital statistics and defective population parameters has been apparent for the last several decades the demand for accurate data on mortality has grown immensely over the same period in Nigeria (Mba, 2008). Hence, the need for indirect method to estimate reliable maternal and child mortality as the data sources are either inaccurate or incomplete or both.

Data on maternal and child mortality is a good measure for monitoring the impact of maternal and child health intervention programmes and the social and economic development of people in Iwo Local Government Area (ILGA).

This study was therefore aimed at using indirect technique to estimate maternal and child mortality and to examine selected social, religion and cultural aspect of women in ILGA Osun State, Nigeria that may be associated with maternal and child mortality. Numerous factors have been found to operate but frequently these factors are found to vary in different settings. Hence a need for empirical research among the women in ILGA to know exactly how these factors operate.

1.8 Broad Objective

To estimate maternal mortality ratio, infant mortality rate and under-five mortality rate and its perceived causes in Iwo Local Government Area

1.9 Specific Objectives

1. To estimate the life time risk of maternal death
2. To produce estimate of maternal mortality ratio using the sisterhood method
3. To produce estimates of infant and under-five mortality rate in Iwo Local Government Area, Osun state
4. To identify factors associated with child mortality
5. To determine perception of the respondents on causes of maternal mortality

CHAPTER TWO

LITERATURE REVIEW

2.1 Studies on estimate of maternal mortality

Maternal mortality remains a major challenge to health systems worldwide. Reliable information about the rates and trends in maternal mortality is essential for resource mobilization, and for planning and assessment of progress towards Millennium Development Goal 5 (MDG 5), the target for which is a 75% reduction in the maternal mortality ratio (MMR) from 1990 to 2015 (Hogan *et al.*, 2010). However, the major constraint on the planning, management and evaluation of programmes aimed at reducing levels of maternal mortality is reliable and timely population-based data (Graham *et al.*, 1989). Moreover, death registration is very low perhaps due to public opinion towards the reporting of these events and the low level of awareness of importance of registering the event. This registration was as low as 0.01 % in 1994, only rising to 13.5% in the year 2007 (NPC, 2008). These deficiencies in the information system of many developing countries are well-recognized. The long term prospects for meeting the need for estimates of maternal mortality are strongly influenced by the progress which can be made to strengthen the statistical infrastructure of these countries.

Currently, there are three main sources of information on maternal deaths: vital registration, Health service statistics, and community based surveys.

2.1.1 Hospital and clinics

A six-year review of maternal mortality ratio in a Nigerian Tertiary Health Institution (University of Ilorin Teaching Hospital, Ilorin, Nigeria) showed that 825 per 100,000 live births maternal deaths occurred in the hospital between 1 January 1997 and 31 December 2002. The review was done through a retrospective analysis of maternal mortality records. The common causes of maternal mortality included pre-eclampsia/eclampsia 30(27.8)%; haemorrhage 22(20.4)%; complications of unsafe abortion 16(14.8)%; puerperal sepsis 8(7.4)%and ectopic pregnancy 6(4.6)%. Grand multiparous and patients aged 40 years and above were at the highest risk. This hospital-based maternal mortality ratio is very high and when compared with previous reports showed a 150% increase (Aboyeji *et al.*, 2007).

The finding in this study further confirms that maternal mortality is still a very serious public health problem in developing countries such as Nigeria. When compared with previous reports

from this centre, this study shows a two to three fold increase over the ratio obtained between 1972 and 1983 and between 1983 and 1986. It is however, 1.5 times that of the 532/100,000 between 1987 and 1996. This MMR, however falls within the country's MMR ranging between 460 and 2200 with an average of 1100. It is comparable with what is obtained in other developing countries of the world: India, 785; Kenya, 730 and Zambia, 729.

The rise in maternal mortality rate is not unexpected, as the economic fortune of the country has suffered a rapid decline in the past decade. The poverty rate in the country increased from 42.7% of the population in 1992 to 65.6% in 1996 with over 67 million Nigerians falling below the poverty line. The implication of this is that many more of the patients resort to deliveries in spiritual/faith home, unregistered clinics and home deliveries, all with disastrous consequences. They only report to the hospitals in a moribund state when they therefore have a slim chance of survival.

A retrospective hospital based study was carried out in the Obstetrics and Gynaecology Department of Rural Medical College and Pravara Rural Hospital – a rural tertiary level health care referral centre in Loni, Maharashtra, India over a period of 5 years from January 2006 to December 2010 by Bangal et al., 2011. A total of 38 maternal deaths occurred among 12,544 deliveries over 5-year period, giving a maternal mortality ratio of 302.9 per 100,000 live births. Most of the women died within 24 hours of admission. The age group of 19-24 years was mainly affected. Most maternal deaths are preventable by optimum utilization of existing maternal and child health facilities, identifying the bottlenecks in health delivery system, early identification of high risk pregnancies and their timely referral to tertiary care centre (Vidyadhar *et al.*, 2011).

Stephen and Terrumun, (2011) carried out a prospective study of all maternal deaths at the Jos University teaching Hospital between June 1, 2006 and May 31, 2008. The hospital situated in Jos, Plateau State serve as a referral centre for the state and most parts of the north central region of Nigeria. During the study period, there were 56 maternal deaths and 4443 live births at the Jos University Teaching Hospital giving a maternal mortality ratio of 1260 per 100,000 live births. Of these there were 15 deaths among 81 unbooked patients giving a maternal mortality ratio of 18518/ 100,000 live births. Twenty-five deaths occurred among those who booked elsewhere (2969/100,000 live births) and 9 deaths among women who booked in Jos University Teaching

Hospital with a maternal mortality ratio of 256/100,000 live births. Thirty nine (69.6%) of the deaths were direct maternal deaths while 17 (30.4%) were indirect maternal deaths. The leading causes of direct maternal deaths were eclampsia (28.6%), haemorrhage (23.1%), unsafe abortion (8.9%) and pulmonary embolism (5.4%). Of the indirect causes of maternal mortality, HIV/AIDS accounted for 14.3% while anaemia, anaesthetic complications and thyrotoxicosis accounted for 8.9%, 3.6% and 1.8% respectively. Maternal mortality ratio is still high in JUTH. It was found to be lower in those that had tertiary education and in booked patients. HIV/AIDS appears to be emerging as one of the leading causes of maternal mortality in this study

Sule (2000) reviewed study conducted at the Ogun states University Teaching Hospital, Sagamu, in South Western Nigeria. The 10-year survey (1988-1997) showed that there were 103 maternal deaths recorded out of a total of 5320 deliveries. Maternal mortality ratio of 1,936 deaths per 100,000 live births was obtained. The study revealed that (86.4%) of the deaths were due to obstetrics causes, while 11 (10.7%) were attributable to septic-induced abortion. Other major causes of deaths were ruptures uteri (28.2%), eclampsia (12.6%) and puerperal sepsis (10.7%). Maternal deaths were higher for unbooked than booked cases, those delivered operationally as compared with normal delivery, and women who have given birth to 5-10 children as compared with 0-4. These mortality figures are alarming, especially given that, they are based on hospital data.

However, research based on hospital data gives a biased picture of the health situation, as a fraction of the population never goes to a hospital, or only in exceptional circumstances. Surveys on the general population are thus needed to obtain more accurate information on health problems.

Jabeen *et al*, (2010) conducted a descriptive study at Bahawal Victoria Hospital, Affiliated with Quaid-e-Azam medical college, Bahawalpur. This was a three years study from January 2006 to December 2008. All direct and indirect maternal deaths during pregnancy, labour and perpeurium were included. The patients who expired after arrival were analyzed on specially designed Performance from their hospital records and questions asking from their attendants. The reason for admission, condition at arrival, cause of death and possible factors responsible for death were identified. The other information include age, parity, booking status, gestational age

and relevant features of index pregnancy, along with the distance from hospital was recorded and analyzed. There were a total of 21501 deliveries and 19462 live births with 2039 perinatal mortalities. Total 133 maternal deaths occurred during last 3 consecutive years revealed MMR 683 per 100000 live births. Obstetrical haemorrhage was the leading cause of maternal deaths. This dreadful cause is preventable and manageable if steps were taken in time during antenatal period for risk detection and in postnatal period. Community awareness, training of traditional birth attendants to recognize the severity of disease and importance of being in time and improving referral can reduce the maternal deaths

Eghe and Lawrence (2008) carried out a 10-year retrospective review of the service delivery records of patients that died in the obstetric unit of Central Hospital, Benin City from 1st of January 1994 to 31st of December 2003. The overall maternal mortality ratio was 518/100,000. MMR was 30 times higher in unbooked as compared to the booked patients, while 60% of maternal deaths occurred within 24 hours of admission. The leading direct causes of maternal deaths were sepsis, haemorrhage, obstructed labor and eclampsia, while the major indirect causes are institutional difficulties and anaemia. Low literacy, high poverty levels, extremes of parity and non-utilization of maternity services were associated with maternal mortality.

A retrospective case-control study was carried out at Adeoyo Maternity Hospital, Ibadan between January 2003 and December 2004 by Olopade and Lawoyin (2008). The case files of all maternal deaths that occurred in the hospital during the two years period were retrieved and data extracted into a study preformat. Each maternal death was matched with three controls that delivered the same day and live around the same area of Ibadan. Bivariate analysis of the data was done with the cases and controls compared in relation to various risk factors. There were 8,724 lives births and 84 maternal deaths giving a MMR of 963/100,000 live births. The main causes of the death were haemorrhage 20 (23.8%), sepsis 20 (23.8%) and eclampsia 14(16.7%). Nine women (10.7%) died while pregnant, 11 (13.1%) died in labour, 52 (61.7%) died after delivery while 12 (14.3%) died from post-abortal complications. Most of the deaths due to post-partum haemorrhage (66.7%) were seen in mothers over the age of 29 years while 64.2% of deaths due to eclampsia were in women under the age of 25 years due to eclampsia occurred in nulliparous women and PPH was responsible for deaths in more women as their parity increased

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from two. From bivariate analysis, factors significantly associated with maternal death included unbooked status.

Ujah *et al.*, (2005) reviewed all the records of all deliveries and case files of all women who died during pregnancy and childbirth between January 1, 1985 and December 31, 2001, in the maternity unit of Jos University Teaching Hospital, Jos, Nigeria. There were 38,768 deliveries and 267 maternal deaths during the period under review, giving a maternal mortality ratio (MMR) of 740/ 100,000 total deliveries. The trend fluctuated between 450 in 1990 and 1,010/100.000 deliveries in 1994. The greatest risk of MMR was among young teenagers (> 15 years) and older women (< 40 years). Parity-specific maternal mortality ratio was highest in the grand multiparous women.

Kullima *et al.*, (2005) conducted a retrospective study of maternal deaths from 1st January 2003 to 31st December 2007 at Federal Medical Centre, Nguru, Yobe State. There were a total of 112 maternal deaths, while 3931 deliveries were conducted over the 5-year period. The maternal mortality ratio (MMR) was 2849/100,000 deliveries. The highest MMR of 6234/100,000 was observed in 2003, with remarkable decline to 1837/100,000 in 2007. Eclampsia consistently remained the leading cause, accounting for 46.4% of the maternal deaths, followed by sepsis and postpartum haemorrhage contributing 17% and 14.3%, respectively.

2.1.2 Vital Registration

Adamu *et al.*, (2003) carried out a population-based study to determine the incidence and causes of maternal mortality as well as its temporal distribution over the last decade (1990-1999) in Kano. This was a retrospective study using information contained in the vital statistics register maintained by the research and statistics department of the Ministry of Health in Kano. The village or local government council also reported births and deaths that occurred at home to the Zonal council in charge of the area. All the maternal deaths recorded within the study period in the Kano state, Nigeria, were analyzed. A total of 4,154 maternal deaths occurred among 171,621 deliveries, yielding a MMR of 2420 deaths per 100,000. Eclampsia and anaemia were responsible for about 50% of maternal deaths. The highest maternal mortality ratio ever reported in the world was found. This community-based surveillance system is more accurately assessed

deaths than facility-based systems, and the results can help program managers understand the causes of poor pregnancy outcomes, identify areas for improvement, and monitor the effectiveness of interventions. Such systems can be used at the community and district levels to assess trends, but sustainability of the system depends on community commitment (Olsen *et al.*, 2000; Font *et al.*, 2000).

Buyanjargal *et al.*, (2010) describe the declining trend in maternal mortality observed in Mongolia from 1992 to 2007 and its acceleration after 2001 following implementation of the Maternal Mortality Reduction Strategy by the Ministry of Health and other partners. A descriptive analysis of maternal mortality data collected through Mongolia's vital registration system and provided by the Mongolian Ministry of Health. The observed declining mortality trend was analyzed for statistical significance using simple linear regression. Mongolia achieved a statistically significant annual decrease in its maternal mortality ratio of almost 10 deaths per 100 000 live births over the period 1992-2007. From 2001 to 2007, the maternal mortality ratio in Mongolia decreased approximately 47%, from 169 to 89.6 deaths per 100 000 live births. Disparities in maternal mortality represent one of the major persisting health inequalities between low- and high-resource countries. Nonetheless, important reductions in low-resource settings are possible through collaborative strategies based on a horizontal approach and the coordinated involvement of key partners, including health ministries, national and international agencies and donors, health-care professionals, the media, nongovernmental organizations and the general public

2.1.3 Community based survey

Besides information on maternal mortality, it is more to have information on why women are dying. For some time confidential enquiry into maternal death has been used in order to identify avoidable factors and weaknesses in obstetric care with the aim to modify them, to improve maternal health care and ultimately reduce maternal mortality.

Hofman and Ndemera (2005) conducted a longitudinal descriptive study to describe the causes and contributing factors of maternal deaths in the area of T/A Nankumba, Mangochi district, Malawi over the years 1999-2001. 22 out of 43 maternal deaths (51%) were investigated. 44% of deaths occurred at the district hospital, 30% at home, 12% at health centre, 7% with a

TBA and 7% on road. Postpartum haemorrhage, ruptured uterus, obstructed labour and complication of abortions were the leading causes accounting for 79% of maternal deaths. Puerperal sepsis accounted for 5%, but may have been the immediate cause of deaths in cases of obstructed labour. Usually more than one contributing factor played a role. Most common was delay to decide or refusal to seek professional assistance when a complication occurred (77%). In 41% there were difficulties, delay or failure to reach the referral hospital, in 18% there was inadequate case management by TBAs. Quality obstetric care at district hospital has not been assessed, but in 32% of cases no blood transfusion could be given because of lack of blood or donors.

