ESTIMATES OF CHILDHOOD AND FEMALE ADULT MORTALITY IN MOKOLA AREA OF IBADAN NORTH LOCAL GOVERNMENT

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CERTIFICATION

I certify that this project was carried out under my supervision by **OGUNBIYI BOLATITO OLUWAYEMISI** of the department of Epidemiology, Medical Statistics and Environmental Health, Faculty of Public Health, College of Medicine, University of Ibadan, Ibadan, Nigeria.

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ABSTRACT

The effectiveness of public health programmes and policies can be measured by levels of specific morbidity and mortality indicators in a population. In particular, the levels of infant and childhood mortality could reflect the overall health status of a population. As a result, the use of mortality information for planning; monitoring and evaluating the impact of various health programs cannot be overemphasized. The poor status of vital registration system in Nigeria through which direct estimates of childhood and adult mortality could be obtained is well known. Therefore, the indirect methods of estimating mortality from retrospective survivorship reports remain an important tool for gaining understanding of the mortality conditions in Nigeria. This study therefore generated estimates of childhood and female adult mortality in Mokola, an urban community in Ibadan.

This cross-sectional study adopted a two-stage cluster sampling procedure to select 1500 eligible individuals from the same number of households. The first stage of sampling involved the selection of 30 clusters by simple random sampling. The clusters were made up of already existing streets as evident in the cartographic representation of Mokola. In the second stage, all men and women aged 15-49 years were selected from a listing of all individuals in the 30 clusters selected at the first stage. Information on survival of children ever born by women and survival of parents were collected from respondents using a structured questionnaire. Data analysis was done using Brass' techniques for estimating childhood and adult mortality.

Respondents were predominantly females (71.4%). The mean ages of men and women were 30 and 31 years (S.D ± 9.6 and 8.8) respectively. Most of the respondents (90.0%) had at least secondary education. The adjusted infant mortality rate was 32 per thousand; probability of dying before the age of two years was 47 per thousand and the under-five mortality rate was 63 per thousand. The logistics regression analysis showed that mothers with primary education (OR=5.5, 95%C.I=2.3 - 13.2) and those with access to pit latrine (OR=2.4, 95%C.I=1.3 – 4.2) experienced high child mortality. Mothers' occupation, marital status and source of drinking water were not significantly associated with child mortality. The implied life expectancy at birth given the mortality level obtained was 64 years. The adjusted female adult mortality level, summarized by the probability of dying between the ages of 15 and 60 years was 33 per thousand. The female adult survivorship probabilities obtained from sons were significantly higher than estimates obtained from daughters (P<0.05).

Relatively low level of childhood and female adult mortality were obtained in Mokola. However, despite the relatively low mortality estimates obtained, there is need to invest in research and surveillance systems to improve on the estimation of mortality levels in Mokola and other similar locations.

Keywords: Childhood mortality, Female adult mortality, Survival, Indirect estimates, and Brass' techniques.

Word count: 486 words.

DEDICATION

This work is dedicated to God Almighty, the immortal, the invisible, the only wise God. It is also dedicated to my family whose love, care and support I enjoy.

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CHAPTER THREE

CHAPTER FOUR

CHAPTER FIVE

LIST OF TABLES

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1

INTRODUCTION

The overall goal of Nigeria National Policy on Population for Sustainable Development is improvement of the quality of life and standards of living of its people (FGN, 2004). One of its specific goals is to progress towards a complete demographic transition in which there is stable population characterized by a reasonable birth and death rates. The path to achieve reduction in mortality is to improve the health and nutritional status of Nigerians particularly children and women through expanded access to high-quality, promotive, preventive and curative health care services. However, the effectiveness of public health programs and policies and indeed the health status of a population is usually measured by levels of specific morbidity and mortality indicators calculated for different age and sex components of a population (Tablin, 1984). Therefore the importance of mortality information for planning; monitoring and evaluation of the impact of various health programs cannot be overemphasized. Estimates of mortality in general can serve several purposes including assessment of population health programs and policies, determination of specific populations that are at increased health risk, population projections, supporting epidemiological and medical research, investigate mortality among different geographic areas, and planning intervention programs to implement policy recommendation.

Indeed, infant and under-five mortality rates are known as key health indicators as they reflect the overall socioeconomic status of a nation (UNICEF 2006). High mortality rates at early ages have been associated with low life expectancies at birth, another key health indicator (UNICEF, 2006). Infant mortality also reflects the health status of a nation.

The effort to generate reliable demographic data from alternative sources resulted in the conduct of numerous sample surveys. These include the 1965-66 Rural Demographic Sample Survey and the 1980 National Demographic Sample Survey (NDSS) conducted by the Federal Office of Statistics and the National Population Bureau, respectively.

The 1981-1982 Nigeria Fertility Survey (NFS) was the first nationally representative survey on fertility, family planning, contraceptive use and related topics. The first Nigeria Demographic and Health Survey (NDHS) followed in 1990. In 1994, the first sentinel survey was conducted to serve as a baseline study to monitor the various projects designed to achieve the objectives of the National Population Policy.

Data from National Demographic and Health Survey (NDHS) 1990 and 2003 on infant and child mortality clearly show a worsening trend (NPC, 2004). The 1990 NDHS reported an infant mortality rate of 91 per 1000 live births and in 2003 NDHS, the rate rose to 100 per 1000 live births. A similar trend was observed in the under-five mortality rate. Under-five mortality rate rose from 192 per 1000 live births in 1990 to 201 per 1000 live births in 2003. More than 2,400 under-five children die daily from preventable causes and malnutrition.

1.11 SOURCES OF MORTALITY DATA

The conventional sources of data necessary to measure mortality, fertility and other variables for population dynamics are the vital registration systems, censuses and sample surveys.

A vital registration system usually has the task of recording vital events (births, deaths, marriages, divorces etc.) as they occur. When this system is coupled with periodic counts of the population (censuses), the direct estimation of demographic parameters becomes possible. Unfortunately, in many countries today, either the data-collection systems do not exist or their performance is so poor that the estimates obtained directly from the data they produce are severely flawed.

The major deficiency of the vital registration system, where it exists at all in Nigeria 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. Only when a child is ready to join the public education system, or some other type of organization for which a birth certificate is required, is the birth reported (UN, 1983) through sworn affidavit as proof of birth date and in countries where a sizeable proportion has never attended school or connected with official organizations demanding birth certificates; many births may never be registered. Also, the births of children who die very young are seldom registered as the parents may consider the registration of either the birth or death to be a futile exercise. Adult deaths are likely to be reported. In countries requiring a death registration certificate before a burial permit is issued, people may report deaths as soon as they occur, especially in urban areas whose administrators are closely supervised by government officials than in rural areas, where ties with the government administration are weaker (UN, 1983). Therefore, it is not surprising to find that, in spite of the legal demand to register deaths, majority of the deaths are never recorded. The vital registration system may also be deficient in recording important characteristics of the vital events, such as age at death, age of mother at a birth, or mother's parity after a birth.

Censuses, the source of the second component of data needed for the traditional estimation of mortality and fertility suffer mainly from two types of error: poor enumeration of all the members of the relevant population and poor reporting of characteristics of the individual such as age. Also, differential coverage of the population by age and sex is very often present (young children, tend to be undercounted to a greater extent than the adult population), and its effects cannot always be separated from those of age misstatement (Hill et al, 2005). Unfortunately in Nigeria, population has always been a contentious issue and censuses conducted in Nigeria have been controversial. To a large extent, this has been because population figures are used by the Federal government as one factor in the allocation of funds, political posts and resources (NPC, 2004).

Given the paucity of vital-events registration and knowledge of health status of a population in most developing countries, demographic and health surveys using prospective multi-round surveys were introduced (Hill, 2003). However due to the cost of carrying out such surveys, retrospective single round surveys have been found more useful to provide data for health planning, practice, evaluation, and allocation of resources. Such surveys include collecting information on sibling histories that ask each respondent about the survival or otherwise of each sibling. A number of countries have sought to measure adult mortality by including questions in censuses and surveys concerning the survival or otherwise of each respondent's mother or father. Attempts have also been made to use the age distributions from successive censuses to arrive at measures of adult survival (Hill, 2003). Estimates of mortality from such retrospective survivorship reports are classified as indirect techniques.

1.12 INDIRECT TECHNIQUES IN DEMOGRAPHIC ESTIMATION.

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 a certain parameter on the basis of information that is only indirectly related to it value. It describes any estimation method that depends on models or uses consistency checks, or indeed uses conventional data in an unconventional way. The classic example is the use of the proportion of children dead among those ever borne by women aged 20-24 years to estimate the probability of dying before age 2. The observed proportion of children dead is clearly related to mortality conditions, but it is not pure mortality measure because it is affected by other, non-mortality parameters. In order to transform this proportion into the desired life table functions, the other parameters must be allowed for, generally by using procedure founded on demographic models. The extent of indirectness varies greatly, however, among procedures, in terms of both the reliance on models and the number of unwanted factors that have to be allowed for (UN, 1983).

1.13 RATIONALE FOR THE STUDY

The reliability of data from the vital registration system in Nigeria is seriously affected by the problems of under-registration and age misreporting. Even in some developed countries, the problem of misreporting (especially under-registration) population vital events is still a real obstacle towards more valid estimates of childhood mortality (Ishak et al, 1987). In developing countries, between one-third and two-thirds of the infant deaths are escaping registrations (International Institute of Statistics, 1987).

The lack of reliable demographic data from traditional sources (occasioned by poor vital registration system and deficient organization of periodic census) makes the development of indirect techniques for estimating demographic indicators of mortality imperative in Nigeria (Bamgboye, 2006).

The geographical information given in the past Nigeria Demographic and Health Surveys is highly aggregated and may therefore conceal local and state-specific effects. Obviously there exists a state-specific geographical variation in the level of mortality in Nigeria. These variations may be attributable to differences in the physical and economic environment, which in turn influence exposure to diseases.

This study will generate estimates of childhood and adult mortality in the study area where no such estimates have been generated either from the grossly deficient vital registration system or the National Demographic and Health Surveys using indirect techniques. These estimates will also serve as a baseline study to monitor the ongoing health project in the community.

1.15 OBJECTIVES

MAIN OBJECTIVE

The main objective of this study is to generate indirect estimates of childhood mortality, female adult mortality level and their trends in the Mokola community of Ibadan, Oyo State.

SPECIFIC OBJECTIVES

1. Estimate childhood mortality from information on total children ever born and surviving in Mokola area of Ibadan.

2. Estimate female adult mortality from proportion of mothers surviving in Mokola area of Ibadan.

3. Generate an abridged life table for females in Mokola using Brass' 2 parameter logit system.

4. Determine the socio-demographic differentials among the proportion of children dead in Mokola.

CHAPTER TWO

LITERATURE REVIEW

2.1 REASONS FOR MEASURING MORTALITY DATA

The patterns of mortality in a community in terms of cause, age, sex, population group, and geographical distribution, inform the work of epidemiologists, medical personnel, and those working in health policy, planning and administration (Anderson, 2006). Mortality data are important in the measurement of consequences of disease and health useful in the planning of health care services. Mortality statistics provide baseline indicators from which health profiles can be constructed and health policy formulated. It can also be used as a proxy for morbidity statistics in the absence of resources for disease surveillance and health surveys. Studying trends in mortality over time helps to understand how the health status of the population is changing and assists in the evaluation of the health system. Mortality data also provide a basis for investigating the incidence of disease, its severity and the quality of life before death.

2.2 EARLIER ATTEMPTS AT ESTIMATING MORTALITY MEASURES IN NIGERIA

Previous attempts to estimate mortality measures in Nigeria can be grouped into four main categories according to the source of data on which the effort was based:

(a) measures from limited vital registration

(b) measure from census data

(c) measures derived from hospital and clinic data

(d) measures from sample surveys

2.21 Vital Registration System

The vital registration system is the main source of data used to estimating changes in the size of a population at any given point in time. While the stock data comes from census, the flow data comes from the vital registration system. If collected accurately vital statistics provide the most reliable information on births and deaths. However, such an accurate system exists only in theory as most developing countries have deficient vital registration system and Nigeria is no exception. Vital statistics are of poor quality affected by underreporting of deaths, and misclassification of their causes.

Mortality measures based on data from vital registration systems are very scanty in Nigeria. This reflects the present poor state of vital data collection status in the country. Efforts are currently being made by the National Population Commission to strengthen this system. A vital registration system has now been established in the 774 local governments in the country. However, their records are far from being complete and reliable. An assessment of the country's death registration system by UNICEF in 1999 revealed a completeness rate of about 20%. A further detracting factor is the uncertainty about the base population to serve as denominators in calculating vital rates.

Notwithstanding all these, the time estimates of infant mortality and crude death rates based on the data from the vital registration system were made for Lagos by the United Nations for the period from 1950 to 1963 and published in the 1966 U.N. demographic Year Book. Table 2.1 shows these rates. The figures for the crude death rate indicate that there has been very little change in the mortality experience in Lagos since 1950. This is evidenced by the very slight, almost unremarkable plummet in the crude death rate from 14.4 in 1950 to 13.5 in 1963. Estimates for the infant mortality rate depict the same trend. Yet the period under consideration is supposed to be one during which mortality, especially infant mortality, has considerably fallen. It is almost impossible to agree that mortality in Lagos in 1950 would have been as low as indicated by the U.N estimates. Taking into account the medical facilities and the standard of living in Lagos (being the commercial capital of the country), even the 1963 estimates appears somewhat low. All these point towards one a strong likelihood: an underestimation of the mortality level by the registration system. This could have been as a result of incomplete death registration or inflated population base or a joint effect. However, the shortcoming is more likely to be on the part of the incompleteness of the death registration, though a substantial effect could also result from the inaccuracy of the base population. Thus, an assessment of the completeness of the registration system is critical before the estimates derived from it can be trusted.

Table 2.1: Estimates of IMR and CDR for Lagos based on Death Registration System, 1950 – 1963

Year	IMR	CDR
1950	87.5	14.4
1951	73.9	15.5
1952	103.8	15.9
1953	85.3	13.6
1954	89.0	13.0
1955	81.8	12.6
1956	75.6	11.7
1957	79.3	13.9
1958	79.1	12.5
1959	76.2	13.4
1960	62.9	11.8
1961	81.0	13.4
1962	62.0	10.9
1963	67.8	13.5

2.22 Hospital and Clinic Data

Among the published reports in this category reported by Ayeni (1974) are the estimates of infant mortality from clinic data collected in three villages in the Niger province of Northern Nigeria by Nicol (1959). Ayeni also reported published infant mortality estimates Gardner and Gardner in 1958 and Hauck in 1963. Gardner and Gardner published infant mortality estimates among children observed from 1955 to 1957 at a clinic in Vom, Northern Nigeria. Their report also incorporated estimates of infant mortality derived from information gathered from six hospitals located in various parts of Northern Nigeria. Hauck reported infant and child mortality estimates made from a study of child mortality in Awo Omama, a village in Eastern Nigeria.