Mohammed *et al.*, (2011) conducted a study to investigate the causes and contributing factors of maternal deaths and to identify any discrepancies in rates and causes between different areas. A reproductive age mortality survey (RAMOS) was conducted to study maternal mortality in Kassala State. Eastern Sudan. Deaths of women of reproductive age in four purposively selected areas were identified by interviewing key informants in each village followed by verbal autopsy. Over a three-year period, 168 maternal deaths were identified among 26,066 women of reproductive age. Verbal autopsies were conducted in 148 (88.1%) of these cases. Of these, 64 (43.2%) were due to pregnancy and childbirth complications. Maternal mortality rates and ratios were 80.6 per 100,000 women of reproductive age and 713.6 per 100,000 live births, respectively. There was a wide discrepancy between urban and rural maternal mortality ratios (369 and 872\100,000 live births, respectively). Direct obstetric causes were responsible for 58.4% of deaths. Severe anemia (20.3%) and acute febrile illness (9.4%) were the major indirect causes of maternal death whereas obstetric hemorrhage (15.6%), obstructed labor (14.1%) and puerperal sepsis (10.9%) were the major obstetric causes. Of the contributing factors, we found delay of referral in 73.4% of cases in spite of a high problem recognition rate (75%). 67.2% of deaths occurred at home, indicating under-utilization of health facilities, and transportation problems were found in 54.7% of deaths. There was a high illiteracy rate among the deceased and their husbands (62.5% and 48.4%, respectively). To reduce this high maternal mortality rate this study recommend improving provision of emergency obstetric care in all health facilities, expanding midwifery training and coverage especially in rural areas.

Songane and Bergstroms (2002) carried out a community-based among 207,369 people in central Mozambique. This was done by assessing maternal deaths using existing health facility records, interviews with health personnel and community collaborators to report deaths of women of reproductive age. During the one-year study period (August 1996 through July 1997) there were 204 deaths of women of reproductive age, and 40 of these were classified as maternal deaths. The study revealed significant under registration of maternal deaths in routine available sources of information. The provincial directorate of health failed by 87 percent to record maternal deaths. The Civil Register and the Funeral Services only registered 9 percent of the maternal deaths. Case notes were often missing for deaths at institutions, and the quality of the information in the notes was poor. It was discovered that there is need to identify a practical and reliable way to collect information about maternal deaths on a routine basis.

2.2 Estimate of Maternal Mortality Using Sisterhood Method

The first field trial of the Sisterhood method was carried out in September 1987 in the Gambia. Since 1982, the British Medical Research Council have maintained a rural population Surveillance system in the Farafenni area of North Bank Division, of the Gambia. This provided an opportunity to evaluate sisterhood method in relation both to deaths recorded by continuous vital registration and to the results of a pregnancy follow-up study conducted by the Medical Research Council among this population in 1982/83 (Graham, 1988). This method uses the proportion of adult sisters dying during pregnancy, childbirth, or the puerperium, to derive a variety of indicators of maternal mortality. The trial was carried out in six villages, two to the west of Farafenni town and four to the east. The target population of the survey was all adults over age 15 years. The interviews were conducted with 2163 individuals, 47% were males and 53% females. The lifetime risk of maternal mortality among this rural population was found to be 1 in 17 chance of death from pregnancy-related causes during the reproductive period, or a maternal mortality ratio of about 1005 maternal deaths/100,000 live births. The previous study estimates were 1050 and 950/100,000 live births covering the period 1951-75 for two nearby villages. It was observed that, the sisterhood method provides an approach suited for estimating

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maternal mortality at a national and sub-national level, thus complementing the findings of smaller scale studies (Graham *et al.*, 1988).

The sisterhood method was applied to Djibouti population data. The survey was implemented in February, 1989 using a modified version of the EPI/CDD cluster sampling method. Comprising the national sample, 30 clusters were involved in Djibouti City and 30 clusters in 4 rural areas using probability proportional to size methods and the 1983 population census sampling frame with a 3% increase. Within 100 ever married women were selected per cluster and 4000 respondents were desired. The assumption was about 500 per 100,000 live births, a total fertility rate of about 6, and an error rate of 6%. The results of the 7408 females 15-49 years interviewed were that the lifetime risk of dying of maternal causes was found to be 0.049 or 1 in 20. Using a total fertility rate of 6.8, the maternal mortality ratio was calculated as 740 maternal deaths per 100,000 live births 11.6 years prior to the survey. The results of the assessment of the quality of the data showed underreporting of the 2 youngest age groups, which suggests misreporting. Severe age heaping on ages of respondents ending in 0 and 5 was also apparent. In spite of the difficulties, the results are plausible and lend support to the method (David *et al.*, 1991).

In Thyolo district in southern Malawi, 5 field teams used the sisterhood Method to interview 4124 people older than 15years in 7 traditional authorities to estimate the lifetime risk of maternal death and the MMR in this area. The life time risk of maternal death stood at 1 in 36 (1.0282).The MMR was 409/100 000 live births.

In another setting in Africa, the sisterhood method was used in a study carried out in rural Niger. It involved 3058 respondents who identified 5796 sisters, among whom 186 were reported to have died from maternal causes. Based on the study findings, the MMR was estimated at between 1030 and 1050 per 100 000 live births, significantly higher than the World Bank estimate of 700/100 000 live births for this part of Africa, but similar to rates obtained using the same method in other West African countries with deficient data collection (Adebowale *et al.*, 2010). These findings prove useful to community and health leaders in designing intervention strategies to reduce MM in the area (Adebowale *et al.*, 2010).

The level of maternal mortality estimated by the sisterhood method is presented for a rural district in the Morogoro Region of Southeastern Tanzania and the main causes of maternal

death are studied. Information from region-specific data using the sisterhood method is compared to data from other sources. The maternal mortality ratio was 448 maternal deaths per 100 000 live births . Maternal causes accounted for 19% of total mortality in this age group. One in 39 women who survive until reproductive age will die before age 50 due to maternal causes. The main cause of death provided by hospital data was puerperal sepsis (35%) and postpartum haemorrhage (17%); this is compatible with the main causes reported for maternal death in settings with high levels of maternal mortality, and similar to data for other regions in Tanzania. The sisterhood method provides data comparable with others, together with a cost-effective and reliable estimate for the determination of the magnitude of maternal mortality in the rural Kilombero District (Font *et al.*, 2000).

Idris *et al.*, (2010) estimated the MMR, the percentage of deaths due to maternal causes, and the lifetime risk of maternal death in three rural communities in Zaria emirate, Kaduna state using the indirect sisterhood method. A total of 1,906 respondents were interviewed. Respondents were mostly Hausa Muslim individuals from 15-49 years of age with a Quranic education. Maternal causes accounted for 46.8% of all deaths, with a 1:13 lifetime risk of dying from maternal causes, and MMR of 1400 per 100,000 live births. Achieving the fifth Millennium Development Goal will require accurate estimates of maternal deaths. A survey-based method such as the sisterhood method are valuable tool in rural area that lack reliable data

Hauwa (2005) used an indirect sisterhood method to estimate the maternal mortality ratio in Fika L.G.A., a rural L.G.A. in Yobe state using a sample of 4,093 male and female respondents aged 15-49 years selected from 4 villages by three staged cluster sampling. The mean age of the respondents was 33.5±9.8 years. The study showed that the maternal mortality ratio among the study population was 3,200/100,000 Live births, the proportional maternal death to the total deaths from all causes for women of reproductive age is 46.5% and the overall lifetime risk of dying a maternal death by the end of reproductive period is 0.181 or 1 in every 6 women

2.3 Studies on estimate of Childhood mortality

The importance of mortality data cannot be overemphasized. However, there is a paucity of information concerning mortality data in Nigeria as well as other developing countries. Age-

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specific mortality rates among children and infants are calculated from birth and death data derived from vital registration, census and/ or household surveys (WHO, 1999).

2.3.1 Vital registration

The vital registration is the continuous, permanent and compulsory registration of the occurrence and characteristics of vital events – births, deaths, marriages, divorce and migration (Mba, 2008). The statistics generated from the exercise is referred to as **vital statistics** because they have to do with the individuals entry into, and departure out of life, with the changes in the civil status of the individual in his/her life time. It serves two main purposes; one, as personal legal documents for proof of age, identity, marriage etc. Two, they form the backbone of vital statistics system which is expectedly an integral component of a country's health information system. The most reliable data source for estimating under-five mortality rate (the probability of dying between birth and age 5 years, also denoted in the literature as U5MR and 5q0) at the national level is vital registration data, when such data are complete and timely (Silva, 2012).

The need for quality vital registration systems is a priority among several international agencies. Guideline for the establishment and improvement of a vital registration system has been developed by the Statistical Commission of the United Nations as far back as 1973 and revised in 2001(United Nations, 2002). There have been improvements in vital registration system in many countries especially in Europe and the Americas but Nigeria and other sub-Saharan African countries have remained at the lowest rung of the ladder (Mathers *et al.*, 2005). These are the poorer countries and their poorest residents who still live in abject poverty and need population data to be planned. for Nigeria like many developing countries has a very long and uncoordinated history of vital registration. In the distant past for example, both private and public organizations instituted a practice that can be called vital registration for different purposes. For example, while private organizations such as the churches, mosques and traditional rulers organized registration of certain vital events such as births, deaths and marriages basically for their own consumption, many public organizations on the other hand, simply mounted vital registration systems in order to generate revenue. It is interesting to note that the various attempts by these private and public organizations to organize registration of certain events were done without any form of legislation that would compel people to comply. This thus, affected the depth of such compilation. However in 1863, the first formal attempt at institutionalizing a vital

registration system in Nigeria was made with the promulgation of ordinance No. 21. This ordinance made provisions for registration of births and marriages as well as the census of Lagos colony (Salawu, 2009). The actual implementation of the provision of the ordinance did not kick off until 1892. The program recorded an encouraging level of success, in terms of numbers of births and marriages registered, which made the colonial government to extend it to Warri and Calabar in 1903 and 1904, respectively.

Thereafter, several ordinances by governments in different parts of Nigeria emerged making expressed provisions for vital registration. However, a comprehensive legislation for registration of vital events that covered the whole country did not emerge until 1917. In 1948, a further progress was recorded when a 'birth, deaths and burial ordinance' was promulgated visibly to consolidate the provisions of the 1917 ordinance.

However, one interesting thing to note about the 1948 ordinance was that it was limited mainly to the township, while the rural areas of the country were left uncovered. As mentioned earlier, these early attempts at registration of vital events in Nigeria were not properly coordinated and as such they were not universally applicable, though each was characterized by pockets of success here and there. This means that at the initial stage, the best the country had were regional laws concerning registration of vital events. This was the situation before the Federal Government of Nigeria prepared and released a legal document, which introduced universal civil registration, titled births and deaths compulsory registration decree No. 39 of 1970. This decree was later reviewed, which gave birth to another decree named births, death etc. compulsory registration decree No. 69 of 1992.

One unique feature of the 1992 vital registration decree is that it established for the first time vital registration in all the local governments in the country with effect from February/March 1994. The decree also placed the responsibility of vital registration squarely under the national population commission. The objective of this new attempt was to establish a uniform system of vital registration nationwide. To do this, the previous regional laws and decree No. 39 of 1970 were reviewed and from this exercise, a new decree was promulgated. Under this new decree, the commission was given the power to appoint the registrar-general, registrars and other staff to run the affairs of the vital registration programmes for the entire country.

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Like all legislations authorizing vital registration in many countries of the world, the vital registration decree in Nigeria expects that the national population commission register all vital events. However, because of the enormous nature of this assignment, the commission focused its attention for now on the registration of three events namely, births, deaths and still-births. To develop a complete and efficient vital registration of the above mentioned vital events, the commission started with some forms of experimentation broken into phases-phase I-III. These are called the experimental vital registration phases. Each phase covered different sector of the Nigerian society. For instance, the experimental phase I was urban local government areas-based in four states selected for the experiment. This is tagged urban experimental phase I. The experimental phase II on the other hand, is rural-based and it covered four predominantly rural local government areas in the same four states selected in phase I. The last experimental phase is the state local governments phase III. This was introduced nationwide in March 1991. This phase covered all the local government areas in all state capitals throughout the nation.

It is worth-noting that the overall success recorded in all the experimental phases led to the expansion of the project in February/March, 1994. The expansion was made to cover all the local government areas nationwide. With this expansion, the national population commission approved the establishment of at least two centers in each local government area in Nigeria. Another landmark progress made in the area of vital registration system in Nigeria is the institution of well-defined administrative structures for the implementation of vital registration objectives. The vital registration administrative structure adopted in Nigeria is the hierarchical organization type that conforms to the three tiers of operation of the national population commission. Consequently, registration centers have been selected at each commission's level of operation and staffed by registration officers. Procedures for registration have also been put in place.

An examination of the spatial and volume of coverage of vital registration in Nigeria in the context of the administrative structure discussed above shows that as of today, the spatial coverage is low and is only much effective in urban areas, states and local government headquarters. In the rural areas on the hand, the impact is almost absent due to inaccessibility of rural settlements. What can be deduced here is that because there are more rural than urban localities in almost all the states in Nigeria, the spatial coverage cannot be said to be above

average. As of now, two registration centers are approved for each local government area, which is far from being adequate. The inadequate level of spatial and volume coverage of vital registration in Nigeria as reported above may be due to a number of factors namely: insufficient funding; insufficient nationwide publicity; inadequate number of registration centers; competition from local councils and lack of effective sanctions (Salawu, 2009).

T.M. Akande and O. O. Sekoni (2005) conducted a survey on birth and death registration in a semi-urban settlement in middle-belt Nigeria using a descriptive cross-sectional survey. Three hundred and two heads of households were interviewed in houses selected by systematic random sampling and birth registration certificate checked for children below 11 years.

The study showed that awareness of birth registration was high in the study population and the major source of awareness is through government agencies and mass media play very little role. The awareness of death registration is however very low. Out of the 217 (71.9%) households that had children below 11 years, total children below 11 years is 473 children, 354 (74.8%) of them had their births registered and only 202 (57.1%) had registration certificate during the interview. Of the 209 households that recorded deaths in the household within the last 10 years only 24 (11.8%) households reported registering deaths in the last 10 years.