Estimates of infant mortality rates given by these authors vary widely. They are summarized in Table 2.2. They range from Gardner and Gardner's estimate of 358 per one thousand live births for Vom to Hauck's 1963 estimate of 65 per one thousand for Awo Omama. Some of Gardner and Gardner's other hospital estimates for 1958 are as high as 825 per one thousand live births. The wide variation in these rates diminishes their usefulness as indicators of approximate mortality levels. Moreover the fact that they are clinic data points strongly to their bias nature and as such of poor reflection of the actual mortality experience of the population at large. This is largely because only the sick and dying concentrate in clinics (hospitals) and also the denominator base is not always enough, thereby not echoing the true mortality level in communities. Also, the mortality estimates obtained from clinic data is strongly dependent on the frequency of visits to the hospital, thereby creating a preconceived notion. The high estimates obtained in some of the clinics could be an upshot of high attendance.

Table 2.2: Estimates of Infant Mortality Rates per One Thousand live Births from Clinic Data in Nigeria between 1930 and 1963

Author	Year of Study	Area of study	IMR per 1000
Hauck, H.M	1963	Awo Omama, Eastern Nigeria	64.8
Nicol, B.M	1949	Niger Province, Northern Nigeria	326
Gardner and Gardner	1958	Vom, Northern Nigeria	358

Source: Ayeni, 1974

2.23 Census Data

Census data can be used to produce estimates of mortality in population with deficient death registration system. However, all population censuses worldwide are affected by both coverage and content errors. However, the magnitude of these errors differs from one country to another. Whilst in some countries the errors are minimal and hence do not need major adjustments, censuses in some countries are subject to massive errors. Coverage errors are more serious in rural remote areas. But, the coverage errors are unlikely to cause serious bias to mortality estimates. Census data are collected retrospectively; they are therefore subjected to (age) mis-reporting and memory-lapse errors. It is possible to perform consistency checks for various variables that are used for estimating both adult and childhood mortality (i.e. checking for content errors).

When assessing reporting of children ever born and children surviving in a typical census data a number of errors could be observed. First, high proportion of women are recorded in the "not stated" category. El Badry (1961) (cited in United Nations, 1983) argued that some enumerators might have failed to write a "0" for women who stated their parity as zero during fieldwork. These women are then mis-classified as "not stated" during coding stage and hence inflating the number of women in the "not stated" category.

Due to under-coverage, Nigerian census data undermines the population base necessary for calculation of rates particularly for the rural areas and urban slums. Unfortunately, Nigeria's census taking, like the vital statistics, is also inconsistent. The changing geographic boundaries in the country meant that for some years, parts of the population were not enumerated. The accuracy of the census reporting is also an issue related to politics. Population figures are used by the Federal Government in the allocation of funds and political posts. Thus, there is always the urge to inflate the figures in order to favour individuals in political offices. The national revenue usually tagged "national cake" is shared largely on the population size of each state.

The first attempt at a population census in Nigeria was in 1866 (even though Nigeria was not yet a nation). Subsequent censuses before 1952, such as 1911 and 1922, were restricted to some parts of the country. The 1952-53 enumeration was the first nationwide census. The first post-independence census conducted in 1962 was cancelled because of alleged irregularities in its conduct and another census conducted in 1963 was officially accepted (Table 2.3). The 1973 exercise was declared unacceptable and was again cancelled. Thereafter, no attempt was made at conducting a census until 1991. A recent census was carried out in 2006, final report of which is yet to be made public.

Table 2.3: Mortality Estimates from Nigerian Census

Indicator	Census 1963	Census 1991	Census 2006
Population (million)	55.7	88.9	140
Crude Death Rate	27	14	*Analysis in progress*
Infant Mortality Rate	*(unknown)*	93	*Analysis in progress*

2.24 Sample Surveys

The effort to generate reliable demographic data has included the conduct of numerous sample surveys. These include the 1965-66 Rural Demographic Sample Survey and the 1980 National Demographic Sample Survey (NDSS) conducted by the Federal Office of Statistics and the National Population Bureau, respectively.

The 1981-1982 Nigeria Fertility Survey (NFS) was the first nationally representative survey on fertility, family planning, contraceptive use, and related topics. The first Nigeria Demographic and Health Survey (NDHS) followed in 1990. In addition to the topics covered by the NFS, the 1990 NDHS also collected information on issues related to maternal and child health.

1965 Rural Demographic Sample Survey

The 1965 Rural Demographic Sample Survey was the first national attempt to generate estimates of mortality rates for all ages in the country. The survey was designed to be a three-round survey of vital events in selected rural areas in the country. The rural sector of the country was stratified by agricultural characteristics of which 204 units were selected. At the beginning of the survey, the average size of each sample unit was about 1800 persons.

The first round of the survey consisted mainly of listing individuals in the selected 204 units which all altogether total 351,336 persons. The second and third rounds focused on collections of vital events that had occurred since the previous visits.

The mortality data derived from the survey were heavily edited before the appropriate rates were estimated from them. The editing was one directional in the sense that units whose recorded number of vital events were thought to be too low were excluded from the final analysis. The exclusion criterion was ambiguous and appeared to be biased. As reported by Ayeni (1974), this bias editing and other shortcomings have led to the severe criticisms of the published estimates by several authors (notably by Olusanya, Ekanem, Caldwell and Igun). The most prominent of their criticism was based on the logic that if so many units were rejected on the basis of being incomplete, then the accepted ones may also include units that ought to have been rejected too. Thus it is clear that their criticism emanated from the fact that the published mortality estimates give too low indicators of mortality level in the rural areas.

The crude death rates calculated from both the rejected and the accepted units are shown in table 2.4. Final estimates of the crude death rate accepted by the authors of the report was 26.9 per one thousand estimated from the data of the accepted units. The final estimate was arrived at after three further stages of adjustment. At each stage the various adjustment have the effect of increasing the rates.

Table 2.4: Crude death rates estimated from accepted and rejected units of the Rural Demographic Inquiry 1965-66

	No of Units	No of deaths	Rate per 1000
Accepted	239	5999	22.2
Rejected	27	558	11.6
Total	266	6557	20.6

Ayeni (1974) is of the opinion that the death rates calculated from the accepted units are a bit too high. He considered the way the original data was edited. He argued that exclusion of units from the analysis has no statistical justification and is contrary to the principles of fair data editing. It is difficult to determine whether the low number of deaths recorded in the excluded units were due to omission or real effect. The fact that the crude death rate in the rejected units was about half that of the accepted ones is not a valid excuse for the rejection of the units. Such disparities between areas within the same country in vital rates estimated from the sample surveys have been reported in other parts of Africa notably in Senegal by Cantrelle (reported by Brass). Cantrelle found that in two areas within the same region surveyed, the average level of the rate of natural increase between 1963 and 1964 was higher in one area than the other by nearly 12 per thousand. The major point here is the fact that sample variabilities of birth, death and growth are very high. To discard some units exclusively based on the small number of recorded vital events is therefore to bias the estimated rates.

2.25 NIGERIA DEMOGRAPHIC AND HEALTH SURVEYS (NDHS)

The Nigeria Demographic and Health Survey (NDHS) is a national sample survey of women of reproductive age designed to collect data on socioeconomic characteristics, marriage patterns, history of child bearing, mortality pattern, breastfeeding, use of contraception, immunization of children, accessibility to health and family planning services, treatment of children during episodes of illness, and the nutritional status of children. This was intended to assist policy makers and administrators in evaluating and designing programmes, and to develop strategies for improving health and family planning services in Nigeria which in turn should reduce childhood mortality levels. (NPC, 2004).

Mortality estimates are calculated from information that was collected in the birth history section of the individual questionnaire. The section began with questions about the aggregate childbearing experience of respondents (i.e., the number of sons and daughters who live in the household, who live elsewhere, and who died). These questions were followed by a retrospective birth history in which data were obtained on sex, date of birth, survivorship status, and current age or age at death of each of the respondents' live births. This permits calculation of various child mortality rates such as infant mortality and under-five rates. (NPC, 2004). The direct estimation technique is based on a life table approach: probabilities of dying are computed from reported dates of birth and death and the numbers of children of a particular age exposed to the risk of dying during a specified period (Hill et al, 1988 and Bicego et al, 1996). Each survey produces national mortality rates for the intervals 0–4, 5–9, and 10–14 years preceding the survey. These estimates can be considered to indicate the mortality rates at a mean of 2.5 years, 7.5 years, and 12.5 years preceding the survey, respectively. The birth history data for the less recent periods are thought to be of lower quality because event omission and misreporting of date of birth and age at death for deceased children are likely to occur more frequently at longer durations of recall. This leads to progressive underestimation of mortality rates with increased time preceding the survey, as has been demonstrated by comparing rates for a given calendar period between recent and less recent surveys. (Bicego et al, 1996).

2.251: Ondo State Demographic and Health Survey (ODHS), 1986

The Ondo State Demographic and Health Survey (ODHS) was conducted by the Ondo State Ministry of Health (MOH) as part of the worldwide Demographic and Health Survey programme. The primary objective of the ODHS was to provide policymakers and planners with information on fertility, family planning, maternal and child health, and infant and child mortality. The data was used to evaluate existing health and family planning programmes and to aid in the design of new programmes. Another objective of the survey was to test the feasibility of conducting a population-based survey in Ondo State where, as with the rest of Nigeria, a sampling frame was available for only part of the State and also to document recent changes in population characteristics and fertility and family planning practices in Ondo State.

The ODHS differs from most other surveys in the DHS Programme which are national in scope. Ondo State was chosen for a DHS survey for two reasons. First, the Ondo State MOH expressed a need for, and interest in, the type of data collected in DHS surveys. Second, the efforts of the National Population Bureau to provide a population-based sampling frame for Nigeria through the Enumeration Area Demarcation Exercise had progressed further in Ondo State than in any other state of Nigeria.

A two-stage sampling procedure was adopted in the ODHS. In the first stage, systematic samples of 90 primary sampling units were selected from census enumeration areas (EAs). In the second stage, households were also systematically selected using a known sampling fraction. Within selected households, eligibility interview was on a *de facto* basis: all women 15-49 who stayed in the household the previous night were eligible respondents. The sample design specified a target of 3,600 completed interviews from female respondents. For the survey, a total of 4,213 completed interviews were obtained.

In the ODHS, direct mortality rates were calculated on a period basis (i.e., utilizing information on deaths and exposure to mortality during a specific time period) rather than on a birth cohort basis.. A complete description of the methodology for computing period-specific mortality probabilities was given by Rutstein, 1984.

The mortality data were obtained in the form of a truncated birth history which collected information on all births which occurred to respondents during the time period 1981-86. As a result of this procedure, the observed person-years of exposure to mortality are less for the older childhood ages (ages 3 and 4) than for the younger childhood ages (ages 1 and 2). The decline in the number of persons exposed to mortality should not substantially increase the sampling variance of the estimated child mortality rates because older children contribute relatively little to the overall child mortality rate.

The reliability of mortality estimates from the truncated birth history depends on the sampling variability of the estimates and on non-sampling errors. In any study of child health and mortality in the developing world, the quality of the data being analyzed is open to question. While NDHS are conducted to high standards, several potential problems need to be borne in mind when interpreting the results of the study. First, fertility and mortality surveys are designed to yield data on the children of women in households but not on orphans or 'street children'; thus, these results fail to reflect the health of some of the most disadvantaged children in the developing world. Secondly, sampling frames for urban areas in developing countries rapidly become out-of-date and commonly omit newly-settled squatter camps. A third major data quality issue is reporting and measurement errors. Exact dates of birth may have been forgotten, reported ages at death of children are often rounded to complete years.

Event underreporting and age at death misreporting are the more serious sources of error for mortality estimation. The ODHS data were verified with respect to these two sources of error by testing their internal consistency. However, it should be stated that the power of internal consistency checks for detecting error is quite limited so that, while they can detect gross defects, they cannot detect less serious data problems and cannot definitively establish the accuracy of the data collected. Underreporting of deaths is most likely in the case of babies who die in early infancy. In the ODHS, age at death was recorded in one of three units: days, for deaths in the first month of life; months, for deaths under two years of age; and years, for deaths at age two and above. A test to detect underreporting of early infant deaths was made by calculating the ratio of deaths under seven days to all deaths in the first month of life. Since mortality is known to decline steeply with age throughout early infancy, the value of this ratio should exceed 0.25. For the period 1981-86, the values of this ratio from the ODHS were well in excess of 0.25, indicating that gross underreporting of babies who died in early infancy is not a problem. Age at death misreporting can result in a net transfer of events between infancy and early childhood and can bias mortality estimates. The possibility of such misreporting was investigated by looking for heaping of deaths at 12 months in the distribution of deaths by age. There were some indication of heaping of deaths at 12 months of age at 11 months and 4 at 13 months) but it was not significant relative to death reported for the 1981-86 period (11 deaths at 12 months versus the total of 214 infant deaths).

Table 2.5 displays infant and child mortality rates for Ondo State for the period 1981-1986. The overall infant mortality rate was 56 deaths per 1,000 live births and the child mortality rate (CMR) was about the same, 55 per 1,000. The overall probability of dying between birth and age five was 108 per 1,000 (i.e., about one in every ten children dies before reaching five years of age). Sex-specific rates were similar for infant and child mortality with male rates being higher than female rates -- a differential found in most populations. The rates (IMR and CMR) by area of residence were lower in urban areas (54 and 49 per 1,000, respectively) than in rural areas (57 and 61 per 1,000, respectively). These differences which may be due to sampling variance appear more marked with child mortality.

Table 2.5: Infant and Child Mortality Estimates 1981-1986, ODHS, 1986

Background Characteristics	Infant Mortality $_1q_0$	Child Mortality $_4q_1$	Under-five $_5q_0$
Sex			
Male	59	58	114
Female	53	51	101
Residence			
Urban	54	49	100
Rural	57	61	115

The rates by education indicated lower infant mortality for women with no education (54 per 1,000) than for women with a primary education (64 per 1,000). The child mortality rates were the same for women with no education and with a primary education (57 per 1,000). On the other hand, for women with a secondary or higher education, the infant and child mortality rates were considerably lower (40 and 15 per 1,000, respectively).

Another perspective on infant and child mortality was obtained by calculating statistics on the proportion of dead children from children ever born. Overall, the proportion of dead children from children ever born to women aged 15-49 years was 0.20 (Table 2.6). In other words, one in five children born to women aged 15-49 years died. As expected, this proportion increased with increasing age of women. Less than one in 12 children born to women aged 15-19 years died while women 45-49 years had lost over one-quarter of their children. The higher proportion of dead children from children ever born among older women reflects the fact that their children were born longer ago and have been exposed longer to the risk of mortality.

Table 2.6: Proportion of Children Dead by Age of Women, ODHS, 1986

Age of Women	Mean Number of Children: Ever Born	Surviving	Dead	Proportion Dead	Number of Women
15-19	0.08	0.07	0.01	0.080	1109
20-24	0.82	0.71	0.10	0.124	563
25-29	2.65	2.30	0.34	0.129	560
30-34	4.65	3.84	0.80	0.173	548
35-39	5.86	4.78	1.08	0.184	478
40-44	6.53	5.06	1.47	0.225	478
45-49	7.24	5.26	1.98	0.274	477
Total	3.31	2.63	0.68	0.205	4213

2.252: Nigeria Demographic and Health Survey (NDHS), 1990.

The 1990 NDHS sample was drawn from the national master sample for the 1987/1992 National Integrated Survey of Households (NISH) programme being implemented by the FOS. The 299 sample clusters correspond to the Enumeration Areas (EA) of the NISH master sample. A sample of about 10,000 households was selected with two-fold over-sampling of the urban stratum, yielding 132 urban EAs and 167 rural EAs. Thus, the NDHS sample is a weighted sample.

Heaping of age at death at 12 months in the 1990 NDHS was fairly common. Also, interviewers at times recorded deaths at "1 year," even though instructions required them to record deaths under two years of age in months. An unknown fraction of these deaths may have actually occurred before the first birthday. Thus, the infant mortality rate may be biased downwards and child mortality biased upward; under-five mortality would be unaffected. Yet, earlier simulation studies using DHS data from other countries indicate that while age at death misreporting is troublesome, the type and magnitude observed in the NDHS is unlikely to result in biases of more than 5 percent (Sullivan et al., 1990). The rates presented in the 1990 NDHS were unadjusted; that is, all deaths reported at 12 months or "1 year" were assigned to the post-infant age period.

It is seldom possible to establish, with confidence, mortality levels for a period more than 15 years before a survey. Even in the recent 15-year period considered here, apparent trends in mortality should be interpreted with caution. First, differences may exist in the completeness of death reporting related to the length of time preceding the survey. Second, the accuracy of reports of age at death and of date of birth and cause of death may deteriorate with time. Thus, without a detailed evaluation of the quality of birth history data, conclusions regarding changes in mortality should be considered preliminary.

In the five years preceding the survey, nearly 1 in 5 children died before their fifth birthday. The direct estimates of infant, child and under-five mortality rates for five-year periods in the 15 years preceding the survey are shown in table 2.7. Under-five mortality over this period fell slowly from 201 deaths to 192 deaths per thousand live births. The small decline was largely attributable to a drop in the neonatal rate from 52 to 42 deaths per thousand live births (data not shown here); mortality between 1 and 59 months of age has shown no improvement over the period. The latter finding reflects the offsetting effects of improved health services on the one hand, and the deteriorating economic position of the average Nigerian household, on the other. Nationally, 87 of every 1,000 children born die before their first birthday, and 115 of every 1,000 children alive at age one year die before their fifth birthday.

Table 2.7: Infant and Child mortality rates by five-year periods preceding the 1990 NDHS survey

Years preceding survey	Infant mortality	Child mortality	Under-five mortality
0 – 4	87.2	115.2	192.4
5 – 9	95.7	103.3	189.1
10 – 14	98.6	113.5	200.9

The age pattern of under-five mortality is an important finding of the 1990 NDHS. In most countries, infant mortality exceeds child mortality rate. In Nigeria however, the situation is different as the child mortality rate (115/1000) is substantially higher than infant mortality (87/1000) in the 5-year period preceding the survey. This higher level of child mortality, relative to infant mortality however, is a pattern also found in other West African countries such as Mali and Senegal (MDHS 2001 & SDHS 1999).

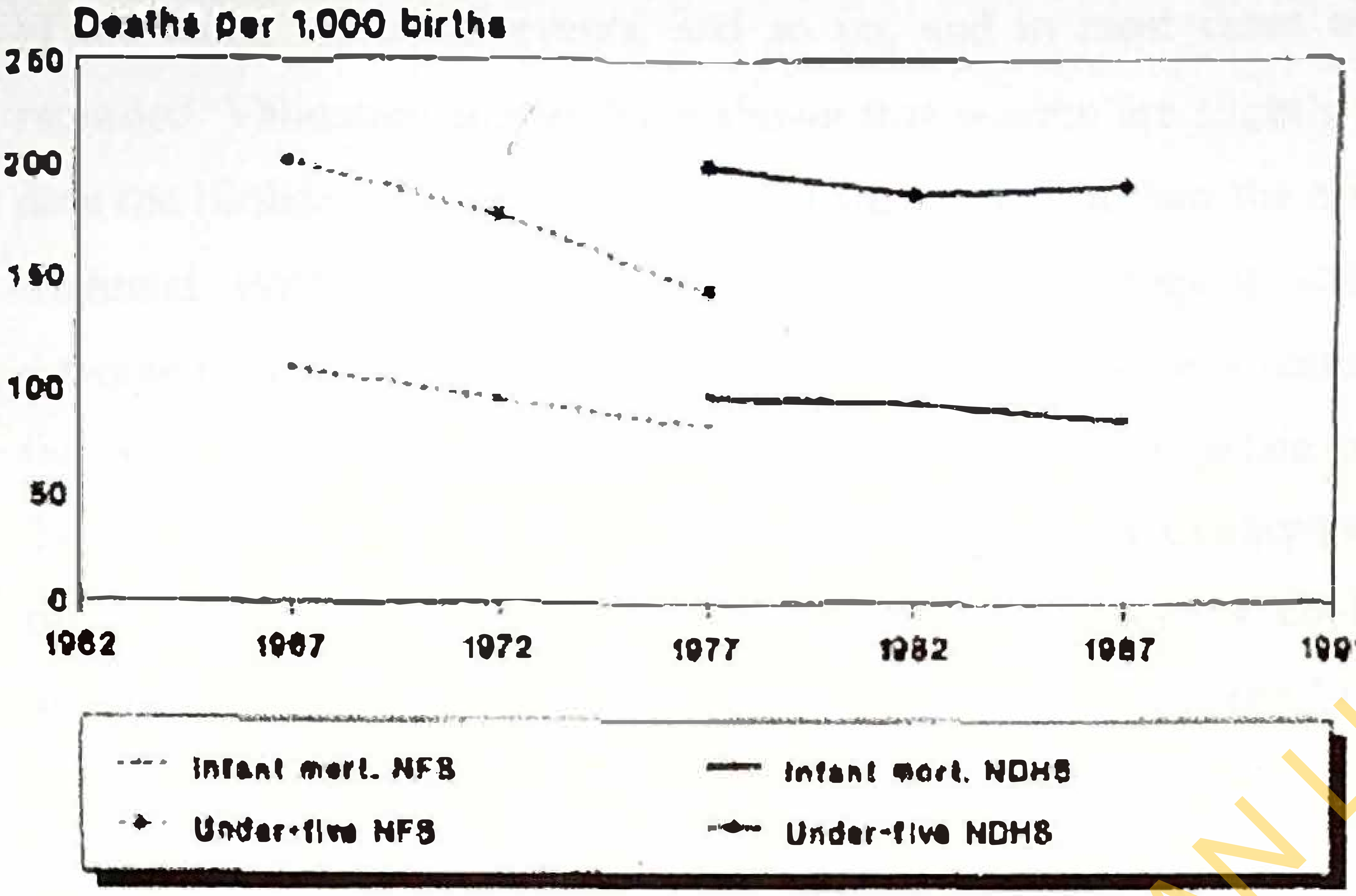
The regional variation of infant, child and under five mortality is shown in table 2.8. A prominent pattern of higher child mortality relative to infant mortality was noticed in the Northeast and Northwest regions. The southwest region however, has the lowest infant, child and under-five mortality rates. The regional variation in the age pattern of under-five mortality may be explained by socioeconomic differentials. The report showed that high child mortality (relative to infant mortality) was experienced by children born to mothers who were uneducated, who lived in rural areas, and who had limited access to basic health services.

Table 2.8: Infant and child mortality rates for the ten-year period preceding the 1990 NDHS by Region

Region	Infant mortality	Child mortality	Under-five mortality
Northeast	87.7	139.2	214.6
Northwest	109.8	151.2	244.4
Southwest	82.7	66.5	143.7
Southeast	84.6	90.5	167.2

A comparison of the 1990 NDHS and 1981-1982 NFS data shown in figure 2.1 revealed that estimates for the overlapping period centred around 1977 suggests gross underreporting of deaths in the NFS, especially for children age 1-5 years. The summary of the two surveys revealed that child survival has improved very little over the decade of the 1980s in Nigeria; the only encouraging sign is a small decline in mortality during the first month of life. These inconsistencies between studies call for a critical review of study methodologies, data gathering techniques and interpretation.

Figure 2.1: Trends in Infant and Under-five Mortality, NFS and NDHS Survey



Note: The points shown are the mid-points of five-year periods.

2.253 Nigeria Demographic and Health Survey (NDHS), 1999

The accuracy of reporting by respondents determines the reliability of early childhood mortality rates from birth history data. In specific cultural settings, such as in Nigeria, where there is reluctance to speak about the dead, many mothers may omit dead children. Therefore, special skills are required to elicit accurate information from respondents about their deceased children. An examination of the birth history data in the 1999 NDHS shows evidence of omission of births and deaths, especially in the three years preceding the date of interview. Such omissions may result from interviewers displacing births to avoid the numerous health questions that were to be asked about live births since January 1996. When women have difficulty recalling exact dates of their birth events, the interviewer is instructed to probe using stated age of the child, historical events, and so on, and in most cases eventually a date is recorded. Validation studies have shown that women are slightly more likely to pre-date the birthdays (over report ages) of their children than the opposite (Becker and Mahmud, 1984; Bairagi, Edmonston and Khan, 1987; Espeut, 2002). In the NDHS if a woman was not sure of the date of birth, the interviewers could avoid completing the questionnaire by placing the estimated date beyond a certain cutoff for eligibility. Thus, if the birth date for a child was not given by the mother (which is quite often the case in communities with low literacy) interviewers could avoid work by assigning a date of birth of both surviving and dead children beyond the five year cutoff in the earlier survey round, and the incentive would be greater for surviving (than for dead) births in the later survey round.

The direct childhood mortality estimates for five-year periods preceding the survey are presented in Table 2.9. The infant mortality rate (IMR) for the most recent period, 0-4 years before the survey, is 75 per 1,000 live births. The IMR for 1985-89 (10-14 years before the survey) is 77 per 1,000 live births. This rate is lower than the 87 per 1,000 live births reported for the period 1986-90 obtained from the 1990 NDHS and probably reflects the underreporting of mortality for the 1999 survey (NPC, 2000). Under-five mortality for the 10-14 years before the survey (1985-89) is 142 per 1,000, which is low relative to the 1990 NDHS estimate of 192 per 1,000 for the same period.

Table 2.9: Rates of Early Childhood Mortality- 1999 NDHS

Years preceding survey	Infant mortality	Child mortality	Under-five mortality
0 – 4	75.2	70.3	140.2
5 – 9	66.2	63.9	125.8
10 – 14	77.0	70.8	142.3

Child mortality rates stratified by regions and states in Nigeria are presented in Tables 2.8 and 2.9 respectively. The geographical information given in Table 2.10 is highly aggregated and may therefore conceal local and state specific effects. Moreover, there is no adjustment for other covariates, which may lead to wrong conclusions. On the other hand, raw mortality values stratified by states in Table 2.11 showed that the number of deaths on which some of the calculated rates were based was considerably low in some states while some reported no deaths at all. This may affect the reliability of the estimated rates. Moreover, the raw mortality rates strongly depend on the sample and may be rather unstable.

Table 2.10: Frequency of Child Mortality by Regions in Nigeria, 1999 NDHS

Region	No of deaths	No of children.	Proportion dead
North East	104	790	0.132
North West	61	669	0.091
South East	63	651	0.097
South West	60	745	0.081
Central	54	697	0.078
Total	342	3552	

Table 2.11: State Distribution of Child Mortality in Nigeria, 1999 NDHS

Number	District	No of deaths	No of children	Rel. freq.
1	Akwa-Ibom	29	213	0.136
2	Anambra	5	68	0.074
3	Bauchi	25	153	0.163
4	Edo	13	99	0.131
5	Benue	7	106	0.066
6	Borno	2	68	0.029
7	Cross River	2	56	0.036
8	Adamawa	12	70	0.171
9	Imo	4	65	0.062
10	Kaduna	14	152	0.092
11	Kano	54	318	0.170
12	Katsina	21	213	0.113
13	Kwara	5	72	0.069
14	Lagos	14	132	0.106
15	Niger	12	111	0.108
16	Ogun	6	122	0.049
17	Ondo	5	66	0.076
18	Oyo	7	131	0.053
19	Plateau	7	90	0.078
20	Rivers	5	57	0.088
21	Sokoto	16	96	0.167
22	Abia	5	71	0.070
23	Delta	5	99	0.051
24	Enugu	4	46	0.087
25	Jigawa	7	95	0.074
26	Kebbi	6	85	0.071
27	Kogi	5	104	0.048
28	Osun	4	76	0.053
29	Taraba	3	74	0.041
30	Yobe	10	110	0.091
31	Bayelsa	0	16	0.000
32	Ebonyi	9	59	0.153
33	Ekiti	6	20	0.300
34	Gombe	6	46	0.130
35	Nassarawa	3	43	0.070
36	Zamfara	1	123	0.008
37	FCT-Abuja	0	27	0.000
Total		342	3552	

It is important to note that the conclusion of an in-depth assessment of the 1999 mortality data was that the reported rates were inaccurate and underestimated. The reliability of these estimates was affected by the few deaths the estimates were based on (table 2.11). It was apparent from the in-depth analysis of the data quality of the 1999 NDHS that a significant number of births and deaths were omitted thus, resulting into generation of biased (downwards) estimates.

2.254 Nigeria Demographic and Health Survey (NDHS), 2003

The 2003 Nigeria Demographic and Health Survey (2003 NDHS) was the third national Demographic and Health Survey conducted in Nigeria. One of the objectives of the Survey was to measure levels and trends of mortality among children, because infant and child mortality reflects a country's level of socio-economic development and quality of life.

The 2003 NDHS is a nationally representative sample of urban and rural areas in which a probabilistic 2-stage sampling design was employed. In the first stage of sampling, 365 Enumeration Areas (EAs) or clusters were randomly selected with probability proportionate to population size (PPS) form a list of EAs developed from the 1991 population census. In the second stage, a complete listing of all households in the chosen EAs was obtained from which a systematic random sample of 7,864 households was finally selected.

Typically, the most serious source of non-sampling errors in a survey that collects retrospective information on births and deaths arises from an underreporting of births and deaths of children who are not alive at the time of the survey. Mothers may be reluctant to talk about their dead children because of feelings associated with any death or because the culture in which they live may discourage discussing the dead. Even if a respondent is willing to discuss a dead child, she may likely to forget events that happened in the more distant past, particularly if a child was alive only for a short time.

When selective omission of childhood deaths occurs, it is usually most severe for deaths in early infancy. (Becker and Suliman, 2005). However, the proportion of neonatal deaths occurring in the first week of life was high: 74 percent for the period 0-4 years preceding the survey. Furthermore, it appeared that early infant death for births that occurred longer before the survey was not severely underreported; 72 percent of all neonatal deaths in the 20 years preceding the survey were early neonatal deaths. Another issue affecting childhood mortality estimates is the quality of reporting of age at death. If age at death is misreported, estimates may be biased, especially if the net effect of age misreporting results in transference of deaths from one age bracket to another. To minimize the error in reporting of age at death, interviewers were instructed to record the age at death in days for deaths under one month and in months for deaths under two years. They also were asked to probe for deaths reported at one year to determine a more precise age at death in terms of months. Despite the emphasis during interviewer training and fieldwork monitoring on probing for accurate age at death, the survey result showed that the number of reported deaths at age 12 months or one year of age was several times higher than that reported for ages 11 and 13 months. It is likely, then, that some of these deaths actually occurred before one year of age but were not included in the infant mortality rate. However, the excess deaths reported at 12 months and one year of age has no effect on estimates of overall under-five mortality rates.