Nannan *et al.*, (2012), reviews available empirical data on levels and causes of child mortality, and consolidates information about the changes that have occurred between 1990 and 2007 in South Africa. The consistency between data sources is considered and efforts are made to estimate child mortality trends. The data include 11 years of vital registration data (1997–2007) from Statistics South Africa, national household surveys and censuses, five years of injury data collected by the National Injury Mortality Surveillance System (2001–005), as well as provincial and demographic surveillance and health service data. Model estimates of child mortality are also considered and assessed against the empirical data.

Vital registration shows that in 2007, the majority of registered child deaths were infants (76%), with 22% of these deaths occurring in the first month of life, i.e. the neonatal period. The majority of the deaths (54%) occurred in the post-neonatal age group (1–11 months). Of the 61 335 under-5 deaths registered in 2007, diarrhoea disease accounted for 21% of deaths, lower respiratory infections for 16% and ill-defined natural causes for 13%. Only 1.2% of the deaths

were certified as being due to HIV/AIDS. The number of registered child deaths increased steadily since 1997, peaking in 2006. The greatest rate of increase was observed in the post-neonatal period, with a particularly marked rise in infection-related deaths including diarrhoea and pneumonia. Interestingly, HIV/AIDS mortality is not particularly apparent in the neonatal period, but there is a definite 'AIDS signature' (a peak between months 2 and 4), which develops over the course of the epidemic. These deaths are concentrated in the pneumonia and ill-defined categories and to a lesser extent in the diarrhoea category. This peak starts to decline approximately two years earlier in the Western Cape (2003) than in the other provinces (2005) due to the earlier roll-out of PMTCT in that province.

There have been substantial improvements in the registration of child deaths during 1997–2007, reaching levels of 90% completeness for infants and 60% for children aged 1–4 years. Despite these improvements, South Africa cannot use vital statistics to measure child mortality without adjusting for completeness. In addition, the cause of death information needs to be interpreted carefully. Efforts to ensure that all deaths are registered and improve the quality of the cause of death information must continue.

2.3.2 Population Census

A Census of population may be defined as the total process of collecting, compiling and publishing demographic, economic and social data pertaining, at a specified time or times, to all persons in a country or delimited territory. Some of the essential features of an official national census are; sponsorship, defined territory, universality, simultaneity, individual unity, compilation and publication. Census data are of great value if censuses are taken at regular intervals. A series of periodic censuses is of great importance in assessing trends – the past can be appraised, the present accurately described, and the future estimate. The UN recommended that every country develop a census programme which will provide that a population census be taken every ten years.

A census is usually conducted by a national government, such as the Federal Government because of the enormous funds, personnel, and other resources required to support the vast organization and large expenditures of a full-scale census. In many jurisdictions, it is the only

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authority mandated to conduct population census in a country. For example in Nigeria the National Population Commission is the statutory organization empowered to collect, analyze and disseminate population/demographic data in the country. A national census requires a vast amount of preparatory work, which include: the preparation of maps and lists of enumeration areas; adequate publicity for the census; designing the census questionnaires; selecting and training of census personnel; pre-testing the questionnaires; and taking a decision on the method of collecting data. The methodology issue is important because a census can be conducted using either the 'de facto' or the 'de jure' approach. The 'de facto' approach is the procedure whereby all persons are enumerated at the place where they physically were on Census Night. The 'de jure' approach is the system whereby all persons on Census Day are enumerated according to their place of usual residence.

Censuses are conducted not just to satisfy the needs of the central governments but also that of other units of government, such as the States and Local governments, as well as the private sector. This is because at some point in time, each of these stakeholders would require for planning purposes, an in depth examination of the characteristics of the people within their areas of jurisdiction. Such data which must be comprehensive, timely and reliable must be able to describe the age, sex, occupation, marital status, literacy levels, number of children ever born, number of children living, ethnic composition, religious affiliation, presence and durability of disability, the spatial distribution of the population as it relates to rural and urban areas as well as different political units of the country. Population trends such as birth and death rates and internal migration are some of the data expected to be captured from a population census.

The Nigeria census history is replete with controversies over the population count and the earlier efforts to provide the country with accurate and reliable figures ended up most of the time in controversies leading to cancellation of the exercise or non-acceptability of the census result, with the exception of the 1991 census. This was mostly due to over-politicization of the census process, failure to meet the international standard and lack of transparency in the methodology and processes adopted. Varying degree of over-enumeration of population was rampant throughout the country coupled with omission of certain settlements in the earlier census exercise and this coupled with the failure to technically control it, possibly contributed much to the unacceptability of the result (NPC, 2009). The federal government uses population figures to

calculate how much money to allocate to each of the country's 36 states and has result into hiking of population data in some quarters.

According to NPC (1998), Nigeria has had a long history of checkered censuses. Though there have been earlier attempts, the first elaborate and near scientific census were carried out in 1952/1953 but probably underestimated the population. The first census after independent was conducted in 1962 but had to be cancelled after declaration of results, as it did not meet the expectations of the political elite (NPC, 2009). Another census was conducted in 1963, which was ultimately accepted politically with much rancor but technically the results were not defensible as these have been often termed "negotiated". Another census was attempted in 1973 by the then military regime but after conducting the census, the results were declared annulled by the then government. No census could be conducted in the 1980's and in 1991 the then military government conducted a census. The provisional results were declared in 1992 but the final results could be accepted by the government only in October 1997. NPC (1998) estimated several indices on mortality as follows: Crude death rate 14 deaths per 1000 population; Infant mortality rate 93 per 1000 births; Life expectancy at birth (e), 53.2 years; Male life expectancy at birth (e), 53.2 years; Female life expectancy at birth (e), 52.6 years.

Although not everyone either in the country or outside accepted the census results of 1991, over the years by and large there was general consensus that the 1991 results were a fair representation of the regional and national populations.

The most recent census was carried out in March 2006 and provisional results have been released. A post enumeration survey (PES) was carried out few weeks after the main census to assess the accuracy of the data collected during the census and to provide additional information on fertility, mortality and migration variables that were not covered in the main census. Analysis of the PES data is still on-going as we write. It is hoped that the major weakness of PES of the 1991 census is not repeated. The weakness was the failure to implement a matching exercise which should have helped to identify missed and duplicated persons. The census put the total population of Nigeria as 140,431,790 comprising of 71,345,488 males and 69,086,302 females. The absolute change in the population of the country is 428,248 and the percentage change is an increase of 0.3% over the provisional results. The annual exponential population growth rate is 3.18 per cent between the period of the two censuses of 1991 and 2006 and the sex ratio is 1.03

at the national level. However, different reactions trailed the released of the result particularly relative proportions of the population in the northern and southern states.

Ayeni (1975) identified the reasons for paucity of fertility and mortality data from census to include; the inaccuracy of the returns in coverage and data quality, census being few and far apart, insufficient personal details about the population enumerated and unavailability of disaggregated population data for local areas. Unfortunately, not much progress has been made since then till date.

2.3.3 Household survey

Household survey seeks to collect information only from a fraction of the population. The relatively small sample size makes survey less expensive and more flexible than population censuses and civil registration. It is employed to arrive at estimates of demographic characteristics of the population size, distribution, mortality, fertility and migration.

The past few decades have seen an increasing demand for current and detailed demographic data for household and individuals in developing countries (UN, 2005). Under-five mortality can be measured using a number of different methods, including registration of births and deaths via registration systems, national population censuses and /or data collected through household survey. When vital registration systems are of good quality, the under-five mortality can be easily estimated. However, in the developing countries including Nigeria do not have well-functioning vital registration systems which can generate nationally representative estimates. Hence, under-five mortality can be derived from household survey data using direct/indirect methods, including MICS and DHS surveys.

House hold survey rely heavily on two common forms of retrospective birth history data: full and summary birth histories. In full birth histories (FBHs), women are asked to retrospectively report each live birth, the date of the birth, and, if the child has died, its age at death. In summary birth histories (SBHs), women are asked to report only summary information: the number of children ever born to them, the number of those children still surviving at the time of the survey, and proxy exposure information (usually the mother's age, duration of her marriage, or time since her first birth)(Silva, 2012).

MICS is an international household survey programme develop by UNCEF. The Nigeria MICS was conducted as part of the fourth global round of MICS surveys (MICS4). MICS provides up-to-date information on the situation of children and women and measures key indicators that allow countries to monitor progress toward the Millennium Development Goals (MDGs) and other internationally agreed upon commitments.

Administratively, Nigeria is divided into states. Each state is subdivided into local government areas (LGAs), and each LGA is divided into localities. In addition to these administrative units, during the 2006 population census, each locality was subdivided into census enumeration areas. The frame of Enumeration Areas (EAs/Clusters) of 2006 Housing and Population Census conducted by National Population Commission (NPC) was used for the survey.

The infant mortality rate is estimated at 97 per thousand while the under-five mortality rate is 158 per thousand (Rates refers to mid-2005). The infant mortality rate for male child is 106 per thousand against 86 per thousand for female child. Similarly, the under-five mortality rate was 170 per thousand and 144 per thousand for male and the female child respectively. Infant and under-five mortality rates are lowest in the South-West zone with 55 and 83 per thousand respectively while the corresponding figure for North-West are 123 and 208 per thousand respectively. Infant mortality rate is lower in the urban areas (68 per thousand) than rural areas (110 per thousand) while under-five mortality rate is 106 per thousand in urban against 182 per thousand in rural area (MICS, 2011).

2.4 Determinant of maternal mortality

The WHO Factsheet (2008) indicates that globally, about 80 percent of maternal deaths are due to four major causes- severe bleeding, infections, hypertensive disorders in pregnancy (eclampsia) and obstructed labour. Complications after unsafe abortion cause 13% of maternal deaths. Among the indirect causes of maternal death are diseases that complicate pregnancy or are aggravated by pregnancy, such as malaria, anaemia, hepatitis, anaesthetic death, meningitis, HIV/AIDS, sickle cell anaemia, anaemia and acute renal failure, which could be a complication of eclampsia. Omoruyi (2008) estimated that in Nigeria, more than 70 percent of maternal deaths could be attributed to five major complications: haemorrhage, sepsis, unsafe abortion, hypertensive disease of pregnancy and obstructed labour. Also, poor access to and utilization of

quality reproductive health services contribute significantly to the high maternal mortality level in the country.

Jones (1980) stated that the matemal health problems resulted from medical causes as well as socio-demographic factors.

The underlying factor of most maternal deaths is ignorance and apathy by women and the society in general. Most women ignore early warning signs due to lack of adequate knowledge and information about danger signals during pregnancy and labor and so delay to seek care. Also, adequate preparation for any emergency before, during and after delivery is also lacking.

Individual characteristics of mothers found to influence maternal deaths include maternal age, educational attainment, socio-economic status and antenatal attendance. Poor socio-economic development, weak health care system and socio - cultural barriers to care utilization are also contributory (Ogunjimi *et al.*, 2012).

Socio-cultural variables in the prediction of maternal mortality include

Early marriage

Early marriage accounts for about 23% of maternal mortality due to severe hemorrhage resulting from obstructed and prolonged labor. The narrow pelvis of these women may also result to fistula and often time still births.

Poor family planning practice

Unsafe abortions accounts for at least 13% of all maternal deaths. If people are not aware of good contraceptive methods, there will be a lot of unwanted pregnancies among the young age group. These most often resort to unsafe abortion with its resultant infections, hemorrhage and injuries to the cervix and uterus.

Inadequate obstetric and post-partum care

About 69% of women still give birth in a traditional setting either at home or in a church. Only 30% of people in the rural areas have access to health care within 4 km distance. The same issue is applicable to people in the urban setting (Lindros and Lawkkainen, 2004). Most attendants of these births in the churches are unskilled.

Educational attainment of women

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Educational attainment of women

Female illiteracy adversely affects maternal and child survival rates and is also linked to early pregnancy. The lack of primary education and lack of access to health care contribute significantly to child and maternal mortality statistics. Women who complete secondary education are more likely to delay pregnancy, receive prenatal and post-natal care and have their birth attended to by qualified medical personnel.

Child death

This in itself is a risk factor for maternal death in the sense that when a mother loses a child at birth, she would want to get pregnant almost immediately not weighing the risk involved.
Also included here are: women decision making power, economic status and access to health care services, food restriction and taboos. Poverty and ignorance also play a part as many families faced with challenges of meeting their basic needs also lack adequate resources for taking care of their health challenges.

2.5 Determinant of child mortality

Childhood morbidity and mortality are mainly from infectious diseases and anaemia. Breastfeeding, better nutrition, improved housing, hygienic and environmental sanitation, safe water supply, endemic disease control, immunization against common childhood diseases and education could prevent most of the disease, which affect children in the tropical and developing countries (Ngozi, 1999).

On the average, 70% of child deaths in Africa are attributed to a few mainly preventable causes such as acute respiratory infections, diarrhoea, malaria, measles, malnutrition and neonatal conditions which include suffocation, prematurity and low birth occurring singly or in combination. More children die in Nigeria from these simple preventable and curable health conditions. Malaria alone accounts for about 24% of child deaths annually in the country. More than one million children die annually in the country before their fifth birthday with malnutrition as the underlying cause for more than 50% of these mortalities (Ogunjimi *et al.*, 2012).

Infectious and nutritional deficiencies remain the major causes of morbidity and of the unacceptable high mortality rates in the tropics (Ngozi, 1999). Low educational status of the mother and poor environmental sanitation may put children at risk of childhood diseases

(Omokhodion *et al.*, 2003). Preventable measures are direct at improving the nutrition status and the socio-economic circumstance of the entire population. Appropriate health education and promotion of health seeking behaviour are desirable strategies.

Until the preventable factors of diseases in Nigeria are adequately controlled, preventable disease will continue to kill so many children. Delay in diagnosis and treatment also contributes to the mortality.

2.5.1 Health-related factors that affect child survival

Infant and Young Child Feeding (IYCF)

Of all proven preventive health and nutrition interventions, infant and young child feeding has the single greatest potential impact on child survival (UNICEF, 2011). Therefore, reduction of infant and child mortality can be reached only when nutrition in early childhood and infant and young child feeding specifically are highly prioritized in national policies and strategies. The 2003 Landmark Lancet Child Survival Series (3) ranked the top 15 preventative child survival interventions for their effectiveness in preventing infant and under-five mortality. Exclusive breasting up to six months of age and breasting up to 12 months was ranked number one, with complementary feeding starting at six months number three. These two interventions alone were estimated to prevent almost one-fifth of under-five mortality in developing countries.

The 2008 Lancet nutrition series (4) also reinforced the significance of optimal IYCF on child survival. Optimal IYCF, especially exclusive breastfeeding, was estimated to prevent potentially 1.4 million deaths every year among children under five (out of the approximately 10 million annual deaths). According to the nutrition series, over one-third of under-five mortality is caused by under-nutrition, in which poor breastfeeding practices and inadequate complementary feeding play a major role.

Growing evidence points to the impact of early initiation of breastfeeding on neonatal mortality. A 2006 study in rural Ghana (Mullany *et al.*, 2008), showed that early initiation within the first hours of birth could prevent 22% of neonatal deaths, and initiation within the first day, 16% of deaths, while a study in Nepal found that approximately 19.1% and 7.7% of all neonatal deaths

could be avoided with universal initiation of breastfeeding within the first hour and first day of life respectively.

Breastfeeding especially six months of exclusive breastfeeding, has a significant effect in the reduction of mortality from the two biggest contributors to infant deaths: diarrhea and pneumonia. According to UNICEF (2011) some of the common belief about infant feeding that are not true include: most women cannot produce enough milk, and therefore need to feed the baby with other foods/milk. There is the belief that babies need to receive traditional teas and medicines and that every baby needs water.

Regarding formula feeding, the belief is that it is as good as breast milk and bottle feeding is harmless and hygienic. It is also widely believed that breastfeeding 'ruins' breast and that a mother who is ill should not breast feed, malnourished women cannot produce enough milk and cannot breast feed. Also, breast feeding mother cannot have sex as the milk will go bad, therefore she should stop breastfeeding soon so that sexual relations can resume.

Utilization of Healthcare Services

Health care utilization is the use of health care services by people. The health care utilization of a population is related to the availability, quality and cost of services, as well as to socio-economic structure, and personal characteristics of the users (Chakraborty *et al.*, 2003; Manzoor *et al.*, 2009; Onah *et al.*, 2009). The under-utilization of health services has been almost a universal phenomenon in developing countries (Zwi, 2001). It is therefore in recognition of this fact that various Nigerian government have made numerous great efforts towards the provision of health care facilities to its population. Notable among these efforts were the expansion of medical education, Improvement of public health care, provision of primary health care in many rural areas. However, the state of the Nigerian health system is dysfunctional and grossly under-funded. As a result, Nigeria still has one of the worst health indices in the world. Rural area dwellers are the most hit prior to huge shortage of qualified practitioners, insufficient health infrastructure, presence of chronic diseases and disabilities, socioeconomic and physical barriers (Ricketts, 2009).

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Antenatal care

Antenatal care and attention to neonatal health play a decisive role in diagnosing and treating maternal diseases as well as in counselling and promoting vaccination. A Bolivian DHS survey analyzed by Forste (1994) indicates that antenatal care received from a physician or other health care professional reduces the odds of death, including the neonatal period, by a factor 1.2, as compared with children of women who received no care at all.

The author suggests that children whose mothers received the anti-tetanus injection during pregnancy, for instance, were 1.7 times less likely to die during the first two years of life than children whose mothers did not.

Victoria and Barros (2001) also state that access to sexual reproductive health services, especially antenatal care, can reduce infants and child mortality by having maternal diseases, such as Syphilis, diabetes, hypertension, HIV, and other infections, diagnosed and treated, by improving maternal nutrition, by having infants vaccinated against tetanus, by providing health advice on smoking and drinking.

2.5.2 Socio-demographic Factors That Affect Child Survival

Poverty

Poverty is a multidimensional phenomenon. The World Development Report 2000/2001 summarizes the various dimensions as a lack of opportunity, lack of empowerment and a lack of security. The window of opportunity remains closed to the poor masses, and this makes them practically inactive in the society. Their lack of empowerment limits their choices in almost everything and their lack of security makes them vulnerable to diseases, violence and so on. Similarly, a United Nations statement says:

> Poverty is a denial of choices and opportunities, a violation of human dignity. It means lack of basic capacity to participate effectively in society. It means not having enough to feed and clothe a family, not having a school or clinic to go to; not having the land on which to grow one's food or a job to earn one's living, not having access to credit. It means insecurity, powerlessness and exclusion of individuals, households and communities. It means susceptibility

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to violence, and it often implies living on marginal or fragile environments, without access to clean water or sanitation

In Nigeria, widespread and severe poverty is a reality. It is a reality that depicts a lack of food, clothes, education and other basic amenities. Severely poor people lack the most basic necessities of life to a degree that it can be wondered how they manage to survive.

There are several effects and deficiencies associated with poverty in Nigeria. One of the main effects of poverty is poor health, as is reflected in Nigeria's high infant mortality and low life expectancy. Poor people in Nigeria face several health issues as they lack basic health amenities and competent medical practitioners. Most children do not have the opportunity of being immunized and this leads to certain physical defects in some of the children. Their health has become low priority and as they have little or no choices, they live with whatever they are provided with, whether healthy or not.

Nigeria's infant mortality rate has been estimated to be currently 99 per 1000 births, which implies that Nigeria has the thirteenth highest infant mortality rate in the world (CIA Factbook). The infant mortality of children under the age of 5 was 189 per 1000 births in 2007. These high mortality rates are mostly due to mothers not having enough money to take care of their children. Many mothers are also ignorant of some preventive measures such as immunizations and vaccines. The immunization rate against diphtheria, pertussis and tetanus (DPT) for children between 12-23 months was about 54 percent in 2007. Many children in Nigeria die as a result of malaria, diarrhea, tetanus and similar diseases. Most of these are preventable and curable diseases, but due to inadequate health care facilities and lack of money far too many children die off from them. Like the grown-up population, many children also lack access to safe water and sanitation, which typically leads to several diseases (Chimobi ucha, 2010).

2.5.3 Socioeconomic factors

The social and economic factors play an important role in determining child survival all over the world (Shawky, 2001). Infant mortality rate is one of the most important sensitive indicators of the socioeconomic and health status of a community. This is because more than any other age group of a population, infant's survival depends on the socioeconomic conditions of their

environment (Madise *et al.*, 2003). Maternal education was observed a strong predictor of child mortality in developing countries (Bhattacharya P.C 1999, Caldwell J.C 1979, Cleland J. 1991).

Caldwell (1979) reported on the effect of mother's education on the reducing the child mortality. He put up a theory that mother's education works through changing feeding and care practices, leading to better health seeking behavior and by changing the traditional familial relationships. In supporting Caldwell's explanation, Hobcraft (1993) explained that education can contribute to child survival by making women more likely to marry and enter motherhood later and have fewer children, utilize prenatal care and immunize their children. The results also, however, showed mysterious conclusion that effect of maternal education on child survival is weaker in sub-Saharan Africa. Similar findings have been reported elsewhere (Devlieger, 2005).

Early marriage is considered as intermediate factor, which affects both the socioeconomic condition and infant mortality (Bildirici *et al.*, 2009). Most young mothers were illiterate housewives (Hussain, 1999). Parents choose to marry off their daughters early for a number of reasons. Poor families may regard a young girl as an economic burden and her marriage as a necessary survival strategy for her family. They may think also that early marriage offers protection for their daughter from the danger of sexual assault. But, early marriage can have serious harmful consequences for girls, including deepening psychosocial and emotional consequences and denial of education. Once married, girls tend not to go school (Shawky and Milaat, 2000; Bittles *et al.*, 1991).

Women's Autonomy

Women's autonomy is another factor that is thought to be closely linked with education, one way or the other, and that may have a substantial impact on child mortality. Using Jejeebhoy's (1995) terminology, women's decision-making autonomy (opportunity to take part and be heard in discussions with parents, husbands, or in-laws) and 'physical autonomy' (freedom of movement) are probably particularly important for mortality.

These factors might, for example operate through such factors as the use of preventive health services as shown by Bloom, Wypij and Das Gupta (2001), the child's nutrition, as suggested by Miles-Doan and Bisharat (1990), or the treatment of sick children, as suggested by Caldwell (1986) and Das Gupta (1990).

As in other many developing countries, high child mortality has been a major public health problem in Nigeria. In man y societies women's inferior social status and status within the household adversely affect their health and that of their children.

Maternal age

Most studies from developed and developing countries have consistently reported that teenage pregnancy were at increased risk for pre-term delivery and low birth weight, although some studies failed to find such an association, Some studies have found increased risk of neonatal mortality among infants born to teenage mothers, whereas others found no increase.

Young maternal age is probably a marker for one or more other maternal risk factors associated with adverse birth outcomes rather than only an indication of incomplete maternal growth. Whether the observed association between teenage pregnancy and adverse birth outcomes simply reflects the deleterious socio-demographic environment (i.e low education, poverty, inadequate prenatal care) teenagers confront or whether biological immaturity is also casually related remains controversial.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter gives the detail description of the methodology to be used in this research. The chapter focuses on description of the study area, the study population, sample size determination, sampling method, questionnaire design and technique of data analysis.

3.2 Description of the Study Area

Iwo is a city in Osun State, South West Nigeria that is the seat of the Iwo Kingdom, a traditional state. The Iwo people, like all other people of Yoruba stock are said to have originally belonged to Ile-Ife from where they migrated sometimes in the 14th century. The earliest settlement was initiated by Adekola Telu a prince from Ife. Adekola Telu was the son of the 16th Ooni of Ife a female called Luwo Gbagida. The town became one of the major townships in Osun State, Nigeria. Iwo is situated on the Western bank of Osun State and is located midway between two capital cities: Osogbo and Ibadan. It lies on latitude 7°37′ 70°40′ and longitude 4°9′ 4°13′. The altitude is generally between 233 and 300 metres above the sea level. It has an area of 245 km² and a population of 191,348 (central city/Local Government) most populous Local Government in Osun State by the 2006 Nigeria National census figures.

The people are primarily of Yoruba descent, and were of African Traditional Religion until Islamic missionaries came and converted many to Islam. The Christian missionaries soon followed and with evangelism, both direct and through established secular schools converted many to Christianity. Iwo people are, presently, mixture of the three religions, with a higher population of Muslims than Christians , and still fewer traditionalists, every one living happily and harmoniously with one another, and usually joining the other in celebration of major religious festivities as every extended family has members in each religion.

Iwo is well noted for Arabic/Islamic education. There are several Arabic schools (Modrassah) in the town and many Iwo indigenes usually have a taste of this along with the secular schools. The source of orthodox Education in Iwo was, initially, primarily Christian Missionary based. These were mostly Baptists as each Baptist Church branch in the central city established a primary school of their own correspondingly named after the branch: Aipate Baptist Day School, Olukotu Baptist Day School, Feesu Baptist Day School, Oke-Odo Baptist Day School. There are many

primary schools in the satellite towns established by the former Western Regional Government as well as many secondary schools in satellite towns established during the period of Chief Bola Ige as the governor of the old Oyo state. Higher Institutions: BOWEN University and Wolex Polytechnic (Wikipedia, the free encyclopedia).

3.3 Study Design

The study design is a cross-sectional household sample survey. Retrospective information on the survivorship of the siblings was collected from respondents aged 15-49 years old in Iwo Local Government Area by personal interview

3.4 Sample size Determined using the formula:

$$n = \frac{(Z_{\alpha} + Z_{\beta})^2 pq}{d^2}$$

Where:

N = Minimum sample size

α= Significant level: 0.05

β= 0.10

Zα = 1.96

Zβ = 1.65

Power = 0.9

d = Absolute deviation 1% from true value

P = Prevalence of the outcome measure (0.00545)

Q = 1- P (1- .00545) = 0.99455

$(Z_{\alpha} + Z_{\beta})^2 = 13.0321$

$$N = \frac{13.0321 \times 0.00545 \times 0.99455}{(0.01)^2}$$

$$= 706$$

To adjust for cluster sample effect

Design effect = 1.86 (NDHS, 2008)

$$N = 706 \times 1.86$$

$$= 1314$$

A sample size of 1315 individual will be used for the study.

3.5 Sampling procedure

A two-stage cluster sampling method was adopted. The primary sampling units used are wards. Wards are political units, and also the smallest units that make up a LGA. They are defined by their physical boundary and are used extensively in primary health care. The sampling involve simple random selection of four wards out of the 15 existing wards in ILGA. Each ward represent a cluster. All households were visited in each selected cluster and an eligible woman was randomly selected in each household

3.6 Description of the questionnaire

The questionnaire has five sections as follows:

Section 1: Household listing

The household listing section was used to collect data on sex and age of all members of visited households during the fieldwork. The data was used to make an estimation of the sex and age distribution. It was also used to identify eligible women for the study.

Section 2: Socio-demographic characteristics

This section was used to obtain basic demographic and background data of the respondents such as religion, age, education, marital status and others

Section 3: Children ever born and those surviving

This section was used to explore information on the number of children ever born, number surviving and number dead in order to obtain data for indirect estimation of childhood mortality

Section 4: Maternal death experience

This section was used to collect data on the number of adult sisters (>15 years) not including herself, born to the same mother, the respondent ever had; the number of these sisters who were still alive; the number of these sisters who had died and the number of these sisters who died during pregnancy, during delivery or within six weeks after the end of the pregnancy.

Section 5: Perceived causes of maternal and child mortality

This section was used to explore the perception of the residents on causes of maternal mortality since causes of maternal death vary from one geographical area to another.

3.7 Administration of Interview instrument

This study employ the use of primary data obtained through a household survey. The data was collected using an interviewer-administered semi structured questionnaire.

However, a pilot study was carried out at Ola-oluwa local government area. The interviewers as well as the principal investigator was involved in the pilot study.

Five research assistants were recruited for this study. Three days training was conducted with emphasis on the study objectives, how to obtain an informed consent from the respondents, collection of data on age, children ever born and the children surviving and maternal death history.

The questionnaires were administered from January to early February 2013.

3.8 Data processing and analysis

Data entry was carried out by the principal investigator using SPSS 20. Descriptive statistics was used to summarize the data in frequencies and percentages and presented in tables and charts.

A bivariate analysis using Chi-square was carried out in order to establish the effect of these variables (locality, age of the respondents, marital status, Children ever born and level of education of the respondents) on child mortality.