Heaping typically occurs at 7 days, 30 days, 12 months and 24 months. A classic problem is heaping at 12 months of age. This affects the calculation of infant mortality, i.e. if some children reported as dying at 12 months of age were really only 11 months old, then the infant mortality rate will be underestimated because 12 months is classified in the 1 to 4-year age group. (NPC, 2004). The magnitude of this problem can be assessed by calculation of heaping ratios [e.g. 3*D12/(D11+D12+D13)] where Dx is the number of deaths reported at age x in months; the ratio should be close to 1.0 if there is no heaping.

Table 2.12 shows early childhood mortality rates (estimated using the direct estimation technique) based on data from the 2003 NDHS. For the five years immediately preceding the survey (1999-2003), the infant mortality rate was 100 deaths per 1,000 live births. The estimates of neonatal mortality and post-neonatal mortality were 48 and 52 deaths per 1,000 births, respectively. The estimate of child mortality (age 1 to age 4) was higher: 112 deaths per 1,000 children surviving to 12 months of age. The overall under-five mortality rate for the period was 201 deaths per 1,000 births.

Table 2.12: Rates of Early Childhood Mortality- 2003 NDHS

Years preceding survey	Infant mortality	Child mortality	Under-five mortality
0 – 4	100	112	201
5 – 9	120	132	236
10 – 14	113	136	234

The infant mortality estimate from the 2003 NDHS (100 per 1,000) is significantly higher than those from the 1990 NDHS (87 per 1,000) and the 1999 NDHS (75 per 1,000). In the case of the latter survey, there is evidence of omission of births and deaths from the period preceding the survey (National Population Commission, 2000). The conclusion of the data quality assessment in the 1999 NDHS report is that the reported rates significantly underestimated the true mortality levels in the country. The very substantial difference between the 1999 and 2003 surveys confirms the underreporting of events in the 1999 NDHS.

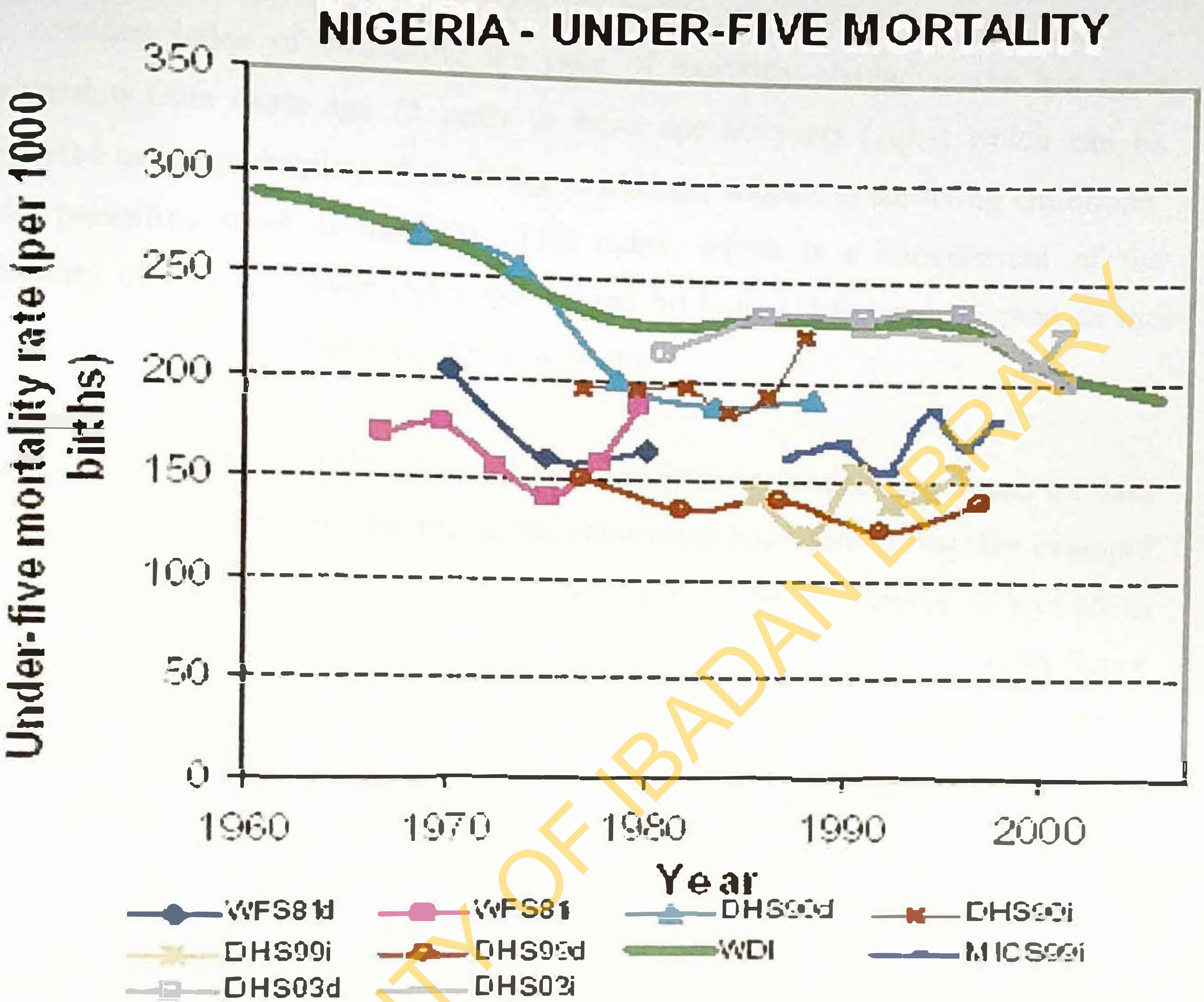
The 2003 NDHS results for the period 10-14 years preceding the survey, which would correspond to approximately the 1989-1993 calendar years, produce an infant mortality rate of 113 per 1,000, while the 1999 NDHS estimate for approximately the same time period (1986-1990) was 87 per 1,000. The 26- point difference is substantial, and it is unlikely that sampling variability is responsible for the much higher rate of the 2003 survey but rather reflect an underestimation during the 1990 survey. Compared to other regions in the country, the southwest estimates during the two surveys remain low (table 2.13). This could reflect a better health system in the region.

Despite evidence of heaping at certain age of death, it should be noted that the age at death data collected in the 2003 NDHS are far superior to those collected in the 1999 NDHS and are substantially better than those in the 1990 NDHS, both in terms of reduction in heaping of age at death and completeness of reporting of age at death. Evidence points to a serious underestimate of mortality in the Northeast and Northwest regions during the 1990 NDHS. This, in turn, would have biased downwards the infant mortality rate for the entire country, because the high-fertility respondents of the north contributed more than half of the births in Nigeria in the sample. The greater contribution to the underestimate is attributable to respondents in the Northeast. In conclusion, the preliminary analysis indicates that the 1990 survey estimate of 87 per 1,000 for the 1986-1990 period was an underestimate. Thus, it is not possible to conclude that the difference between the 1990 rate (87 per 1,000) and the 2003 rate (100 per 1,000) is due to an increase in mortality risks during the intervening years. Clearly, poor data quality in the previous survey contributes to the difference. Furthermore, the majority of deaths recorded at one year of age occurred in the North East and North West (data not shown), where lack of recordkeeping and uncertainty regarding dates of events makes this type of data collection extremely difficult.

Table 2.13: Comparison of Infant Mortality rates from the 2003 NDHS and the 1990 NDHS

Years preceding survey	Northeast	Northwest	Southeast	Southwest	Total
2003 NDHS	129	136	192.4	81	113
1990 NDHS	83	110	189.1	75	87

Figure 2.2:



Data source and type	Acronym
1981-1982 Nigeria Fertility Survey (direct)	WFS81d
1981-1982 Nigeria Fertility Survey (indirect)	WFS81i
1990 Nigeria Demographic and Health Survey (direct)	DHS90d
1990 Nigeria Demographic and Health Survey (indirect)	DHS90i
1999 Nigeria Demographic and Health Survey (direct)	DHS99d
1999 Nigeria Demographic and Health Survey (indirect)	DHS99i
1999 Multiple Indicator Cluster Survey (indirect)	MICS99i
2003 Demographic and Health Survey (direct)	DHS03d
2003 Demographic and Health Survey (indirect)	DHS03i

WDI: Estimates used for World Development Indicators.

2.26: Other Attempts to Estimate Adult Mortality in Africa

One common index of measuring the pace of mortality change is the life table survivorship from exact age 15 years to exact age 60 years ($_{45}p_{15}$) which can be interpreted as the probability of surviving to old age, subject to surviving childhood, at the prevailing level of mortality. This index, which is a complement of the probability of dying between exact age 15 and 60 ($_{45}q_{15}$), has been adopted as the preferred index of adult mortality (Timæus 1998).

Timæus (1993) points out that some of the results on adult mortality based on data that have been subjected to smoothing and adjustment have shown that, for example around 1980, more than 75 per cent of those aged 15 would survive to age 60 in Benin and The Gambia. In Ghana, Mauritania, and Zimbabwe, the equivalent figure is more than 80 per cent. The increase from low to high mortality in some countries has been substantial. For example, Feeney (2001) reports that in Zimbabwe the value of $_{45}p_{15}$ decreased from about 80 per cent in 1982 to about 50 per cent in 1997. In Malawi, this value increased from 56 per cent in 1966 to 58 per cent in 1977 and further increased to 68 per cent in 1987 before declining to 52 per cent in 1998 (MNSO 1994, 2002).

In southern Africa, adult mortality levels in neighbouring countries quite often not only appear to be close but also have similar trends and patterns. In this region, adult mortality appears to have leveled off at high levels while that of children appear to have declined. Although much attention in the past has been paid to mortality and morbidity in adults and children living in the urban areas, little is known about the extent of mortality of adult populations in the rural areas of sub-Saharan Africa. Lack of such basic health data places health planners and policy makers at a disadvantage

(Quigley *et al.* 2000). Adults, especially the economically active, provide the economic support for the whole population, and the emergence of the HIV/AIDS pandemic has increased our understanding of the effects of increased adult mortality and morbidity.

In 1995, a Lusaka study on adult mortality (Kelly *et al.* 1998) found that among young adults, death rates were 20 times higher than in another study in rural and urban Nigeria (Cooper *et al.* 1998a). The Lusaka study comprised poor urban neighbourhoods where a total of 2,258 households (representing 6,440 adults and 5,073 children) were initially interviewed in 1995 and followed up for two years. It was found that 29 per cent of all households reported one or more deaths within two years, a total of 392 adult deaths (202 men and 190 women). The crude death rate in Lusaka was 2.5 times higher than the Nigerian cohorts.

The Nigerian study (Cooper *et al.* 1998b), conducted in 1995, followed 7 628 adults over the age of 15 years in an urban cohort of Ibadan and 4 205 adults over the age of 25 years in the nearby rural district of Igbo-Ora. A follow-up was done every three months to see if a death had occurred. The findings showed that a total of 216 deaths occurred during the follow-up.

In a study to measure mortality and probability of death between 15 and 59 years of age ($_{45}q_{15}$) in one urban and two rural areas of Tanzania, the result showed that Crude mortalities ranged from 6.1/1000/year for women in Hai to 15.9/1000/year for men in Morogoro rural. Rates were higher in men at all ages in the two rural areas except in the age group 25 to 29 years in Hai and 20 to 34 years in Morogoro rural. In Dar es Salaam rates in men were higher only in the 40 to 59 year age group. The probability of death before age 60 of a 15 year old man ($_{45}q_{15}$) was 47% in Dar es Salaam, 37% in

Hai, and 58% in Morogoro; for women these figures were 45%, 26%, and 48%, respectively.

CHAPTER 3

METHODOLOGY

3.1: Study Design

This is a single round cross-sectional survey of Mokola area, Ibadan. Relevant information was collected using a structured questionnaire that contains information on respondents' demographic characteristics, retrospective survivorship of close relations and birth histories.

This study was done in collaboration with two other colleagues who also estimated some health parameters in the study area.

3.2: Study Area

Mokola is an urban settlement in Ibadan North Local Government Area of Oyo state, located in the south western region of Nigeria. Its population was estimated to be 17,014 during the 1991 Census. The community is predominated by the Yoruba ethnic group. The majority of the residents are in private business such as: traders and Artisans. Mokola, being an urban settlement, is densely populated with a population density of 314 persons per Km^2, which is considerably higher than the national population density of 146 persons per Km^2. The mean household size in Ibadan where Mokola is located is 4 persons per household (NPC, 1997).

3.3: Target Population

The target population is all residents of Mokola community.

3.4: Study Population

The study population is men aged 15-65 years and women in the reproductive age group (15–49 years) selected from households in Mokola.

3.5: Study Duration

The study was conducted within a period of three months between November 2006 and February 2007.

3.6: Sample Size

A sample size for the study was calculated using the statistical formula for calculating minimum sample size to estimate single proportion. The minimum sample size needed to estimate the prevalence of under-five mortality to within 5% of the estimate of 201 per 1000 (NDHS, 2003) at a 5% level of significance and 80% power is obtained using the formula as follows:-

$$N = \frac{(Z_\alpha)^2 \times pq}{d^2}$$

Where

N = minimum sample size

Z_α = standard score: 1.96 (Assuming a level of error of 5%)

p = prevalence of outcome measure: 0.201 (under-five mortality)

q = 1-p = 1-0.201 = 0.799

d = Absolute deviation: 5% = 0.05 (this means that the estimate for under-five mortality is within 5% from the assumed true rate)

$$N = \frac{(1.96)^2 \times 0.201 \times 0.799}{(0.05)^2}$$

N = 247

According to NDHS 2003, the design effect within a cluster with 30 - 50 households is 1.78.

Design Effect = $\frac{\text{Design (Cluster)}}{\text{Simple Random Sample}}$

This means that the total error is about 2 times higher than it would have been if a simple random sample, without clustering, had been chosen. However for this study, a design effect of 3.5 was used. Therefore, the minimum sample size is multiplied by the design effect.

N = 247 x 3.5 = 867

Assuming a response rate of 90%,

$N = \frac{867 \times 100}{90}$

N = 964 Households

However, a sample size of 1,000 households was used for the study to allow for statistical analysis of different variables.

3.7: Sampling Procedure

The interviewers carried out house to house numbering two days before the survey. A probability two-stage cluster sampling technique was adopted in the study. The first stage of sampling is the selection of 30 clusters (blocks of houses as shown in the cartographic representation of Mokola) from the already existing 60 clusters. This was done by picking a 1 in 2 systematic random sample of 30 clusters from the list of clusters.

The second stage of sampling was the selection of 1000 households from the 30 clusters. This was done by listing all the housing unit and households in the selected cluster after which 1000 households were randomly selected. Subsequently, a woman in the reproductive age group (15-49 years) per each selected household was interviewed. Also from the selected households, information on survival of mothers was collected from 360 men aged 15-65 years.

3.8 Data Collection and Questionnaires

Two questionnaires were used for the data collection during the survey. These are the household questionnaire and individual questionnaire. The content of these questionnaires was similar to the 2003 NDHS questionnaire (NPC, 2004).