Variables that showed significant association ($P<0.05$) in the bivariate analysis were then included in the multivariate analysis (Logistic regression model).

Binary logistic regression analysis was carried out to examine association between some factors and child mortality. Child loss per woman will be taken as an indicator of child mortality (Dependent variable).

$$\text{Log}\,[p(x)/1\text{-}p(x)] = a + b_1x_1 + b_2x_2 + b_3x_3 \ldots$$

Where p = probability that a case is in a particular category

a= constant of the equation

c= coefficient of the predictor variable

3.8.1 The Life Time Risk of Maternal Death

The question on number of sisters ever had (born of the same mother) who ever reached the age 15 (or who were ever married) including those who are now dead will allow me to define the total number of women ever at risk of maternal deaths, while the last three questions give the total number of maternal deaths. The questions were framed in this manner, to prevent misreporting errors and to ensure that the sister's status (dead or alive) is known since the respondents were reporting about the survivorship of their sisters.

Adjustments will be made to the respondents who were 15-19 and 20-24 on the survivorship of their sisters because the respondents in these age groups (15-19 and 20-24 years) may have sisters who have not reached 15years of age at the time of the survey. Therefore, the hypothetical numbers of sisters ever to be at risk in these younger respondents will be calculated based on the average number of reported by the older respondents, aged years and above. The average number of sisters reaching age 15 years for the respondents above aged was calculated, in which 1.54 was obtained. That is each of the respondents above the age of 25 years had 1.54 sisters reaching age 15years. The number of the respondents in the age groups 15-19 years and 20-24 years respectively were multiplied by this figure to fill in the first two entries column of sisters units of risk. The adjustment factors referred to in the method were derived from fertility and mortality distributions in developing countries as defined by Graham (Graham *et al.*, 1989 and Brass w. 1975).The adjustment is based on the age distribution pattern of developing countries. Therefore the adjustment factors were used to convert the number of sisters being reported to sister units of risk exposure to maternal deaths.

Sisters' units of exposure can be calculated by multiplying number of sisters' aged 15 years and above in each age groups with the adjustment factors. Thus summing up the sister units of risk and over the maternal death for respondents under age of 50, to obtain an estimate of life time risk.

$$LTR = \frac{\text{Total number of maternal deaths}}{\text{Total sister units of risk exposure}}$$

The calculated TFR will provide a means of translating the life time risk into maternal mortality ratio (MMR).

$$MMR = \{1-(1-LTR)1/TFR\} \times 100,000$$

Moreover, information will be collected on fertility history of the mothers. The interviewer will ensure that all the female respondents provide information about their fertility history. The technique that will be used for assessing fertility levels and patterns are based on survey questions concerning current and retrospective fertility. By current fertility, we mean the number of children born during a twelve-month period prior to the survey. Retrospective fertility refers to the total number of live births by each woman. The questions will reflect the total number of children ever born, the number of children dead, the number of children alive and the number of children who are daughters and sons. All these questions were so framed to prevent misreporting errors and bias. The information will provide estimates of total fertility rates for Iwo Local Government Area.

3.8.1 Limitations of the study

- Some of the deaths contributing to the estimates will have taken place longer than 10-12 years ago. This can result into recalling and misclassification error.
- Respondents simply not knowing, or wanting to say, whether a woman has died as a result of a maternal cause - early maternal deaths or those arising from abortion complications in particular are exceedingly difficult to capture
- The general methodological and cultural difficulties of collecting information about deaths in surveys
- Misreporting errors prior to memory lapse and the cultural milieu of the people that says children are not to be counted.

3.8.2 Estimation of childhood mortality

It is well known that the proportion of children ever born who have died is an indicator of child mortality. The births to a group of women follow a model fertility distribution over time, and the time since birth is the length of exposure to the risk of dying (that is, upon the distribution in time of the births) and upon the mortality risk themselves. By allowing for the effect of the

distribution of the births in time, such a proportion of dead children can be converted into a conventional mortality measures expressing their average experience.

Specifically, the proportions of children dead classified by the mother's five-year age group or duration of marriage can provide estimates of the probabilities of dying between birth and various childhood ages. In certain cultures, women appears to be more likely to state duration of marriage correctly than to give correct information about their age, so the estimation procedure based on data classified by duration of marriage may be preferred. However, the use of data classified by duration is not recommended in countries where consensual unions are frequent and relatively unstable.

Brass was the first to develop a procedure for converting the proportions dead of children ever born reported by women in age groups 15-19, 20-24, and so on into estimates of the probability of dying before attaining exact childhood ages.

3.8.3 Data required

The data required for this method are listed below:

1. The number of children ever born, classified by sex and by five year age group of the mother;
2. The number of children surviving (or the number dead), classified by sex and by five year age group of the mother;
3. The total number of women (irrespective of marital status), classified by five year age group of the mother.

   Note that all women, not merely ever married women, must be considered

3.8.4 Computational procedure

The steps of the computational procedure are described below:

Step 1: Calculation of average parity per woman.

Parity P(1) refers to age group of 15-19, P(2) to 20-24 and P(3) to 25-29. In general,

$P(i) = CEB(i) / FP(i)$

Where CEB(i) denotes the number of children ever born by women in age group i ; and FP is the total number of women in age group i, irrespective of their marital status. Recall that, following the usual conversion, variable i refer to the different five year age groups considered. Thus, the value i =1 represents age group 15-19, i =2 group 20-24 and so on.

Step 2: Calculation of proportion of children dead for each age group of mother.

The proportion of children dead, D(i), is defined as the ratio of reported children dead to reported children ever born, that is,

$$D(i) = CD(i) / CEB(i)$$

Step 3: Calculation of multipliers K(i) using coefficients of Trussell variant of the original Brass method. A different set of coefficients is provided for each of the four different families of model life tables in the Coale-Demeny system.

TABLE 3.8.5 Trussell's coefficient for child mortality estimation based on the West model

Age of mothers	Index (i)	Age of child (r)	a_i	Bi	c_i
15-19	1	1	1.1415	-2.7070	0.7663
20-24	2	2	1.2563	0.5381	-0.2637
25-29	3	3	1.1851	0.0633	-0.4177
30-34	4	5	1.1720	0.2341	-0.4272
35-39	5	10	1.1865	0.3080	-0.4452
40-44	6	15	1.1746	0.3314	-0.4435
45-49	7	20	1.1639	0.3190	-0.4435

$$Ki = a_i + b_i.P_1/P_2 + c_i.P_2/P_3$$

Where a_i,b_i and c_i are read from the table above and P_1,P_2 and P_3 are the parities of the first three age group of the data

Trussell's coefficient will be used to calculate the multipliers because other means like the use of mean age of the specific fertility distribution (m) and P1/P2 do not always give a good index for the younger ages of childbearing which is the period that matters in the estimates of infant and early childhood mortality.

Step 4: Calculation of probabilities of dying. Estimates of the probability of dying, q(x), are obtained for different values of exact age x as the product of reported proportions dead, D(i), and the corresponding multipliers, K(i). Note that the value of x is not generally equal to that of I, because x is related in broad terms, to the average age of the children of women in age group i.

3.8.6 Adjusting childhood probabilities of dying

To obtain a better q(x) series, the values obtained will be smoothed using the Brass African standard. The values will be smoothed against the logit model.

$$Logit\{l(x)\} = \alpha + \beta logit\{ls(r)\}$$

$$Y(x) = \alpha + \beta Ys(x)$$

Where $Y(x) = logit\{l(x)\}$

Put $\beta = 1$

We can estimate α from each value of x, i.e $x=1$, $x=2$,$x=3$ e.t.c independently. But these values of α will be different from each other.

So it is better to estimate α from the average of $x=2$,$x=3$ and $x=5$

Thus if ¥ is the average of Y(2), Y(3) and Y(5) and

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Then, $\alpha = ¥ - ¥(s)$

$Y(1) = \alpha + Ys(1)$

$Y(2) = \alpha + Ys(2)$

$Y(3) = \alpha + Ys(3)$

$Y(5) = \alpha + Ys(5)$

Y(1) and Y(5) are adjusted infant and under-five mortality rate.

TABLE 3.8.7 The African Standard Life Table

Exact age x	ls(x)	Ys(x)
1	0.8802	-0.9970
2	0.8335	-0.8052
3	0.8101	-0.7252
4	0.7964	-0.6819
5	0.7863	-0.6515
10	0.7502	-0.5498
15	0.7362	-0.5131

Step 5: Calculation of the reference period. When mortality is changing smoothly, the reference period, t(x), is an estimate of the number of years before the survey date to which the child mortality estimates, q(x), obtained in the previous step refer. The value of t(x) is also estimated by means of an equation whose coefficients were estimated form simulated cases by using linear regression.

$$t_{(x)} = a_i + b_i.P_1/P_2 + c_i.P_2/P_3$$

TABLE 3.8.8 Coefficient for estimation of the reference period $t_{(x)}$ to which the values of $q_{(x)}$ estimated from data classified by age are refer

Age of mothers	Index (i)	Age of child (r)	a_i	Bi	c_i
15-19	1	1	1.0970	5.5628	-1.9956
20-24	2	2	1.3062	5.5677	0.2962
25-29	3	3	1.5305	2.5528	4.8962
30-34	4	5	1.9991	-2.4261	10.4282
35-39	5	10	2.7632	-8.4065	16.1787
40-44	6	15	4.3468	-13.2436	20.1996
45-49	7	20	7.5242	-14.2013	20.0162

3.8.9 Indirect Sisterhood method

The original indirect sisterhood method asks respondents four simple questions about how many of their sisters reached adulthood, how many have died and whether those who died were pregnant around the time of death. The four questions are:

4 How many sisters (born to the same mother) have you ever had who were ever-married (including those who are now dead)?

5 How many of these ever-married sisters are alive now?

6 How many of these ever married sisters are dead?

7 How many of these dead sisters died while they were pregnant, or during childbirth, or during the six weeks after childbirth? (Graham et al., 1988)

The questions can be added to an ongoing study and take very little additional time so the method is particularly cost-effective. Because the method relies heavily on a number of assumptions about the relationships between fertility and age-specific maternal mortality, it

should not be used in settings where levels of fertility are.low (Total Fertility Rate below 3), or where there have been recent and marked declines in fertility, or where major migration has occurred. While the method is relatively simple and inexpensive to use, the overall results relate to a point around 10-12 years prior to the survey, a major disadvantage. However, it is possible to calculate estimates for more recent periods by limiting the upper age of the respondents to, say, adults aged below 30 years old. In this case, the overall maternal mortality estimate would relate to a period some seven years prior to the survey. The disadvantage of limiting the upper age of respondents is, however, that larger number of households need to be visited to achieve the desired sample size of adult respondents. Thus, decision-makers need to balance the desire for a current estimate against the additional costs incurred by the necessary increase in sampled households (WHO and UNCEF, 1997).

3.9 Rationale for the method

The required information are summarized as follows:

N(i) – Number of sisters ever at risk of maternal death reported by respondents in age group i.

D(i) – Number of maternal deaths among those sisters

N(i) – Number of sisters that have ever married (or are aged over 15)

D(i)- Number among the N(i) who have died during pregnancy, childbirth or postpartum period of six weeks after birth.

P(i)- the proportion of adult sisters who died from maternal causes, reported from respondents aged i

q(w)- the lifetime risk of maternal death.

A(i) - The adjustment factors

TFR- The total fertility rate is the average number of births a mother has by the time she reaches her menopause and it will be calculated using P/F ratio method.

The method relates the proportion of adult sisters that died from maternal causes {P(i)} to the lifetime risk of maternal death {q(w)}.

If there are no birth after age 50, the lifetime risk of maternal death can be expressed as q(50).

Two demographic models are used to establish relationship between P(i) and q(50), these are:

1. Standard fertility and mortality schedules which allows one to model a distribution of Z, the difference between the ages of siblings and respondents. Z has a symmetrical

distribution $\Theta(z)$ with mean zero at the completion of the reproductive life of the mothers of respondents.

2. A maternal mortality model that allows one to relate q(i), the probability of dying from maternal causes before age i to q(50), the probability of maternal deaths by the end of the reproductive period.

The relationship between q(i) and q(50) can be expressed as:

$$q(i) = C(i).q(50) \text{ - - - - - - - -(i)}$$

Where C(i) = proportion of maternal deaths occurring before age i, according to standard schedule of maternal mortality.

The proportion of sisters dead from maternal causes P(i), reported by respondents aged i is equal to

$$P(i) = \int_{-\infty}^{\infty} \Theta(z)q(i+z)dz \text{ - - - - - - - - - -(ii)}$$

Combining equation (i) and (ii) we obtain

$$P(i) = q(50)\int_{-\infty}^{\infty} \Theta(z)C(i+z)dz \text{ - - - - - - -(iii)}$$

From equation (iii) P(i) and q(50) differ only by the factor $\int_{-\infty}^{\infty} \Theta(z)C(i+z)dz$ which depends only on the two demographic models.

If age i of respondents is high enough, say 60 and over, all sisters have graduated from the risk of maternal mortality i.e all maternal deaths have occurred. The function C(i+z) in this case for any value of Z, equal to or near 1, P(i) at those ages is a good estimator of q(50).

However, if the age of the respondents is under 60, some sisters would still be at risk of maternal death. The function C(i+z) will be <1 for some value of Z, and in this case P(i) will underestimate q(50).Thus, the proportion need to be adjusted in order to give correct estimates of the lifetime risk of mortality.

3.9.1 Perception of the respondents on causes of Maternal and childhood mortality

Perceived causes of maternal and childhood mortality was assessed on a 13-point scale with score more than mean±1SD classified as right perception and the results were expressed as percentage.

CHAPTER FOUR

RESULTS

A total of 1250 women of reproductive age were interviewed from four wards out of the fifteen existing wards in Iwo Local Government Area. Respondents were asked the four simple questions concerning their ever married sister and the children ever born and those surviving. The results are presented in the following figures and tables

4.1 AGE AND SEX DISTRIBUTION OF THE HOUSEHOLD POPULATION OF THE STUDY AREA

Table 4.1.1 below shows the household population by five–year age groups, according to sex. The total household population enumerated was 4964 with 2505 females and 2459 males. Age group 0-4 years has the highest proportion among the males and age group 20-24 years among the females in the household population.

Table 4.1 Household population distribution of the study area

Age group	Male	Percent	Female	Percent	Both sexes	Percent	Sex ratio
0-4	330	13.43	291	11.61	621	12.51	113.4
5-9	360	14.65	302	12.05	662	13.34	119.2
10-14	309	12.57	261	10.41	570	11.48	118.4
15-19	226	9.19	312	12.45	538	10.84	72.4
20-24	158	6.43	327	13.04	485	9.77	48.3
25-29	219	8.91	324	12.92	543	10.94	67.6
30-34	290	11.80	261	10.41	551	11.09	111.1
35-39	186	7.57	149	5.94	335	6.75	124.8
40-44	173	7.04	135	5.38	308	6.20	128.1

45-49	109	4.44	90	3.59	199	4.00	121.1
50-54	57	2.32	33	1.32	90	1.81	172.7
55-59	15	0.61	10	0.390	25	0.50	150.0
60-64	14	0.57	6	0.24	20	0.40	233.3
65-69	4	0.08	2	0.16	6	0.12	200.0
70-74	6	0.24	1	0.04	7	0.14	600.0
75+	3	0.12	1	0.04	4	0.08	300.0
Total	2459	100	2505	100	4964	100	

Figure 4.1.1 Population Pyramid of the study area by age and sex as percent of the total population

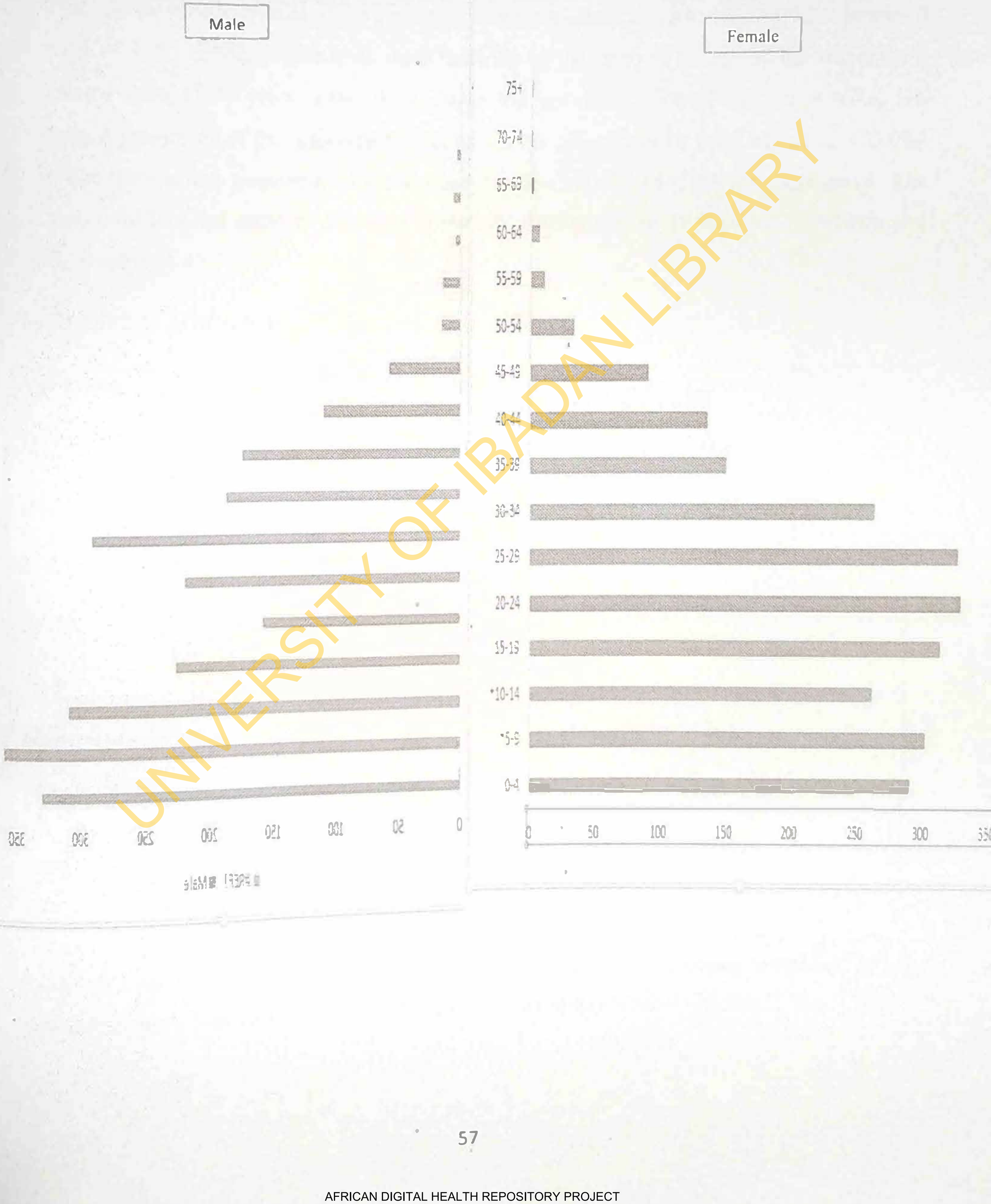
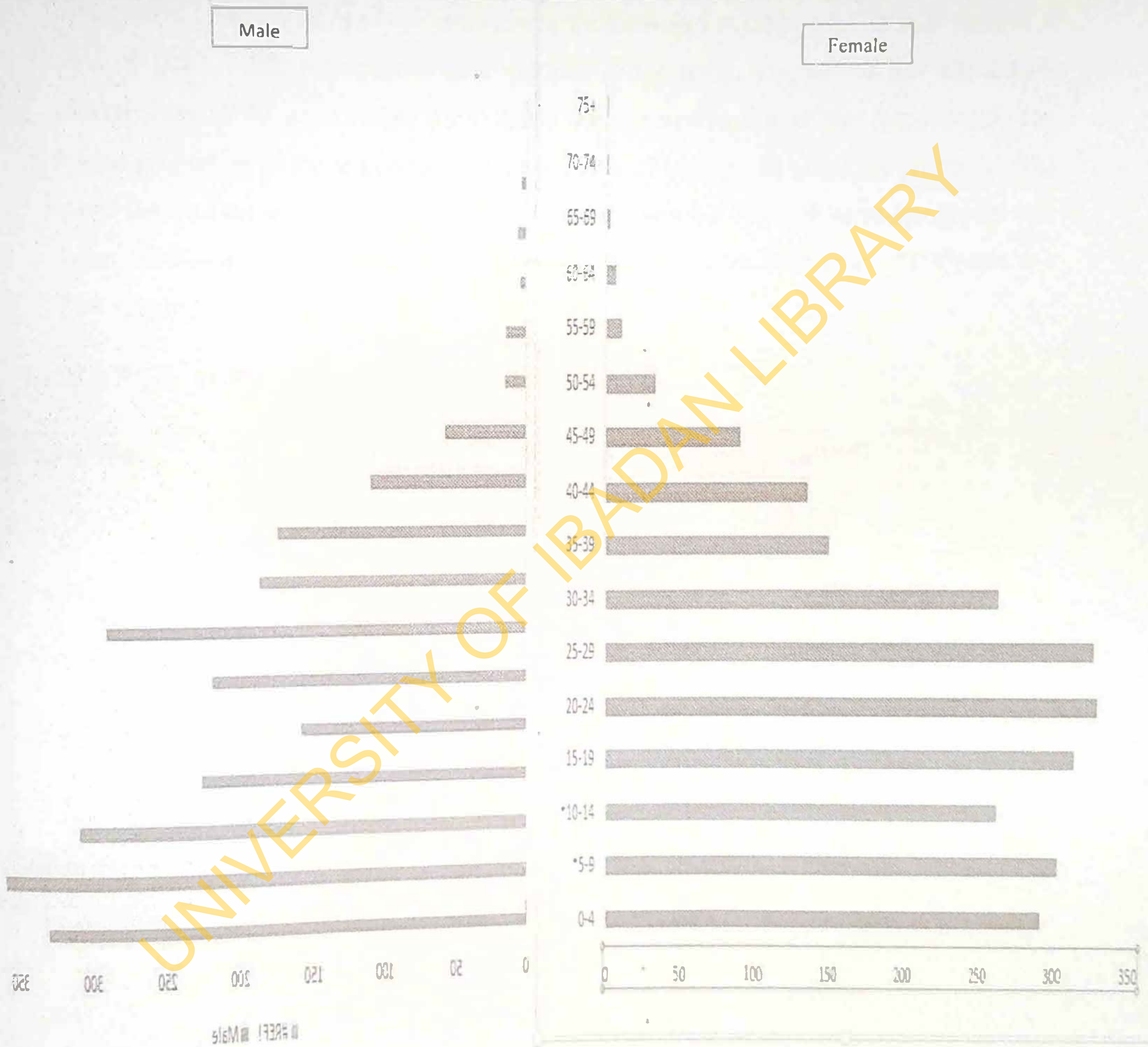


Figure 4.1.1 Population Pyramid of the study area by age and sex as percent of the total population



7.1 SOCIO-DEMOGRAPHIC CHARACTERISTICS

The general characteristics of the respondents are presented in table 4.2.1 to 4.2.7 below. A total of 1250 female respondents were included in the study. The age of the respondents ranged from 15-49 years. Table 4.2.1 shows the age distribution of the respondents. The largest proportion of the respondents falls within the 25 years to 29 years age group (23.6%) while the smallest proportion of the respondents falls into the 45 to 49 years age group. The mean, median and standard deviation of the age distribution are 29.69years, 29.00years and 8.28 respectively.

TABLE 4.2.1: AGE GROUP OF THE RESPONDENTS

Age groups	Frequency	Percent
15-19	106	8.5
20-24	233	18.6
25-29	295	23.6
30-34	251	20.1
35-39	142	11.4
40-44	134	10.7
45-49	89	7.1
Total	1250	100.0

Table 4.2.2 shows the distribution of the respondents by location. The largest proportion of the respondents were from Isale oba iii (28.0%) and the least from Molete ii (20.5%)

Table 4.2.2: LOCALITY OF THE RESPONDENTS

Locality	Frequency	Percent
Molete ii	256	20.5
Oke adan iii	344	27.5
Gidigbo ii	300	24.0
Isale oba iii	350	28.0
Total	1250	100.0

Table 4.2.3 shows the distribution of the respondents by education level. There is variation in the educational levels of the women in the study area; about 58.72% of the respondents have secondary school education, 20.88% of them have primary school education, 10.64% have tertiary education and 9.76% do not go to school at all.

TABLE 4.2.3: EDUCATIONAL LEVELS OF THE RESPONDENTS

Educational level	Frequency	Percent
None	122	9.76
Primary	261	20.88
Secondary	734	58.72
Tertiary	133	10.64
Total	1250	100.0

Table 4.2.4 shows the religious composition of the respondents. About 62.5% are Muslims while 37.3% are Christians and only 3 respondents (0.2%) are traditional worshipers.

TABLE 4.2.4: RELIGIOUS COMPOSITION OF THE RESPONDENTS

Religion	Frequency	Percent
Christianity	466	37.28
Islam	781	62.48
Traditional	3	0.24
Total	1250	100.0

Table 4.2.5 shows the ethnic composition of the respondents. Majority of the respondents are Yoruba (98.9%) while others are mixture of Hausa and Igbo.

TABLE 4.2.5: ETHNIC COMPOSITION OF THE RESPONDENTS

Tribe	Frequency	Percent
Yoruba	1236	98.88
Others	14	1.12
Total	1250	100.0

TABLE 4.2.6 OCCUPATION OF THE RESPONDENTS

Majority of the respondents are artisan (46.5%), followed by a third who are traders while 3 of the women (0.2%) are clergy.

Work	Frequency	Percent
Civil servant	61	4.1
Artisan	581	46.5
Farming/Forestry/fishery	10	0.8
Professional/Specialist	19	1.5
Unemployed	35	2.8
Student	121	9.7
Trading	420	33.6
Clergy	3	0.2
Total	1250	100

Table 4.2.7 shows the distribution of the marital status of the respondents. The term ''married'' refers to legal or formal marriages (civil or religious).

TABLE 4.2.7: MARITAL STATUS OF THE RESPONDENTS

Marital status	Frequency	Percent
Single	151	12.1
Married	1066	85.3

Currently living with man	2	0.2
Divorced	5	0.4
Separated	6	0.5
Widowed	20	1.6
Total	1250	100.0
Age at first marriage		
18 yrs and below	440	40.0
19 and above	659	60.0
Total	1250	100.0

4.3 FERTILITY

Estimates of fertility are presented in this section. Estimates were calculated from data obtained from the responses of the women about the births they had in the past 12 months (current fertility) as well as the total number of children ever born (retrospective fertility). There is also a presentation of the P/F ratio method of correcting fertility.