The Household Questionnaire was used to list all usual residents and visitors in the selected households so as to determine eligible men and women. The de jure method of enumeration was used in administering the questionnaire. Some basic information was collected on the characteristics of each person listed, including age, sex, and relationship to household head. The main purpose of the Household Questionnaire was to identify eligible men and women for the individual interview. The Household Questionnaire also collected information on characteristics of the household's dwelling unit, such as the source of water, type of toilet facilities and ownership of various durable goods.

The individual questionnaire was used to collect information from all men and women aged 15-49 years, and included questions on the following topics:

- Background demographic information
- Birth history and childhood mortality (women only)
- Adult Mortality

The questionnaire was translated into Yoruba and back translated into English language to ensure no loss of information. The data was collected by four trained interviewers who are fluent in Yoruba language under the close supervision of the researcher. The translated questionnaire was administered to respondents who did not understand English language. Copies of the questionnaires are shown in annex 1. Consistency checks were done by the interviewers and the researcher for early detection of errors.

3.9: Ethical Considerations

Ethical clearance was obtained from the joint UI/UCH Institutional Review Committee. Informed consent for confidentiality was obtained from the participants before administering the questionnaires using the informed consent form. The participants were informed on their right to either take part in the study or decline. The questionnaire was administered in respondent's local language when the need to do so arose. Confidentiality of information collected was assured by making sure that the questionnaires are only accessible to the interviewers and the researcher.

3.10: Training of Personnel and Pilot Study

The field workers were trained on sample selection methods (including household listing) and questionnaire administration. After the training exercise, field testing of instrument was carried out to assess their feasibility and administration.

The pilot study was carried out in Ibadan North East Local Government Area - two weeks before the main study. Subsequently, corrections were made to the questionnaires before the full study was undertaken.

3.12: Data Management and Analysis

A data file was created using SPSS 12.0. Data collection and editing was done concurrently to clarify some outliers on the field. Data cleaning was done by running frequencies of all relevant variables to identify inaccurate entries and missing values. Descriptive statistics and cross tabulations were generated after data editing.

Bivariate and multivariate analysis was carried out to assess the association between background demographic variables and child loss. The major demographic variables used were: respondents'' age group, religion, ethnicity, educational attainment and marital status.

3.12.1: Logistic Regression

Binomial (or binary) logistic regression is a form of regression which is used when the dependent variable is dichotomous and the independent variables are of any type. Continuous variables are not used as dependents in logistic regression. Logistic regression can be used to predict a dependent variable on the basis of values of continuous and or categorical variables to determine the percent of variance in the dependent variable explained by the independent variables and rank the relative importance of independent variables. Logistic regression applies maximum likelihood estimation method after transforming the dependent variable into a logit variable (the natural log of the likelihood of dependent variable occurring or not). In this way, logistics regression estimates the probability of a certain event occurring based on the predictor variables. It should be noted that logistic regression calculates changes in the log odds of the dependent variable rather than changes in the dependent variable itself.

The multivariate analysis, using logistic regression models, examined demographic and socio-economic indicators that influence child loss. Those who reported positively to have ever lost a child were coded as '1' and '0' if otherwise. The resulting coefficients represent the effect of a one-unit change in the explanatory variables on the indicator of ever experienced child loss. Odds ratios larger than one indicate a greater likelihood of ever experienced child loss than for the reference category. The logistic regression function has the form:-

$\ln(p/q) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \ldots\ldots\ldots\ldots\ldots\ldots\ldots \beta_i X_n$

Where p is the probability of ever experienced child loss; q (or 1-p) is the probability of never experienced child loss; β_0, β_1, β_2,............ βi are regression coefficient; and X_1, X_2.........X_i are variables. The exponent of the regression coefficients of the parameter estimated would give the odds ratios in the logistic regression models.

3.12.2 Demographic Analysis

Estimates of childhood and adult mortality rate were obtained using Brass' techniques (as shown below). Construction of an abridged Life Table was done manually. The Population Analysis Spreadsheet (PAS) was used for demographic analysis.

3.12.3 Estimating Childhood Mortality

Childhood mortality from children ever born was estimated using the Trussell variant of the method developed by Brass (1971).

The basic data required for this method of estimation are:

a. The number of children ever born, classified by sex and by five year age group of women.

b. The number of births in the last 12 months preceding the survey classified by sex and five year age groups of the women.

c. The number of children surviving (or the number of children dead), classified by sex and by

five year age groups of women

d. The total number of women (irrespective of marital status), classified by five year age groups.

Procedure

The idea is to translate the proportion of children dead (D_i) estimated directly from survey data into a conventional life table measure q(x), which is probability of death between age 0 and x. using the following equation:

$q_x = D_i \times k_i$

where q_x is the probability of dying between birth and exact age x, D_i is the proportion of dead children ever born to women in age group i, and K_i is a multiplier that adjusts for non-mortality factors determining the value of D_i.

This relationship between $D_{(i)}$ and $q_{(x)}$ is primarily determined by the age pattern of fertility because it determines the distribution of the length of exposure to the risk of dying of the children of a group of women (United Nations 1983).

Step 1: calculation of average parity per woman. P(1) refers to parity in age group 15-19, P(2) to 20-24 and P(3) to 25-29. In general,

$$P(i) = CEB_{(i)}/TNW_{(i)}$$

Where $CEB_{(i)}$ is the children ever born by women in age group i and $TNW_{(i)}$ is the total number of women in age group i. Variable *i* refers to the different five-year age groups considered. Thus, the value i = 1 represents age group 15-19, i = 2: age group 20-24 and so on.

Step 2: calculation of the proportion of dead children for each age group of mothers. The proportion of children dead ,$D_{(i)}$, is defined as the ratio of reported children dead to reported children ever born, that is,

$$D_{(i)} = CD_{(i)}/CEB_{(i)}$$

Where $CD_{(i)}$ is the number of children dead reported to women in age group i.

Step 3: calculation of multipliers. Table 1 presents the necessary coefficients to estimate the multipliers, $k_{(i)}$, according to Trussell variant of the original Brass method. The West Family was used because it is recommended for use where sufficient information for informed choice is not available. A different set of coefficients is provided for each of the four different families of the Coale-Demeny model life tables.

$k_{(i)} = a_{(i)} + b_{(i)} (P1/P2) + c_{(i)}(P2/P3)$

Where a, b, and c are coefficients generated by Trussell

Step 4: calculation of probabilities of dying and of surviving. Estimates of the probability of dying, $q_{(x)}$, are obtained for different values of exact age x as the product of the reported proportion dead, $D_{(i)}$, and the corresponding multipliers, $k_{(i)}$. Note that the value of x is not generally equal to that of 1, because x is related to the average age of the children of women in age group i.

The compliment of $q_{(x)}$, $p_{(x)}$, the probability of surviving from birth to exact age x can be obtained as $p_{(x)} = 1.0 - q_{(x)}$.

Step 5: Calculation of Reference Period. When mortality is changing smoothly, the reference period, $t_{(x)}$, is an estimate of years before the survey date to which the child mortality estimate, $q_{(x)}$, obtained refers. The value of $t_{(x)}$ is estimated by the equation: The coefficients were estimated by Trussel (UN, 1983) from simulated cases by using linear regression: $t_{(x)} = a_{(i)} + b_{(i)} (P(1)/P(2)) + c_{(i)}(P(1)/P(2))$

Dummy Table:

Estimation of Values of $_xq_o$ from Data on Children Ever Born and Children Surviving

Age of Woman *(1)*	Age interval (i) *(2)*	Average number of children ever born per woman (Pi) *(3)*	Average number of children surviving per woman (Si) *(4)*	Proportion of children dead (1-Si/Pi) *(5)*	Multiplier for col. (5) (P1/P2=) *(6)*	Age (x) *(7)*	Proportion dead by age x ($_xq_o$) *(8)*
15-19yrs	1					1	
20-24yrs	2					2	
25-29yrs	3					3	
30-34yrs	4					5	
35-39yrs	5					10	
40-44yrs	6					15	
45-49yrs	7					20	

The data for mothers at selected age groups provide the following information:

Index 1	Age of mother	Derived values
1	15 – 19	$_1q_0$ probability of dying between birth and age 1
2	20 – 24	$_2q_0$ probability of dying between birth and age 2
3	25 – 29	$_3q_0$ probability of dying between birth and age 3
4	30 – 34	$_5q_0$ probability of dying between birth and age 5
5	35 – 39	$_{10}q_0$ probability of dying between birth and age 10
6	40 – 44	$_{15}q_0$ probability of dying between birth and age 15
7	45 – 49	$_{20}q_0$ probability of dying between birth and age 20

Limitations of the Method

- The estimate of infant mortality based on information provided by women ages 15 to 19 years should be interpreted with caution. Usually children born to these young women have higher mortality than those born to older women. This appears to be true not only for biological reasons, but mainly because the socioeconomic characteristics of the young mothers may be related to higher infant mortality. The estimates for the 15 to 19 year age group may also be more severely affected by sampling variation (since the youngest women have fewer births) and more sensitive to deviations of the actual pattern of fertility from the pattern implied by the model.
- If the pattern of fertility implied by the data has not been constant (due either to a change in the level of fertility or to a change in the pattern), the results may be affected.
- Poor quality of the data will produce results of uncertain reliability:

(a) If the estimates of child mortality fluctuate erratically, this is more likely to be due to data problems than to actual mortality changes.

(b) If the estimates imply that mortality was lower in the past than the present, then the data to which the technique was applied should be carefully evaluated for possible errors. In particular, older women may be more likely than younger women to underreport the number of children who died, especially those who died when the women were very young.

(c) Age misreporting of mothers can affect the results, since the children's length of exposure to the risk of dying is inferred from their mothers' ages.

3.12.4 Estimation of Adult Mortality

Williams Brass (1971) developed the first formal methods for converting indicators of mortality based on survival of close relative into standard life table measures by adjusting for confounders. Brass & Hill (1973) proposed methods for estimating life table survivorship ratios from proportion of respondents of successive five-years age groups with mother alive or father alive (the orphanhood method). The methods have been improved by several authors (Hill & Trussel 1977; Timaeus 1991, 1992).

Data Required for the Method

1. The proportion of respondents with a surviving mother (father) in each five-year age group from n to $n + 4$. This proportion is denoted by $S(n)$. The set of proportions $S(n)$ can be calculated when any two of the following items are available:

(a) The number of respondents with mothers (fathers) alive;

(b) The number of respondents with mothers (fathers) dead;

(c) The total number of respondents whose mother's (father's) survival status is known. All respondents who did not know (or declare) their mother's (father's) survival status should be excluded from the calculation.

2. The number of births in a given year classified by five-year age group of mother (father). This information is needed to estimate M, the mean age of mothers (fathers) at the birth of their children in the population being studied. The M to be estimated is not the mean age of fertility schedule (mean age of child bearing); it is rather the mean age of fertility schedule weighted by the age distribution of female (male) population. It may be regarded as an estimate of the average age difference between mother (father) and child in the population, thus being an indicator of the average age at which the target persons (parents) begins their exposure to the risk of dying.

Procedure

Step 1: Calculation of mean age at maternity (paternity). The mean age of mothers (fathers) at the birth of a group of children (normally those born in the year before the survey) is denoted by M. Let i denote the five-year age group in the reproductive life span of a woman and lets $B(i)$ be the number of births during a particular period to women in age group i, then the mean age of mothers is:

$$M = \Sigma a_{(i)} B_{(i)} / \Sigma B_{(i)}$$

Where $a_{(i)}$ is the mid-point of five year age group i.

The estimation of M for males is one of the problems associated with the estimation of male adult mortality from the proportion of respondents with a surviving father. Fertility questions are generally not asked from males, so the information from which the female M is estimated is usually not available for fathers.

A robust procedure for estimating M for males consists of adjusting the female M by using information on marital status. The median age of currently married population can be calculated by sex, and the difference between male and female medians can be added to the previously calculated female M to obtain an estimate of the male M.

Step 2: Calculation of weighting factors. For the value of M calculated above and for each value of n, the weighing factors, $W(n)$, are tabulated in the annex table 5 (table 6 is used when fathers are being considered).

Step 3: Calculation of survivorship probabilities. If the survivorship of mothers is being considered, the probabilities of surviving from age 25 to age 25 + n are calculated by using the equation:

$$l_f(25 + n) / l_f(25) = W(n)S(n - 5) + (1.0 - W(n))S(n)$$

where $S(n)$ is the proportion of respondents aged from n to n + 4 with mothers alive at the time of the interview.

The value 32.5 or 37.5 is used to replace 25 in the case of fathers to allow for the fact that men are usually older than women at the birth of their children. The survivorship probabilities for fathers are estimated in this case by the following equations:

$$l_m(35 + n) / l_m(32.5) = W(n)S(n - 5) + (1.0 - W(n))S(n)$$

if the weighting factors $W(n)$ are obtained from table 6, part (a); and

$$l_m(40 + n) / l_m(37.5) = W(n)S(n - 5) + (1.0 - W(n))S(n)$$

if the weighting factors are obtained from table 6, part (b)

The choice of equation to use depends on the estimated value of M: if it is less than or equal to 36, part (a) should be used; if it is greater than 36, part (b) should be used.

Step 4: Calculation of number of years before the survey to which the survivorship estimates refer. When female mortality in adulthood has a pattern similar to that described by the general standard, the number of years before the survey to which each estimate derived from maternal orphanhood data refers, denoted by $t_{(n)}$, can be estimated as:

$$t_{(n)} = n(1.0 - u_{(n)}) / 2.0$$

where

$$u_{(n)} = 0.3333 \ln ({}_{10}S_{n-5}) + Z(M + n) + 0.0037(27 - M)$$

The value of Z(M + n) is obtained by linear interpolation of the standard function for calculating the time reference for indirect estimates of adult survivorship (Brass and Bamgboye, 1981).

When data on paternal orphanhood are being used, the above equations becomes

$$t(n) = (n + 0.75)(1.0 - u(n)) / 2.0$$

and

$$u(n) = 0.3333 \ln ({}_{10}S_{n-5}) + Z(M + n) + 0.0037(27 - M + 0.75)$$

where 0.75 or three quarters of a year have been added to make allowance for the fact that a father must have been alive at the time of conception, but not necessarily at the time of birth of his offspring.

Adult Mortality Estimates from Proportion with Surviving Mother

Age Group (N-5,N)	Proportion with Mother alive	P(25+N)/P(25)	Derived 45q15
15-19			
20-24			
25-29			
30-34			
35-39			
40-44			
45-49			

Limitations of the Method

- Mortality and fertility may not have been constant during the past before the survey date.
- Migrants may constitute a special group of persons with characteristics concerning orphanhood different from those of persons who did not migrate.
- Orphanhood information may not be accurate in countries with high internal migration and poor communication systems.
- If the population has a mortality pattern significantly different from those of model life tables, the estimates will be affected.

3.12.5 Derivation of a Life Table from the Set of Survivorship Probabilities

Linkage of Child Survivorship Probabilities with Conditional Adult Survivorship Probabilities

Child survivorship probabilities can be linked with conditional adult survivorship probabilities using a logit life-table system. In the two-parameter logit life-table system, any pair of survivorship probabilities, one from birth and another condition on attaining a certain age, uniquely determine values of the parameters α and β defining a life table in the system. However, because one of the probabilities is conditional, the values of these parameters have to be estimated iteratively, as there is no way of solving for them algebraically. The procedure provides a way of finding satisfactory values of α and β when a number of conditional survivorship probabilities, all referring to the same population, are available, without having to find parameter values for each one.

Data Required

The following data are required for this method:

(a) Conditional probabilities of adult survivorship usually in the form of $l_{(x)}/l_{(y)}$ ratio estimated by using the orphanhood or widowhood methods.

(b) An estimate of child survivorship. Survivorship probabilities $l_{(z)}$ for childhood ages can be estimated by using any of the indirect methods.

(c) A standard life table, which may be selected from the Coale-Demeny models, the United Nations models for developing countries, the general standard or any reliable life table thought to approximate the pattern of mortality in the population being studied.

Procedure

Step 1: initial estimate of parameter α. Given an estimate of $l_{(z)}$ for children, such as l(2) or the average of a group of estimates, the initial estimate of parameter α is obtained as $\alpha_1 = \lambda_{(z)} - \lambda_{s(z)}$

Under the assumption that $\beta_1 = 1.0$, where $\lambda_{(z)}$ is the logit transformation of $l_{(z)}$

Step 2: initial estimate of survivorship probability appearing as denominator. Given the value of α_1 estimated in step 1 and still to assume that $\beta_1 = 1.0$, a first estimate of this survivorship probability, l(y), denoted by $l_1(y)$, is obtained from

$$l_{1(y)} = (1.0+\exp(2\alpha_1 + 2\lambda_{s(y)}))^{-1}$$

Step 3: initial estimate of survivorship probabilities from birth. The initial approximation of $l_{(y)}$, $l_{1(y)}$, is now used to calculate initial estimates of the survivorship probabilities from birth, $l_{(x)}$, for each value of x from the observed ratios $l_{(x)}/l_{(y)}$:

$$l_{1(x)} = \frac{l_{(x)}}{l_{(y)}} l_{1(y)}. \quad (1)$$

Step 4: modified estimate of parameter β. If the logit transformation of $l_{1(x)}$ is denoted by $\lambda_{1(x)}$, each pair of points $[\lambda_{s(z)}, \lambda_{(z)}]$ and $[\lambda_{s(x)}, \lambda_{1(x)}]$ and determines parameters α and β with respect to the standard being used. The main interest at present is in parameter β, which can be found as

$$\beta_{2(x)} = \frac{(\lambda_{(x)} - \lambda_{(z)})}{(\lambda_{s(x)} - \lambda_{s(z)})} \quad (2)$$

A single estimate of β_2 can then be obtained by averaging the $\beta_2(x)$ values. It is often the case that the values of $\beta_2(x)$ vary sharply with x, it may be decided that a best estimate of β_2 can be obtained by averaging the $\beta_2(x)$ values after excluding obvious outliers, such as the highest and lowest values.

Step 5: a second estimate of parameter α. A second estimate of α, denoted by α_2, is obtained by repeating step 1, but now using the estimate of β_2 obtained in step 4 instead of the first assumed value of $\beta_1 = 1.0$. Thus, $\alpha_2 = \lambda_{(z)} - \beta_2\lambda_{s(z)}$.
(3)

Step 6: second estimate of survivorship probability used as denominator. The new value of α, denoted by α_2, second approximation to β, denoted by β_2, are now used to obtain a revised value of $l_{(y)}$, as follows: $l_{2(y)} = (1.0 + \exp(2\alpha_2 + 2\beta_2\lambda_{s(y)}))^{-1}$
(4)

Step 7:- further iteration. The iteration procedure continues, by repeating step 3 to obtain a second estimate of $l_{(x)}$, then repeating step 4 to find a revised estimate of β_2, then re-estimating α in step 5 and $l_{(y)}$ in step 6 with the new α and β values, and so on, until the first two or three decimal places of the estimate of β no longer change with repeated iteration. This unchanging value of β, denoted by β^*, and the value of α^* it implies (calculated by using equation (3)) are then accepted as best estimates of the parameters defining a life table consistent with the available survivorship probabilities in the logit system being used.

CHAPTER FOUR

RESULTS

4.1 AGE AND SEX DISTRIBUTION OF MOKOLA RESIDENTS

A total of 1361 respondents participated in the study; this is made up of 994 (71.4%) women and 367 (28.6%) men. Table 4.11 shows the distribution of the population by sex and age in five year age groups. Figure 4.11 shows the population pyramid. The population pyramid shows that Mokola is characterized by an ageing population with about 25% between the age 20-29years. The sex ratios at younger ages were lower than older ages. However, there seems to be more males than females in the 50+ age groups.

Figure 4.11: AGE AND SEX DISTRIBUTION OF MOKOLA, 2006

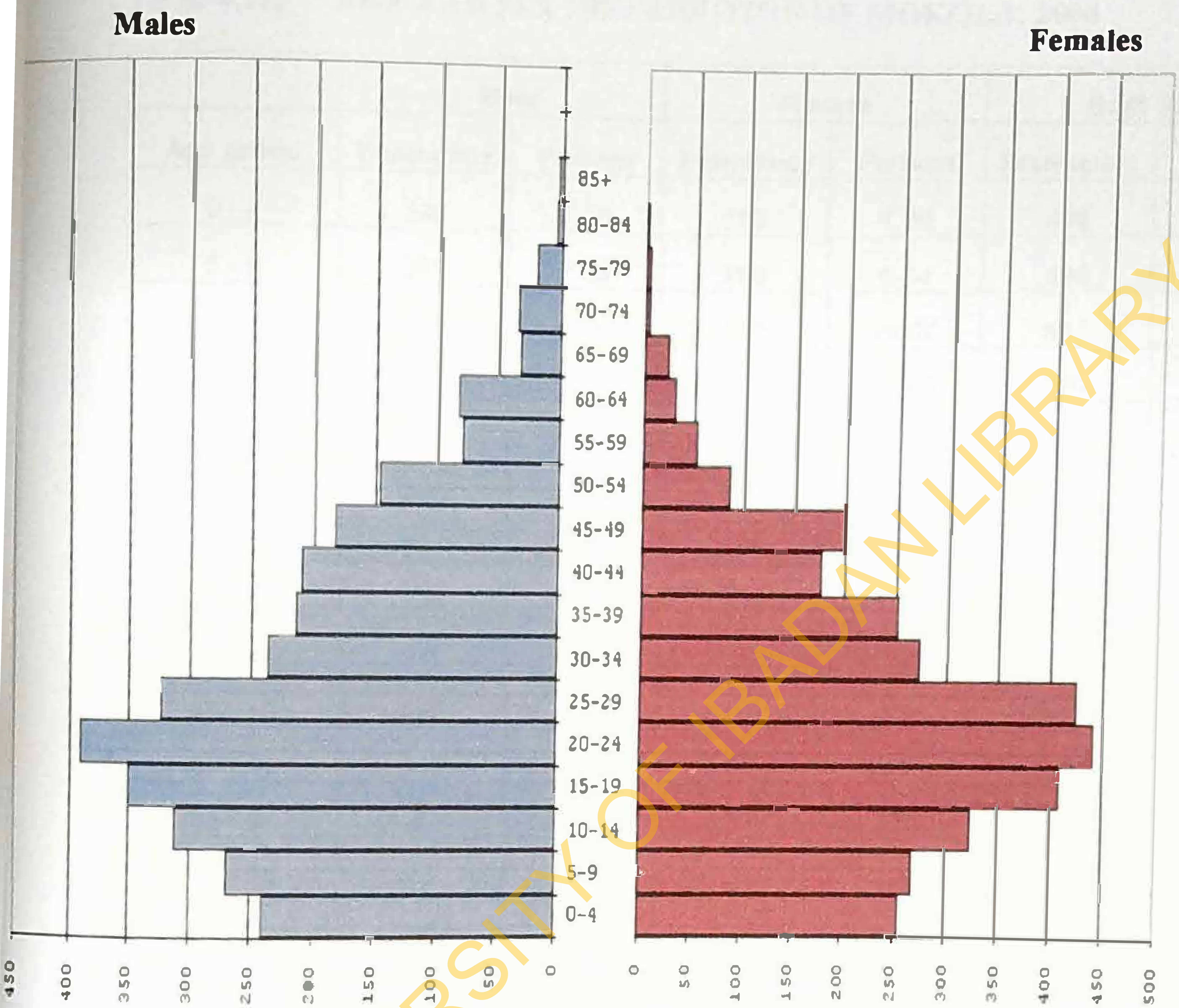


Table 4.11: AGE AND SEX DISTRIBUTION OF MOKOLA, 2006

	Male		Female		Both Sexes	
Age group	Frequency	Percent	Frequency	Percent	Frequency	Percent
0 - 4	240	7.66	256	7.94	496	7.79
5 - 9	269	8.58	269	8.34	538	8.46
10 - 14	312	9.96	325	10.07	637	10.02
15 - 19	350	11.17	409	12.68	759	11.93
20 - 24	390	12.44	441	13.67	831	13.07
25 - 29	323	10.31	425	13.17	748	11.76
30 - 34	237	7.56	274	8.49	511	8.03
35 - 39	214	6.83	252	7.81	466	7.33
40 - 44	210	6.70	176	5.46	386	6.07
45 - 49	183	5.84	198	6.14	381	5.99
50 - 54	147	4.69	86	2.67	233	3.66
55 - 59	80	2.55	52	1.61	132	2.08
60 - 64	83	2.65	31	0.96	114	1.79
65 - 69	33	1.05	23	0.71	56	0.88
70 - 74	35	1.11	4	0.12	39	0.61
75 - 79	20	0.64	4	0.12	24	0.38
80 - 84	5	0.16	1	0.03	6	0.09
85+	3	0.10	0	0	3	0.05
Total	3134	100	3226	100	6360	100

4.2 HOUSEHOLD AND SOCIO-DEMOGRAPHIC CHARACTERISTICS OF RESPONDENTS

Table 4.21 below shows some socio-demographic characteristics of the respondents. The mean age of male respondents was 30 years (S.D± 9.61) while that of female respondents was 31 years (S.D±8.75). The table shows that more than half (56.4%) of the male respondents were less than 30 years, 22% were aged 30-39 years and 19.6% were aged 40-49 years. Seven percent of the female respondents were aged 15-19 years, 33.6% were aged 30-39 years and 19.9% were aged 40-49 years. The female respondents were less educated than their male counterparts with about 35.2% having tertiary education and 51.8% having secondary education. The respondents are predominantly Yorubas (males- 66.5%, females- 72%) and Christians (males- 84.4%, females- 80.4. Majority of the male respondents are single (61.3%) while most of the female respondents are married (69.6%). %). About 41% of the male respondents were self employed while 60.2% of their female counterparts are also self employed.

Table 4.21: Socio-Demographic Characteristics of Respondents in Mokola

Variable	Male		Female	
	Frequency	Percent (%)	Frequency	Percent (%)
Age group				
15 - 19	37	10.1	70	7.0
20 – 24	97	26.4	151	15.2
25 – 29	73	19.9	238	24.0
30 – 34	50	13.6	181	18.2
35 – 39	31	8.4	153	15.4
40 – 44	37	10.1	101	10.2
45 - 49	35	9.5	96	9.7
50+	5	1.4	2	0.2
Non response	2	0.5	2	0.2
Total	367	100	994	100
Education				
No Formal education	9	2.5	26	2.6
Primary	9	2.5	101	10.2
Secondary	168	45.7	515	51.8
Tertiary	181	49.3	350	35.2
Non response	0	0	2	0.2
Total	367	100	994	100
Occupation				
Professional	24	6.5	46	4.6
Self employed	152	41.4	598	60.2
Civil servant	16	4.4	65	6.5
Unemployed	170	46.3	269	27.1
Non response	5	1.4	16	1.6
Total	367	100	994	100
Ethnicity				
Yoruba	244	66.5	716	72.0
Igbo	72	19.6	135	13.6
Hausa	6	1.6	19	1.9
Others	45	12.3	124	12.5
Total	367	100	994	100

Table 4.21: Socio-Demographic Characteristics of Respondents in Mokola (contd)

Variable	Male Frequency	Percent (%)	Female Frequency	Percent (%)
Marital Status				
Single	225	61.3	267	26.9
Married	141	37.4	703	70.7
Divorced/Separated	1	0.3	15	1.5
Widowed	0	0	5	0.5
Non response	0	0	4	0.4
Total	367	100	994	100
Religion				
Christian	309	84.4	798	80.4
Islam	56	15.3	192	19.4
Others	1	0.3	2	0.2
Total	366	100	992	100