TABLE 4.3.1 CHILDREN EVER BORN, MEAN PARITY BY MOTHERS AGE GROUP AND BIRTHS IN THE PAST YEAR

Age Groups	Index for women's age group	Number of women	Children Ever born	Mean Children ever born	Births in the Past Year	Reported current fertility(fi)
15-19	1	106	19	0.1792	11	0.1038
20-24	2	233	232	0.9957	71	0.3047
25-29	3	295	557	1.8881	58	0.1966
30-34	4	251	683	2.7211	33	0.315
35-39	5	142	477	3.3592	10	0.0704
40-44	6	134	461	3.4403	3	0.0224
45-49	7	89	326	3.6629	2	0.0225
Total		1250	2755		188	

TABLE 4.3.2: P/F RATIO METHOD APPLIED TO SURVEY DATA

Age	Reported ASFR $f_{(i)}$	Average CEB $P_{(i)}$	Cumulative Fertility(Ø)	K(i)	$F_{(i)}$ = Ø + $k_i f_i$	P_i/F_i	ASFR* (f*)	Adjusted ASFR f* ×0.776
15-19	0.1038	0.1792	0.519	1.980	0.725	0.247	0.1327	0.103
20-24	0.3047	0.9957	2.043	2.844	2.910	0.342	0.3011	0.234
25-29	0.1966	1.8881	3.026	3.012	3.618	0.522	0.3292	0.255

30-34	0.1315	2.7211	3.6835	3.173	4.101	0.664	0.125	0.097
35-39	0.0704	3.3592	4.0355	3.313	4.269	0.787	0.0652	0.0506
40-44	0.0224	3.4403	4.148	3.699	4.231	0.813	0.0225	0.0175
45-49	0.0225	3.6629	4.2605	4.775	4.368	0.839	0.0185	0.0144
TFR							4.971	3.857

Figure 4.3.1: Age specific fertility rates of the respondents

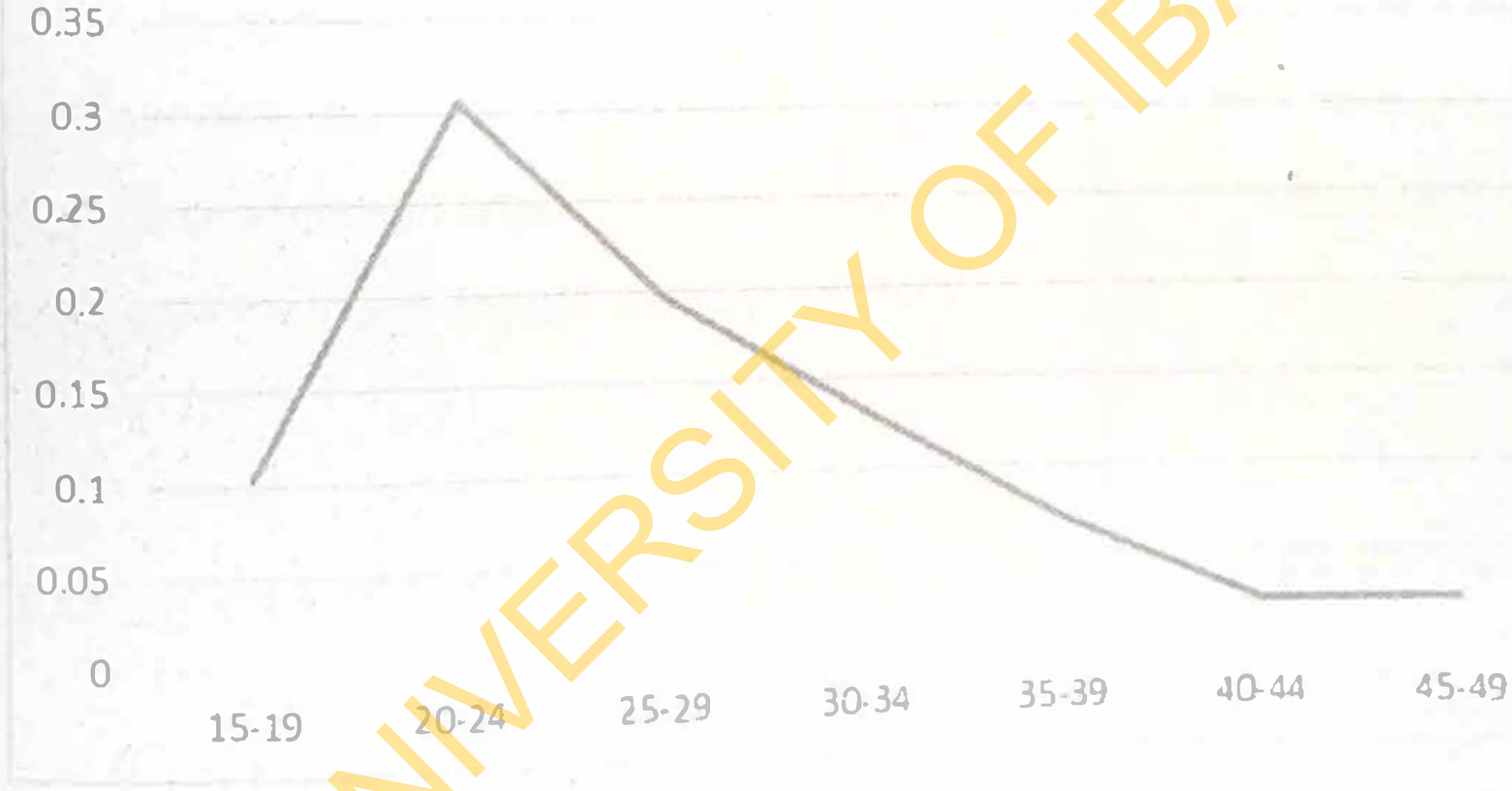
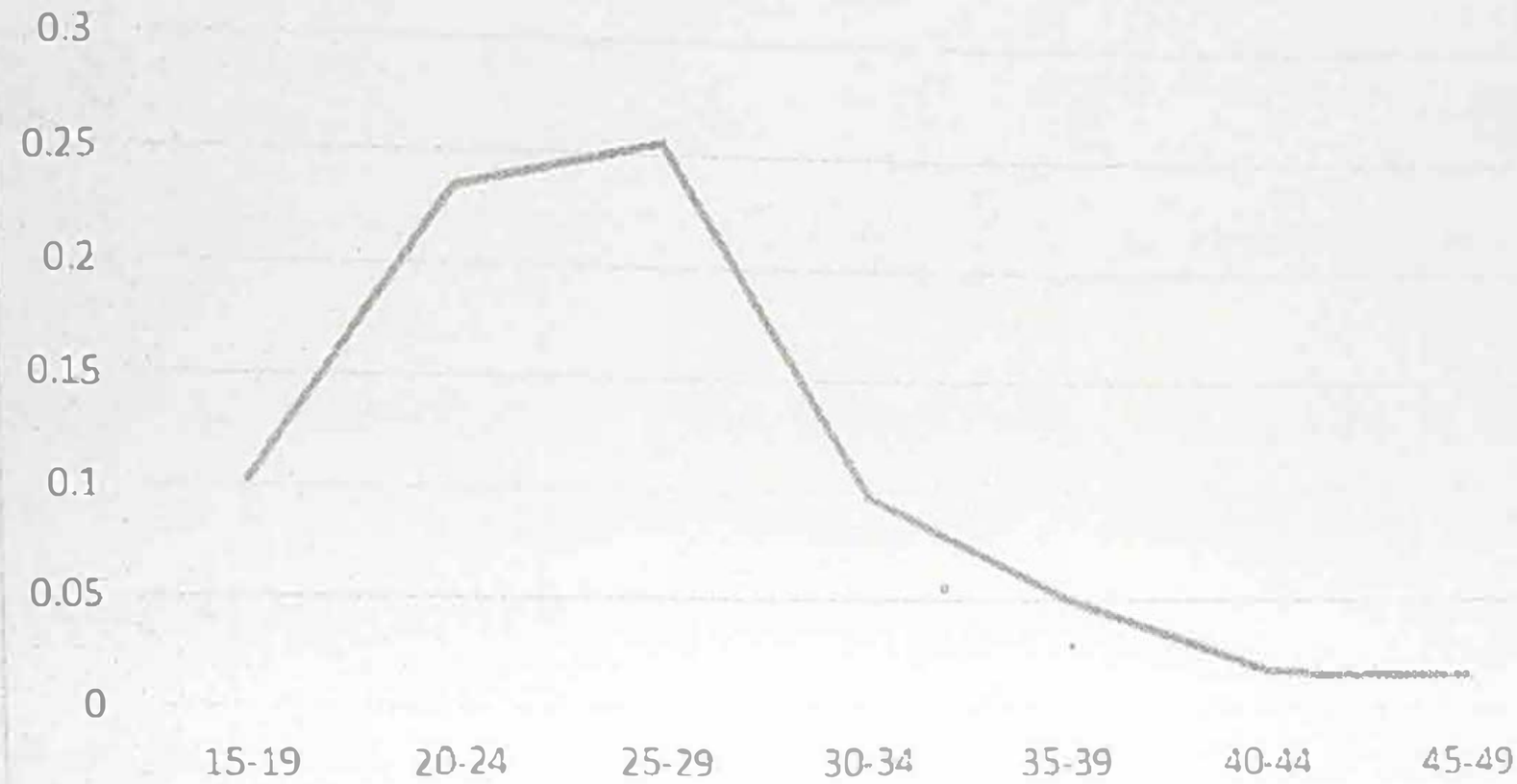


Figure 4.3.2: Adjusted age specific fertility rates of the respondents



4.4 MATERNAL MORTALITY

Estimates of maternal mortality are presented in this section. The estimates were calculated from the data obtained from the responses of the women to four simple questions about how many of their sisters reached adulthood, how many are alive, how many have died and whether those who died were pregnant around the time of death.

TABLE 4.4.1 ESTIMATES OF SISTER UNITS OF RISK IN IWO

Age group	No of respondents	No of Sisters aged 15+ above(N_i)	Maternal death D_i	Adjustment factor A_i	Sister units of risk (N_i A_i)
15-19	106	163*	4	0.107	17.441
20-24	233	359*	3	0.206	73.950
25-29	295	703	9	0.343	241.129
30-34	251	667	15	0.503	335.501

35-39	142	346	7	0.664	229.74
40-44	134	322	10	0.802	258.24
45-49	89	216	8	0.900	194.40

Number of sisters aged 15+ above for age group 15-19 and 20-24 were obtained by multiplying the number of respondents by average number of adult sister aged 15 years and above per respondent reported for the age groups 25+ i.e 1.54.

The life time risk of death was obtained by dividing the total number of maternal deaths ($\sum Di$) by sister units of risk exposure (56/1350.399 =0.04146).

Thereafter the life time risk obtained was divided by the estimate of total fertility rate (3.86) and the figure obtained was multiplied by 100,000.

The maternal mortality ratio is 1,074 per 100,000 live births.

TABLE 4.4.2 ESTIMATES OF TIME POINTS OF LIFETIME RISKS IN IWO

Age group	Life time risk of maternal death(D_i/ N_i A_i)	Reference period	No of dead	Proportion of dead sisters dying of maternal causes related to pregnancy
15-19	0.2294	5.7	9	0.4444
20-24	0.0406	6.8	16	0.1875
25-29	0.03732	8.1	48	0.1875
30-34	0.0447	9.7	49	0.3061
35-39	0.0305	11.7	48	0.1458
40-44	0.0387	14.3	42	0.2380

45-49	0.0412	17.5	36	0.2222

4.5 CHILDHOOD MORTALITY

Table 4.5.1 shows the proportion of children dead calculated for each of the women's age group. The proportion of children dead differ among the age groups.

TABLE 4.5.1: NUMBER OF CHILDREN EVER BORN, CHILDREN SURVIVING AND PROPORTION DEAD

Age group	Age group index	Number of women	Children ever born	Children dead	Proportion of children dead
15-19	1	106	19	2	0.1053
20-24	2	233	232	20	0.0862
25-29	3	295	557	24	0.0431
30-34	4	251	683	54	0.0791
35-39	5	142	477	27	0.0566
40-44	6	134	461	32	0.0694
45-49	7	89	326	36	0.1104
TOTAL		1250	2755	195	

TABLE 4.5.2 TRUSSELL'S MULTIPLIERS FOR CHILDHOOD MORTALITY ESTIMATION BASED ON THE WEST MODEL

Women's age group	Age group index i	Multipliers $K_{(i)}$
15-19	1	1.0586
20-24	2	1.2140
25-29	3	1.6421
30-34	4	1.5368
35-39	5	1.0071
40-44	6	1.0003
45-49	7	0.9823

A set of adjustment factors were developed by Trussell to convert proportion of children dead to probabilities of dying at different exact ages. These values were estimated as explained in the methodology. The values are presented in the table 4.5.2 above.

TABLE 4.5.3: ESTIMATES OF PROBABILITIES OF DYING AND PROBABILITIES OF SURVIVING AT EXACT AGES X

Women's age group	Age group index	Exact age	Multipliers	Proportion of Children Dead	Probability of dying before exact age X	Probability of surviving to exact age X
	i	(x)	K(i)	D(i)	q(x)= K(i)× D(i)	l(x)
15-19	1	1	1.0586	0.1053	0.1115	0.885
20-24	2	2	1.2140	0.0862	0.1046	0.8954
25-29	3	3	1.6421	0.0431	0.0708	0.9292
30-34	4	5	1.5368	0.0791	0.1216	0.8784
35-39	5	10	1.0071	0.0566	0.0570	0.4300
40-44	6	15	1.0003	0.0694	0.0694	0.9306
45-49	7	20	0.9823	0.1104	0.1084	0.8916

The proportion of children dead, categorized for women of different age groups were used to indirectly estimate child mortality at different childhood ages. Table 4.5.3 shows estimated levels of child mortality at different ages: 1, 2, 3, 5, 10, 15 and 20 years. The reported q(x) and l(x) values in the study were erratic and they were therefore graduated to smooth out these irregularities as explained in the methodology.

4.6 ADJUSTING CHILDHOOD PROBABILITIES OF DYING

To obtain reliable q(x) series, the values obtained were smoothed using the Brass African standard. The values were smoothed against the logit model. Assuming that $\beta = 1$, the value of α, estimated as -0.1066, was obtained by averaging the logits of l_2, l_3 and l_5 as explained in the methodology. The smoothing equation was obtained as:

$$Y(x) = -0.1066 + Ys(x)$$

TABLE 4.6.1: ADJUSTING CHILDHOOD PROBABILITIES OF DYING

Age group	Exact age(x)	Alpha α	Ys	Yx	Probability of surviving to exact age x $l^*(x)$	Probability of dying before exact age x $q^*(x)$
15-19	1	-0.1066	-0.9970	-1.1036	0.9009	0.0991
20-24	2	-0.1066	-0.8052	-0.9118	0.8610	0.1390
25-29	3	-0.1066	-0.7252	-0.8318	0.8407	0.1593
30-34	5	-0.1066	-0.6515	-0.7581	0.8200	0.1800
35-39	10	-0.1066	-0.5498	-0.6564	0.7879	0.2121
40-44	15	-0.1066	-0.5131	-0.6197	0.7754	0.2246
45-49	20	-0.1066	-0.4551	-0.5617	0.7546	0.2454

4.6.1 ESTIMATED PARAMETERS OF INFANT AND UNDER-FIVE MORTALITY

As the study set out to estimate infant and under-five mortality rate, Table 4.7.4 shows the adjusted value for q(x) which depict infant and under-five mortality rate. The infant mortality rate is translated from 0.0991 to **99 deaths per 1,000 live births**. The under-five mortality rate is similarly translated from 0.1800 to **180 deaths per 1,000 live births.**

4.7 ESTIMATION OF THE REFERENCE PERIOD

The reference period for each parameter was estimated under condition of changing mortality, each proportion of dead identifies a probability of death, from some point in the past. Where the point in the past lies between the time of the survey and the longest exposure time of the children, so the reference period of an estimate can be approximated by the average time ago of the deaths of the reported children.