Figure 4.21: Distribution of Respondents by Age group

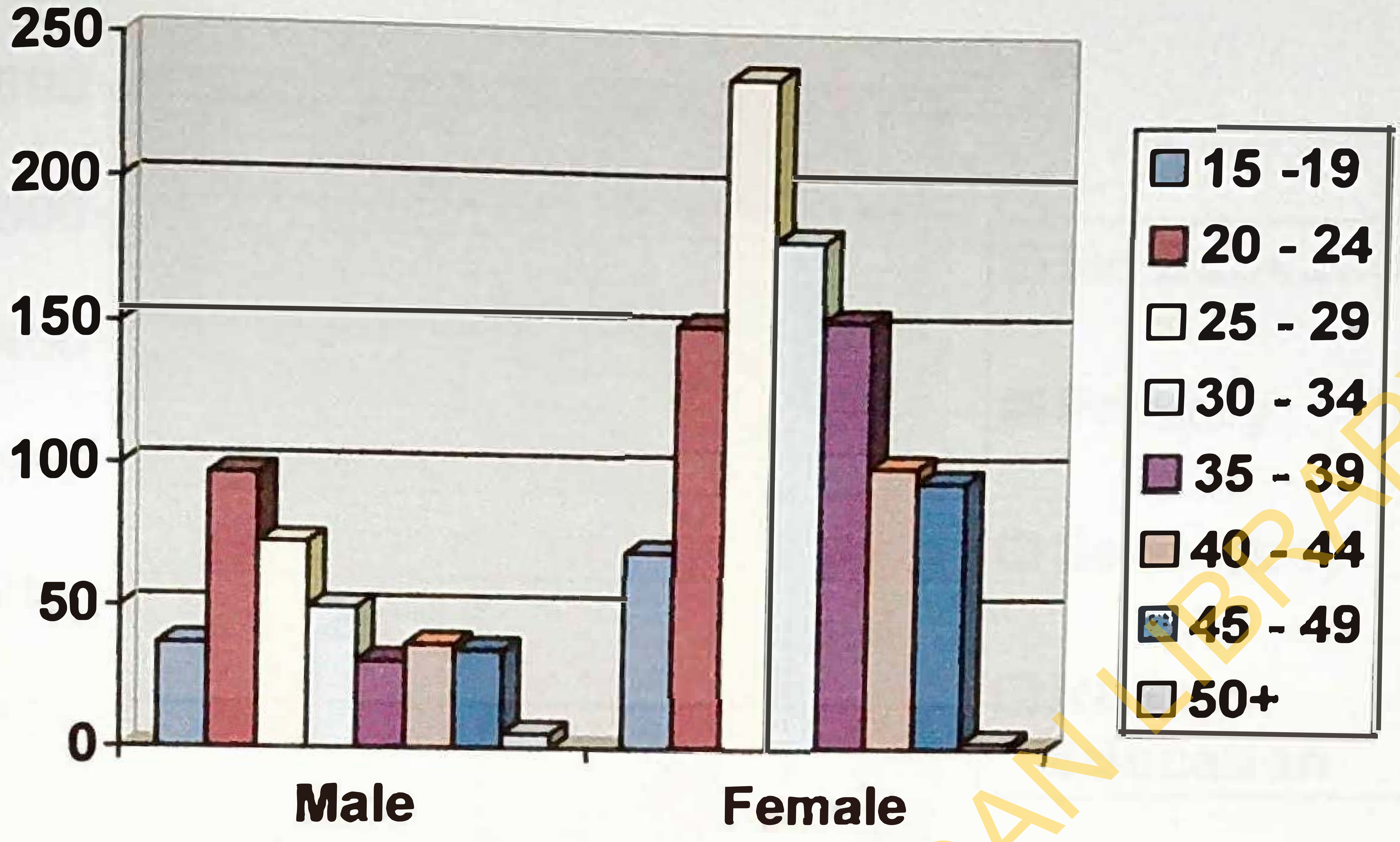


Figure 4.22: Distribution of Respondents by Education

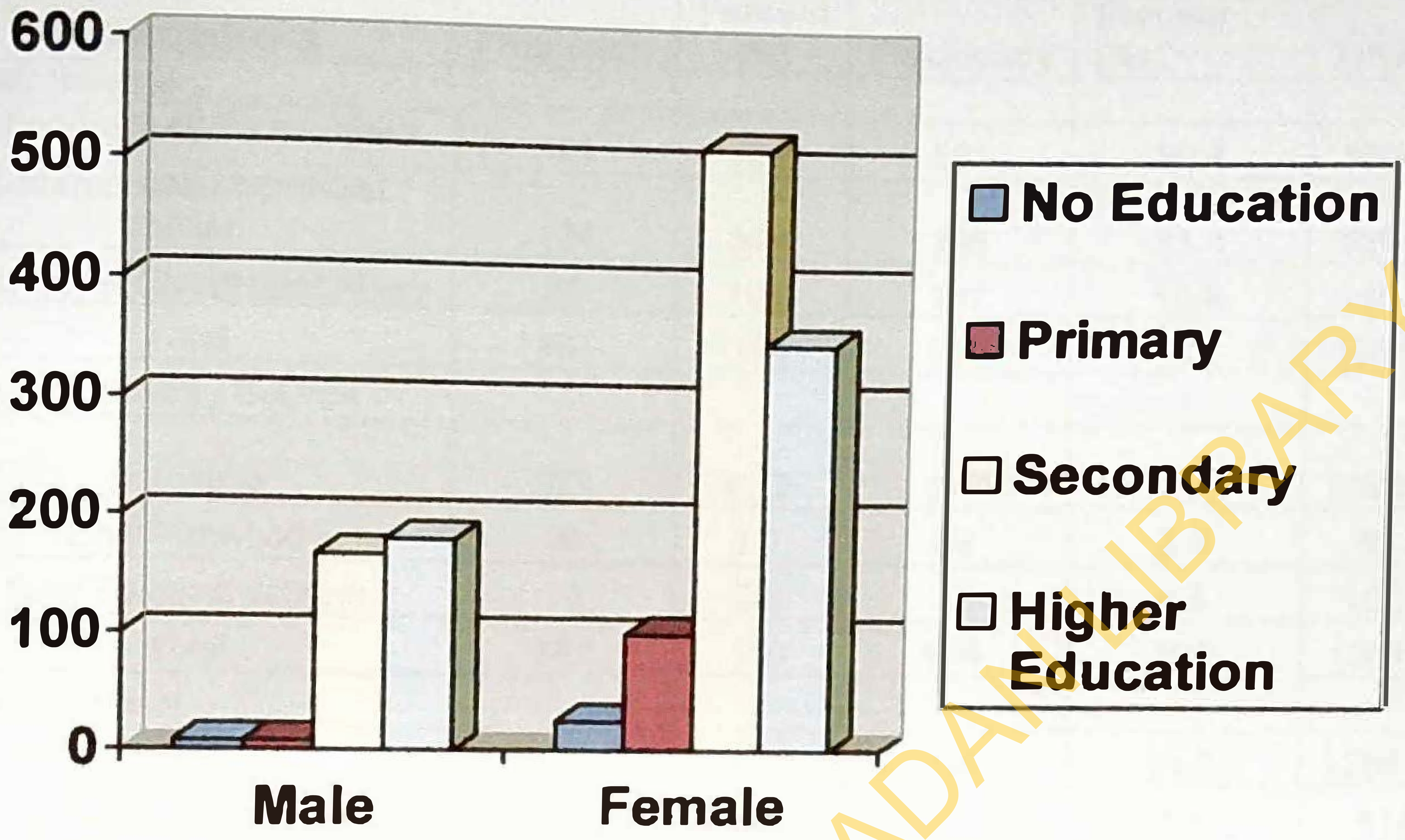


Table 4.22 shows some household characteristics of the respondents. Their main source of drinking water was bottled/sachet/piped water (53% and 50.8% for male and female respondents respectively).The main cooking energy source was kerosene (males- 88.2%, females- 85.6%), more than 99% of all the respondents had access to electricity, while about 66% of the female respondents and 31% of male respondents had access to refrigerator.

Table 4.22: Household Characteristics of Respondents in Mokola, Ibadan, 2006

Characteristics	Male		Female		Both Sexes
	Frequency	Percent (%)	Frequency	Percent (%)	Total (%)
Water Source					
Bottled/Sachet/ Piped Water	194	52.9	501	50.4	695(51.1)
Covered well / borehole/ tanker	134	36.5	386	38.8	520 (38.2)
Open Well/ River/Rain/Others	39	10.6	107	10.8	146 (10.7)
Total	367	100	994	100	1361 (100)
Cooking Energy Source					
Kerosene	322	87.7	847	85.2	1169 (85.9)
Coal/Firewood	26	7.1	63	6.3	89 (6.5)
Gas/ Electricity/others	19	5.2	84	8.5	103 (7.6)
Total	367	100	994	100	1361 (100)
Floor Material					
Cement	353	96.2	936	94.2	1289 (94.7)
Tiles	7	1.9	34	3.4	41(3.0)
Wood/ Others	7	1.9	24	2.4	31 (2.3)
Total	367	100	994	100	1361 (100)
Toilet facility					
Flush toilet	289	78.7	773	77.8	1062 (78.0)
Pit toilet/ Bush/River/Others	78	21.3	221	22.2	299 (22.0)
Total	367	100	994	100	1361 (100)
Electricity					
Yes	365	99.4	988	99.4	1353 (99.4)
No	1	0.3	1	0.1	2 (0.2)
Non response	1	0.3	5	0.5	6(0.4)
Total	367	100	994	100	1361 (100)
Refrigerator					
Yes	113	30.8	651	65.5	764 (56.2)
No	253	68.9	338	34.0	591 (43.4)
Non response	1	0.3	5	0.5	6(0.4)
Total	367	100	994	100	1361 (100)

4.3: CHILDHOOD MORTALITY

Table 4.31 shows the frequency distribution of children ever born by women in Mokola. The table shows that 32.7% of the women have had no children, 13.7% have had three children and 19.8% have had four or more children.

Table 4.32 shows children ever born and dead by sex and age of mother in five years age groups. The children ever born increased with mothers' age up to age group 40-44 years before a decline. The female children ever born to women in the first four age groups is higher than the number of male children ever born to the same women suggesting a lower sex ratio at birth. There was however a reversal of this observation in the last three age groups. The table shows that women in the first age group (15–19 years) did not report any child death. The proportion of dead children increased with mothers' age as expected with the exception of the fifth age group (35-39 years). The number of dead male children in the last two age groups was twice the number among female children.

Table 4.31: Frequency Distribution of Children Ever Born by Women in Mokola, Ibadan

No of Children ever born	Frequency (women)	Percent (%)
0	325	32.7
1	163	16.4
2	174	17.5
3	136	13.7
4+	196	19.8
Total	994	100

Table 4.32: Children Ever Born and Children Surviving, by Sex and Age of Mother

		Male Children		Female Children		Both Sexes	
Age group	*Total number of women*	*Ever born*	*Dead*	*Ever born*	*Dead*	*Ever born*	*Dead*
15 -19	70	8	0	13	0	21	0
20 – 24	151	30	2	44	2	74	4
25 – 29	238	100	8	117	10	217	18
30 – 34	181	191	10	217	7	408	17
35 – 39	153	205	3	190	2	395	5
40 – 44	101	208	14	175	6	383	20
45 – 49	96	198	22	206	10	404	32
Total	990	940	59	962	37	1902	96

Table 4.33 shows the complete sets of average parity per woman by sex and age of mother. The average parity for female children was a little higher than estimates for male children for the first four age groups, thereafter, there was a reversal of trend with the average parity for males higher than the estimates for females. The average parity per woman for both sexes increased with increase in mothers' age. Average parity less than 1 as indicated in the first two age groups implied that not all women in that age group have had a live birth in their life time. The result shows that for women aged 35-39 years, each one has had an average of 3 children in their life time and for those aged 45-49 years, an average of 4 children.

Table 4.33: Average Parity per Woman by Sex and Age of Mother

Age group	Age group Index	Males P_m	Females P_f	Both Sexes P_t
(1)	(2)	(3)	(4)	(5)
15 -19	1	0.1143	0.1857	0.3000
20 – 24	2	0.1987	0.2914	0.4901
25 – 29	3	0.4202	0.4916	0.9118
30 - 34	4	1.0552	1.1989	2.2541
35 - 39	5	1.3399	1.2418	2.5817
40 - 44	6	2.0594	1.7327	3.3721
45 - 49	7	2.0625	2.1458	4.2083

Table 4.34 shows the complete values of proportion of children dead ($D_{(i)}$) by sex. The values were computed for the two sexes separately (though the numbers in each of the groups are small). The value zero recorded for the first age group of mothers was as a result of no reported death in the age group. The proportion of dead children was highest among women aged 25 – 29 years.

Table 4.34: Proportion of Children Dead by Age of Mother

	Age group	Males	Females	Both Sexes
Age group	Index	D_m	D_f	D_t
15 -19	1	0.0000	0.0000	0.0000
20 - 24	2	0.0667	0.0455	0.0541
25 - 29	3	0.0800	0.0855	0.0829
30 - 34	4	0.0524	0.0323	0.0417
35 - 39	5	0.0146	0.0105	0.0127
40 - 44	6	0.0673	0.0343	0.0522
45 - 49	7	0.1111	0.0485	0.0792

The complete set of k(i) values is shown in table 4.35. In computing these estimates, it was assumed that the West family of Coale-Demeny model life tables is an adequate representation of mortality in Mokola, so the values of $a_{(i)}$, $b_{(i)}$ and $c_{(i)}$ were obtained from the bottom panel of table I of annex 1. The values of P(1), P(2) and P(3) are shown in table 2 (see annex 1). .

Table 4.35: Trussell's Multipliers for Child Mortality Estimation, West Model

	Age group	Multiplier $K_{(i)}$ for		
Age group	Index	Males	Females	Both sexes
(1)	*(2)*	*(3)*	*(4)*	*(5)*
15 -19	1	-0.0532	-0.1294	-1.1036
20 - 24	2	0.8221	0.7571	0.7852
25 - 29	3	1.0240	0.9778	0.9930
30 - 34	4	1.1047	1.0680	1.0857
35 - 39	5	1.1532	1.1189	1.1357
40 - 44	6	1.1506	1.1168	1.1335
45 - 49	7	1.1377	1.1043	1.1208

Table 4.36 shows the estimates of probabilities of dying and surviving classified by age of mother. The $l_{(x)}$ estimate for the first age group (that is $l_{(1)}$) is estimated as 1, this is due to a zero mortality in this group (as evidence in the number of dead children recorded.). The $l_{(x)}$ estimates are unusually high and they indicate low mortality in the study population.

Table 4.36: Estimates of Probabilities of Dying and Surviving Classified by Age of Mother, West Model

Age group	Exact age	Probabilities of dying, $q_{(x)}$, and survival, $l_{(x)}$					
		Males		Female		Both Sexes	
	(x)	$q(x)$	$l(x)$	$q(x)$	$l(x)$	$q(x)$	$l(x)$
15 -19	1	0.0000	1.0000	0.0000	1.0000	0.0000	1.0000
20 - 24	2	0.0548	0.9452	0.0344	0.9656	0.0425	0.9575
25 - 29	3	0.0819	0.9181	0.0836	0.9164	0.0823	0.9177
30 - 34	5	0.0579	0.9421	0.0345	0.9655	0.0453	0.9547
35 - 39	10	0.0168	0.9832	0.0117	0.9883	0.0144	0.9856
40 - 44	15	0.0774	0.9226	0.0383	0.9617	0.0592	0.9408
45 - 49	20	0.1264	0.8736	0.0536	0.9464	0.0888	0.9112

Tables 4.37a and 4.37b shows the adjusted (graduated) probabilities of surviving ($l^*(x)$) and dying ($q(x)$) values (for females and both sexes respectively) against the logit model using Brass' African Standard (assuming that $\beta = 1$) and implied life expectation at birth (e^o_o) from Brass one-parameter model life-tables. The α value was calculated using the average of l_2, l_3 and l_5. The adjusted $q^*(x)$ values in column 4 shows an infant mortality rate of 27.7, child mortality rate (under-two mortality

rate) of 40.1 and under-five mortality rate of 53.7. The graduated $l^*(x)$ values shows a gradual decline which was not observed in the unadjusted $l(x)$ values. The implied average life expectation at birth for all the values of $l(x)$ is 64.1years.