TABLE 4.7.1 ESTIMATES OF THE REFERENCE PERIOD TO WHICH THE ESTIMATED INFANT AND UNDER-FIVE MORTALITY REFER

Parameter Estimated	Number of Years Prior to the Survey	Standard	Reference Period
Infant Mortality Rate	1.05	2013	2012
Under-Five Mortality Rate	7.06	2013	2006

4.8 FACTORS ASSOCIATED WITH CHILDHOOD MORTALITY

A univariate and multivariate analysis was carried out to determine relationship between some factors and childhood mortality. Child loss per woman was taken as an indicator for child mortality for women under 35 years of age. This is because it is only for women below age 35 that the proportion dead is a good proxy for childhood mortality. When women are questioned about the loss of their children, a substantial amount of these "children" especially to the older women may have been adults at death. It is this age that determines whether the children dead are related to q1, q2, q3 or q5. The proportion of children dead relating to infant mortality i.e q1 are from mothers aged 15-19 years while that relating to q5 are from mothers aged under 35years. Hence, the women used for this analysis are aged less than 35 years.

TABLE 4.8.1 SOCIO-DEMOGRAPHIC CHARACTERISTICS OF RESPONDENTS AND CHILD LOSS

N=885

VARIABLE	Childhood mortality			
	Yes n (%)	No n (%)	Statistics X^2	p-value
Locality				
Molete ii	18(9.2)	178(90.8)		
Oke adan iii	20(8.4)	218(91.6)	2.482	0.479
Gidigbo ii	11(5.4)	194(94.6)		
Isale oba iii	21(8.6)	224(91.4)		
Educational status				
None	7(13.2)	46(86.8)		
Primary	19(10.6)	160(89.4)	5.115	0.164
Secondary	37(6.6)	521(93.4)		
Higher	7(7.4)	87(92.6)		
Parity				
None	27(3.9)	660(96.1)		
1-2	30(17.8)	139(82.2)	94.692	0.000
3-4	11(47.8)	12(52.2)		
Religion				
Christianity	22(7.2)	285(92.8)		
Islam	48(8.3)	529(91.7)	0.365	0.546
Ethnic composition				
Yoruba	69(7.9)	805(92.1)		
Others	1(10.0)	9(90.0)	0.060	0.806
Marital Status				
Currently Married	66(9.1)	660(90.9)		
Formerly Married	4(50.0)	4(50.0)	33.697	0.000
Occupation				
Civil servant	4(13.8)	25(86.2)		
Self employed	60(8.5)	648(91.5)	4.641	0.098
Unemployed	6(4.1)	141(95.9)		
Age (Years)				
15-24	17(5.0)	322(95.5)	19.789	0.000
25-34	53(9.7)	492(90.3)		

4.8.2 MULTIVARIATE ANALYSIS FOR CHILD LOSS

To further study the association between child mortality and some characteristics, the multivariate analysis of socio-demographic variables as a predictor for child loss among individual women was carried out using the logistic regression. Child loss per woman is taken as indicator of child mortality. Table 4.9.1 shows the variable used and the P values, odds ratio and confidence interval obtained from the multivariate analysis.

Two variables that explained child loss in the study are respondent's age at birth and parity. Respondents who reported less than three children (OR=0.24, CI=0.11-0.57) were less likely to experience child loss compared to those who reported three or more. Young women who were aged 15-24 years (OR=1.89, CI=0.64-2.46) were more likely to experience child loss compared to those aged 25-34 years

Table 4.8.3: FACTORS ASSOCIATED WITH CHILD LOSS

VARIABLE	OR	95% CI	p-value
Age (Years)			
15-24	1	-	-
25-34	1.89	0.64-2.46	0.041
Parity			
None			
1-2	1	-	-
3-4	0.24	0.11-0.57	0.001

4.9 PERCEPTION OF THE RESPONDENTS ON CAUSES OF MATERNAL AND CHILD MORTALITY

A 13-point perception scale was used for the analysis. The mean perception score was 6.9 ± 1.9. Majority (62.6%) of the respondents had right perception relating to causes of maternal and child mortality. About half (52.4%) of the respondents, opined that the rate at which women die during pregnancy, childbirth or six weeks after delivery is high.

Moreover, 53.8% of the respondents agreed that pregnant women die because they do not deliver in the health centers. 60% of the respondents disagree that health facilities that provide maternal health services are too far from the residences and majority of the respondents (71%) reported that pregnant and nursing mothers do not go for antenatal care because they lack the money to pay for transport and care.

CHAPTER FIVE

DISCUSSION

5.1 Socio-demographic characteristics of the study area

The population pyramid of the study area has a broad base which becomes narrow at the older ages. This means the study area's population is young with high fertility rate. This is typical of population in developing countries (PRB, 2013). The household population of Nigeria according to the 2013 Nigeria Demographic and Health Survey exhibit similar demographic characteristics.

Age and sex are important demographic variables and the primary basis of demographic classification in vital statistics, censuses and household surveys. The distribution of the household population in the study area by five year age groups according to sex shows that about 50.5 percent of the population are females and 49.5 percent males. Age specific sex ratios are influenced by mortality, fertility and sometimes migration differences between sexes at various age. Fertility creates inequalities at birth since more boys are born than girls but boys tend to have higher mortality rates. This is because of the risk-taking behaviour of the male child (NPC, 1998).

The sex ratio of the study area is 98 which is higher than the reported 2013 NDHS figure of 97. At early age, the sex ratio for the study area reflect the normal trend of having more male than females as reported by NPC (1998). However, the sex ratio at older ages which shows an excess of males over females, deviates from what is expected generally. Similar deviations were documented in the 2003 NDHS. Migration is age and sex selective. In certain situations, females are more likely to migrate whiles in others male are more likely to migrate (Lattes, 1989). Incomplete reporting of female household members by the respondents may have also come into play here. In addition, males under fifty years reporting their ages as above fifty years, for some perceived respect or benefit, could have contributed to the male/female imbalance at the older age groups. The pattern of the age distribution in the population structure may have been influenced errors caused by under reporting of age by some household members in the study area and age misstatements.

According to Ewbank (1981) age errors can be attributed to factors such as ignorance of correct age, general tendency to state ages in figures ending in preferred digits, a tendency to exaggerate length of life at advanced ages and misstatements arising from motives of an economic, social, political or personal character and heaping of ages ending in 0 and 5, so a relatively large concentration of persons enumerated with ages ending with 0 and 5.

5.2 Maternal mortality

The result that indicated a lifetime risk of maternal mortality of 0.0415 that yield a maternal mortality ratio of 1,074 per 100,000 live births. The finding is higher than the current estimate of maternal mortality ratio in Nigeria reported to be within the range of 500-652 per 100,000 live births (NDHS, 2013). According to WHO, UNCEF, UNFPA and The World Bank 2015 the maternal mortality ratio of Nigeria is reported to be within the range of 596-1180 per 100,000 live births. However, the maternal mortality ratio obtained in this study is the estimate of the 10-12 years period preceding the survey. Thus, the estimate obtained using an indirect method fall within the reported estimate of maternal mortality ratio for Nigeria.

The result of this study showed a much lower maternal mortality ratio than the one carried out in Fika Local Government Area, Yobe State, Nigeria where the maternal mortality ratio was 3,200 per 100,000 live births and a lifetime risk of maternal mortality is 0.181 or 1 in every 6 women of reproductive age (Hauwa, 2005). Idris *et al.*, (2010) estimated the maternal mortality ratio in three rural communities in Zaria emirate, Kaduna state to be 1400 per 100,000 live births. The lifetime risk of maternal mortality is 1 in 13 women of reproductive age. This affirm the recent national survey that had reported higher maternal mortality ratio for the Northern areas compared to the Southern Nigeria.

The maternal mortality ratio in Iwo Local Government is higher than the estimates obtained in other African countries as reviewed in chapter two. For example, the maternal mortality ratio estimate in Thyolo district in Southern Malawi was 409 per 100,000 live births in 1989 (Graham *et al.*, 2004) and in the year 2000, the estimate of maternal mortality ratio in Southeastern Tanzania, was 448 per 100,000 live births (Font *et al.*, 2000). However, the estimate appear relatively similar to that of the study carried out in rural Niger. The maternal mortality ratio was estimated at between 1030 and 1050 per 100 000 live births (Adebowale *et al.*, 2010).

There is a wide variation of maternal mortality estimate in hospital based study conducted in South-western part of Nigeria. Sule in the year 2000 conducted a study at the Olabisi Onabanjo University Teaching Hospital, Sagamu, Ogun state. The 10-year survey (1988-1997) showed that there were 103 maternal deaths recorded out of a total of 5320 deliveries. Maternal mortality ratio of 1,936 deaths per 100,000 live births was obtained. However, another study carried out in the same institution by Oladapo in 2006 to investigate maternal deaths where all maternal deaths in 2005 were retrospectively reviewed showed an increase in maternal mortality ratio (2989.2 per 100,000 live birth). Also a retrospective case-control study carried out at Adeoyo Maternity Hospital, Ibadan between January 2003 and December 2004 by Olopade and Lawotoyin (2008) reported maternal mortality ratio of 963 per 100,000 live births.

A probable explanation for this variation is that most maternal deaths go unregistered and this could bias the estimate of maternal mortality. Also, it has been observed that the number of maternal deaths recorded in the hospital setting is not a good representative of the women, who are at risk of maternal deaths but only those that sought care at the hospital (PRB, 2007). According to NDHS (2008) it was observed that majority of births in Nigeria occur at home (62%) and only one third of live births during the five year preceding the survey occurred in health facility. This mean that most of the maternal deaths would not occur in the hospital settings, so health-facility based study suffers serious biases owing to selectivity and often lead to over or under estimate of maternal mortality .

The difference in the estimated values could also be due to some of the assumptions of sisterhood method. The method relies heavily on the relationships between fertility and age specific fertility rate and some respondents might not know with certainty whether their siblings are alive or not. Also, very large sample sizes are needed for a reliable estimates to be derived using this technique.

5.3 Childhood mortality

Estimates of child mortality for this study include those of infant and under five mortality rates. The infant mortality rate estimated for this study area was 99 deaths per 1000 births which is much higher than the 2013 NDHS estimate for southwest region (61 per thousand birth). The estimated under-five mortality rate for the study area is 180 deaths per 1000 births is twice as

high as the rate estimated in the 2013 NDHS for southwest region (90 per thousand births) which is the geo-political region the study area is located. The result implies that one in 10 children in Iwo Local Government Area die before their first birthday and one in 6 die before their fifth birthday. However, the infant and under-five mortality rates obtained in this study gives a closer estimate of infant mortality rate (86 per thousand births) and under-five mortality rate (167 per thousand birth) obtained for rural areas in 2013 NDHS. This discrepancy buttress what other studies have shown that rural areas seem to have higher mortality rates.

Montgomery and Hewett (2004) have suggested that if anything, such urban-rural differences are more striking in today's world, because even in poor countries many cities have managed to provide the basic public health infrastructure needed to combat communicable disease, and city populations are generally better supplied with modern curative health services as compared to rural areas. A study conducted by Sonko (1996) showed that in some rural areas, infant mortality rates were significantly higher than that of urban centers by over 100 deaths per 1000 live births. Sonko (1996) supported this by noting that such a scenario is what is expected of the relatively higher literacy rates, better socio-economic conditions and the exposure and access to family planning that urban women enjoy more than their rural counterparts. The population census also show similar differentials in rural and urban estimates.

The estimated child mortality is very high and this can be attributed to the poor socio-economic condition of the majority of the women in the study area. Lack of access to adequate health care facility and infrastructure, such as water and poor sanitation. Majority of the respondents reported that pregnant and nursing mothers do not go for antenatal care because they lack money to pay for transport and hospital bill. Also, low average age at first birth (17 years) can predispose some of the women to have child mortality.

The differentials of child mortality according to the bivariate analysis of children dead for women according to socio-demographic characteristics, shows that women with tertiary education have smaller percentage of child mortality than women of no or lower education. This correspond to the result of various studies that reported education as an important factor that directly or indirectly affect child survival. (MacLeod, 1999) (NDHS, 2013) (Charmarbagwala *et al.*, 2004) (Nazrul *et al.*, 2009)

The variables which explain the experience of child mortality differentials at multivariate levels are parity and age. The study shows that women with lower parity were less likely to have experience child mortality and young women of reproductive age (15-24) were more likely to experience child mortality compared to those aged 25-34. This correspond to the result obtained by Nazrul (2009) that showed that multiple births have many times higher infant mortality rates than the first birth. Also, infants born to young mothers or 35 or more years of age are at higher risk of dying (Nazrul *et al.*, 2009) (John, 1991). This is as a result of complication in pregnancy and delivery, premature birth and other related causes that are prevalent among young mothers.

5.4 Conclusion

It was observed from the study that the maternal and child mortality estimates are much higher than the estimates for the Southwest zone. This is not unexpected since the study area has inadequate health care facilities and the available private health centers are inaccessible by the majority of the population due to high level of poverty of the populace. However, the maternal, infant and under-five estimate obtained in this study is for 10-12 years, 1year and 7years prior 2013 when this survey was conducted, then it is plausible to say that maternal mortality ratio, infant and under-five mortality rate are declining but in a slow rate in Nigeria.

In the absence of vital registration system and detailed birth history data, estimates of mortality calculated by indirect methods are the next best form of providing much needed data for planning and further research in Nigeria. Therefore, maternal and child mortality estimates from this research will enrich our data base for vital statistics. It will also help the programmers to track the impact of several maternal and child health programmes and provide necessary information on where to allocate resources.

5.5 Recommendations

- The high maternal and child mortality estimates observed in this study shows that maternal and child health care service needs urgent attention.
- The high level of maternal mortality can be reduced by investing in education of women and health which will lead to prompt health care-seeking behavior when the need arises

- Strengthening of the primary health care system and the provision of equipment and drugs by government at all levels will improve the quality of antenatal and postpartum obstetric care.
- The act of gathering reliable demographic data should be encouraged at both micro and macro levels.
- There is need for public enlightenment campaign of the importance of giving accurate information by respondents during census and surveys.
- There is a need to establish compulsory and reliable vital registration system
- The method of estimation should be refined to provide current estimates of maternal and child mortality.

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