Table 4.37a: Adjusted Female Probabilities of Dying and Surviving Classified by Age of Mother

Age group	*Age group index*	*Exact age (x)*	*Adjusted $q^*(x)$*	*Adjusted $l^*(x)$*	*Implied e^o_o*
(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
15 -19	1	1	0.0277	0.9723	66.17
20 – 24	2	2	0.0401	0.9599	66.17
25 – 29	3	3	0.0467	0.9533	66.17
30 – 34	4	5	0.0537	0.9463	66.17
35 – 39	5	10	0.0651	0.9349	66.17
40 – 44	6	15	0.0697	0.9303	66.17
45 – 49	7	20	0.0776	0.9224	

Table 4.37b: Adjusted Probabilities of Dying and Surviving Classified by Age of Mother

Age group	*Age group index*	*Exact age (x)*	*Adjusted $q^*(x)$*	*Adjusted $l^*(x)$*	*Implied e^o_o*
(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
15 -19	1	1	0.0324	0.9676	64.29
20 - 24	2	2	0.0468	0.9532	64.29
25 - 29	3	3	0.0545	0.9455	64.29
30 - 34	4	5	0.0626	0.9374	64.29
35 - 39	5	10	0.0756	0.9244	64.29
40 - 44	6	15	0.0809	0.9191	64.29
45 - 49	7	20	0.0891	0.9109	64.29

Figure 4.33: Estimated and Adjusted Probabilities of Dying

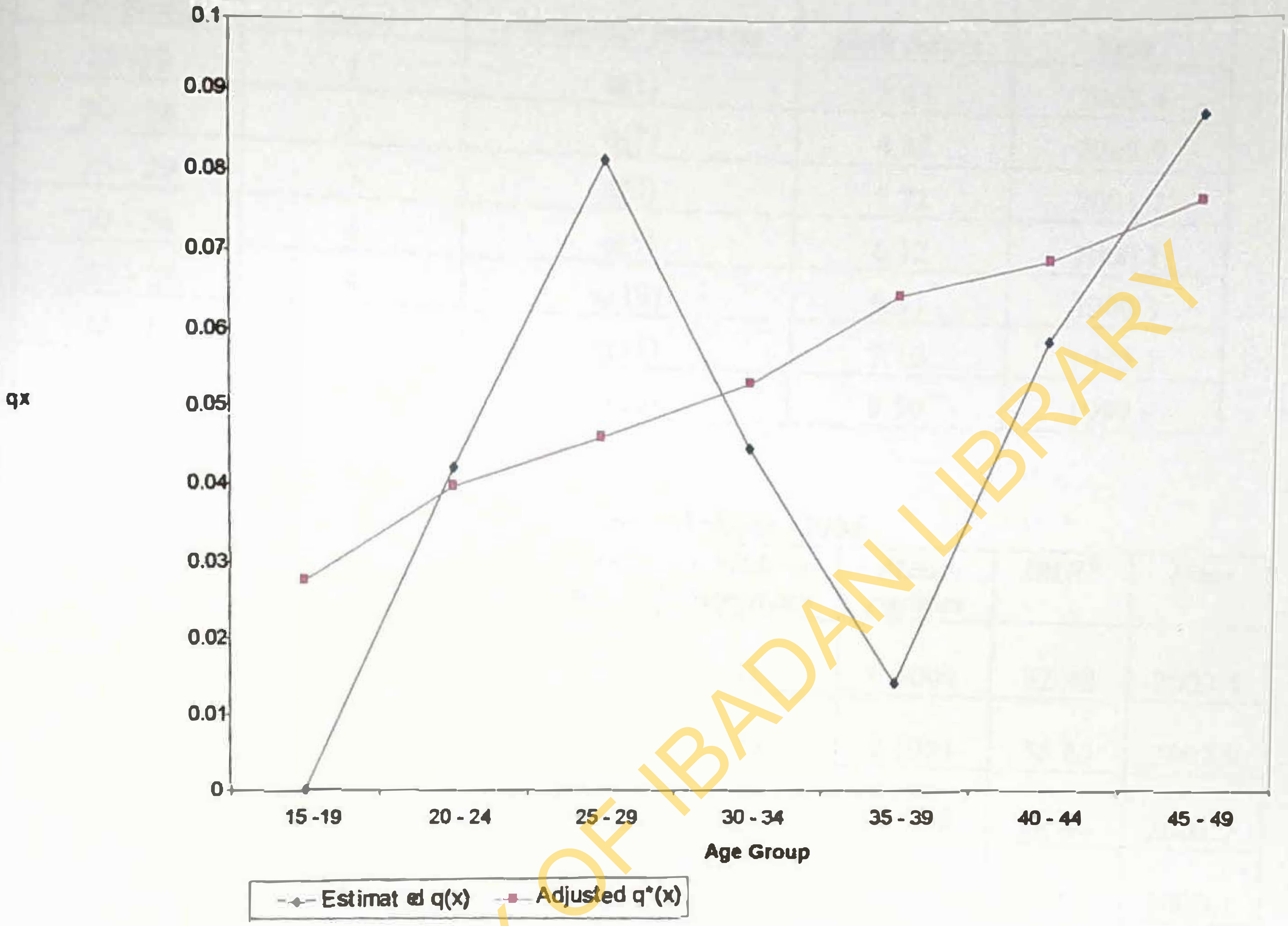


Table 4.38 shows the reference period to which the estimated probabilities of dying refer assuming the west model. The coefficients were obtained from table 2 of annex 1. The reference period of the estimated probabilities of dying and surviving is 9.6 years to 3.4 years; this implies that the estimates refer to those operating between July 2003 and May 1997 (the survey took place between November and December, 2006).

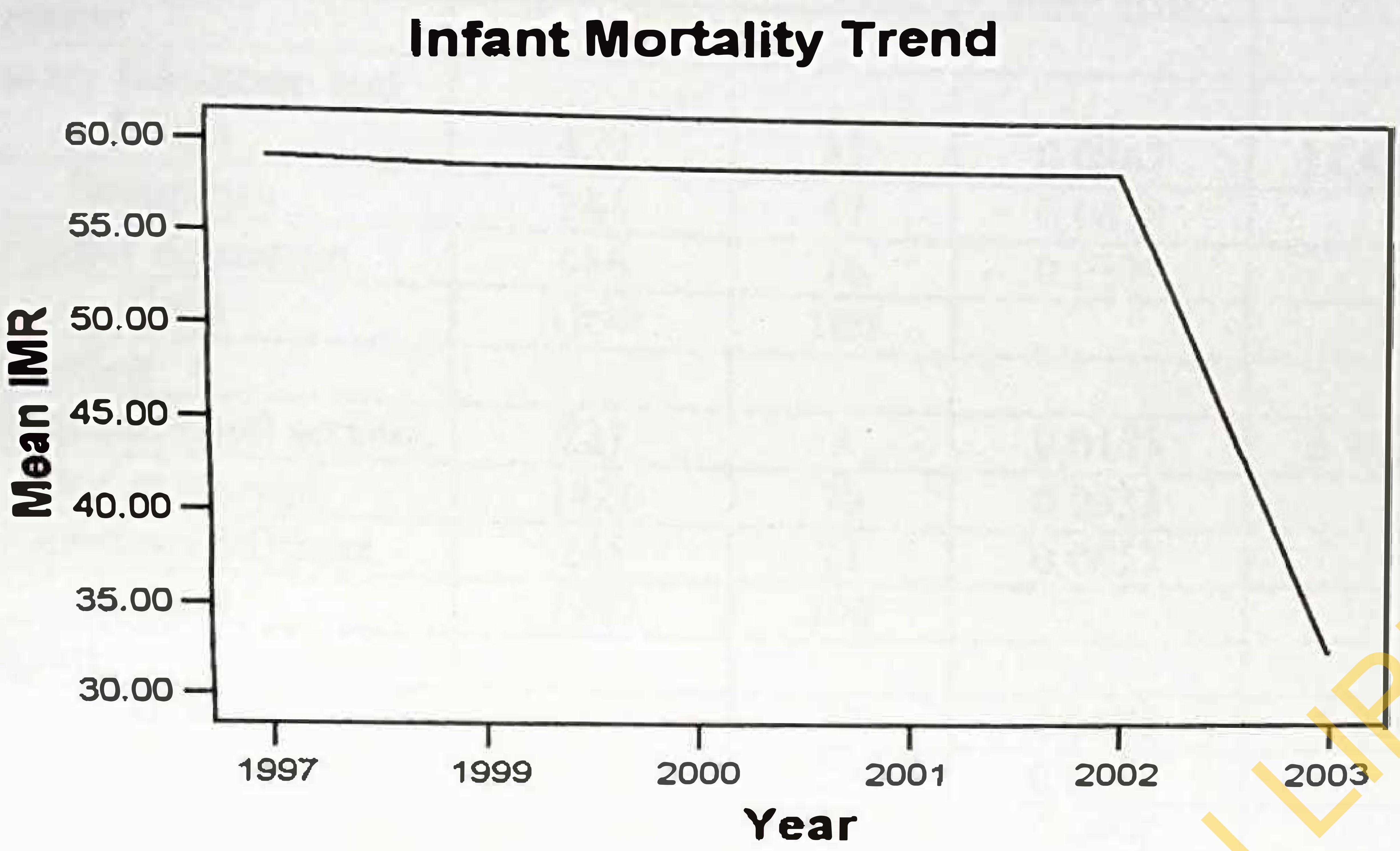
Table 4.38: Estimates of the Reference Period to which the Estimated Probabilities of Dying Refer, West Model

Age group	*Age group Index*	*Parameter estimate*	*Both Sexes*	*Year*
15 -19	1	q(1)	3.43	2003.4
20 - 24	2	q(2)	4.87	2002.9
25 - 29	3	q(3)	5.72	2001.7
30 - 34	4	q(5)	6.12	2000.1
35 - 39	5	q(10)	6.31	2000.3
40 - 44	6	q(15)	7.10	1999.1
45 - 49	7	q(20)	9.59	1997.6

Table 4.39: Infant Mortality Trends from Mokola, 2006

Age group	*Total number of women*	*Children Ever born*	*Children Surviving*	*Mean parities*	*IMR**	*Time*
15 -19	70	21	21	0.3000	32.40	2003.4
20 – 24	151	74	70	0.4901	58.83	2002.9
25 – 29	238	217	199	0.9118	58.84	2001.7
30 – 34	181	408	391	2.2541	58.85	2000.1
35 – 39	153	395	390	2.5817	58.82	2000.3
40 – 44	101	383	368	3.3721	58.82	1999.1
45 – 49	96	404	372	4.2083	59.15	1997.6

Figure 4.34



4.4: SOCIO- DEMOGRAPHIC DIFFERENTIALS OF CHILDHOOD MORTALITY

This section describes the socio-demographic differentials of childhood mortality. The Brass' method can not be used to estimate mortality rate for each socio-economic variable because of the relatively small sample size used in the study. Therefore, the proportion of children dead $D_{(i)}$ have been used as a proxy for mortality.

Table 4.41: Proportion of Dead Children by Mothers' Socio-demographic Characteristics

Variable	*Ever born*	*Dead*	*Proportion dead D(i)*	X^2	*P value*
Education					
Primary Education and below	429	37	0.0862	32.420	0.000
Secondary	984	47	0.0478		
Higher Education	486	16	0.0329		
Total	1899	100			
Occupation					
Professional/Civil servant	221	3	0.0135	3.767	0.033
Self employed	1426	76	0.0533		
Unemployed/Others	245	21	0.0857		
Total	1902	100			
Religion					
Christian	1468	77	0.0525	0.820	0.606
Islam	426	23	0.0540		
Others	8	0	0.0000		
Total	1902	100			
Ethnicity					
Yoruba	1344	67	0.0499	10.500	0.015
Igbo	238	9	0.0378		
Hausa	46	2	0.0435		
Others	274	22	0.0803		
Total	1902	100			
Marital Status					
Single	103	11	0.1068	3.768	0.031
Ever married	1799	89	0.0495		
Total	1902	100			
Toilet Facility					
Flush	1388	61	0.045	13.677	0.000
Pit latrine	491	39	0.079		
Bush/River/others	23	0	0.000		
Total	1902	100			
Drinking water					
Bottled/Sachet/ Piped	940	54	0.057	3.180	0.365
Open well/Rain	236	11	0.047		
Covered well/Borehole	726	35	0.048		
Total	1874	100			

Table 4.41 shows that mothers with primary education and below (including those with no education and koranic education) have the highest proportion of dead children while, those with any form of tertiary education have the lowest proportion of dead children. The result also shows that self-employed mothers had the highest proportion of dead children (76 per 1000), followed by the unemployed with a figure of 21 per 1000 while the professionals/civil servants reported the least number of dead children. There appears to be no difference in the proportion of dead children between Christians and Muslims. The table also shows that Yoruba mothers have the highest proportion of dead children.

4.5: Bivariate Analysis

Table 4.41 also displays the chi-square values and the p-values of socio-demographic characteristics of mothers. The table shows that mothers' education and access to sanitary latrine were the most significant variables at $p<0.000$. Mothers' occupation, tribe and marital status are also significant ($P<0.05$), while religion and source of drinking water are not statistically significant ($p>0.05$).

4.6: Multivariate Analysis

Table 4.61 shows the result of the logistic regression of socio-demographic variables as predictors of child mortality level. The dependent variable is child loss which is coded "0" for women who had never experienced child loss and "1" for women who had experience at a least a child loss.

The table displays the regression coefficients, odds ratio and their 95% confidence intervals and levels of significance. The variables regressed are only those that attained significance at the bivariate analysis level using chi-square analysis. Using tertiary education as the reference category, it was found that women with primary education and below are about 5.5 times more likely to experience child loss than those with tertiary education (p<0.000). However, there was no significant difference in the odds of experiencing child loss between those with secondary and tertiary education (p>0.1). Also, Yorubas appears to be at a lower risk of child loss than other ethnic groups as well as those using flush toilets compared to others using pit latrines (p<0.05).

Table 4.61: Logistic regression of socio-demographic variables as predictor of child loss

	β	O.R	95%C.I for O.R		P value
Variables			**Lower**	**Upper**	
Education					
Secondary	0.370	1.448	0.645	3.251	0.369
Primary and below	1.703	5.493	2.286	13.201	0.000
Tertiary (rc)					
Occupation					
Unemployed	-0.580	0.560	0.290	1.083	0.085
Professional/Self employed (rc)					
Tribe					
Yoruba	-0.586	0.556	0.312	0.992	0.047
Others (rc)					
Marital status					
Single	-0.685	0.504	0.171	1.488	0.215
Ever married (rc)					
Toilet used					
Pit	0.867	2.380	1.377		0.002
Flush (rc)					

Rc – Reference category

4.7: FEMALE ADULT MORTALITY USING ORPHANHOOD DATA

This section describes female adult mortality in the study population. Tables 4.71 and 4.72 shows the proportion of daughters and sons with mothers alive respectively. The proportion of respondents with mother alive reduced with increase in age of respondents. The youngest age group has the highest proportion with surviving mothers while the oldest age group has the lowest proportion. Respondents whose mortality status of their mothers was not known have been excluded in the calculation of proportion with surviving mother. Male respondents in the first age group (15-19 years) did not report any death of mother and the male respondents reported more mothers alive than their female counterparts in the early age group. This is evidence in the proportion of sons and daughters with mothers alive in the age groups.

Table 4.71: Proportion of Daughters with Mothers Alive

Age group of respondent	Central age (n)	Mother alive	Mother dead	Proportion with mother alive
(1)	*(2)*	*(3)*	*(4)*	*(5)*
15 -19	20	66	4	0.9429
20 – 24	25	140	10	0.9333
25 – 29	30	215	21	0.9110
30 – 34	35	157	22	0.8771
35 – 39	40	132	21	0.8627
40 – 44	45	79	22	0.7822
45 – 49	50	67	28	0.7053

Table 4.72: Proportion of Sons with Mothers Alive

Age group of respondent	Central age (n)	Mother alive	Mother dead	Proportion with mother alive
(1)	*(2)*	*(3)*	*(4)*	*(5)*
15 -19	20	35	0	1.0000
20 – 24	25	95	2	0.9794
25 – 29	30	68	4	0.9444
30 – 34	35	46	4	0.9200
35 – 39	40	26	5	0.8387
40 – 44	45	28	9	0.7568
45 – 49	50	24	11	0.6857

Tables 4.73 and 4.74 shows the female adult survivorship probabilities (measured from age 25) from proportion of daughters and of sons with surviving mother respectively. M is fixed at 26 years (M is assumed to be in the region 25 and 27 years in the developing countries). The appropriate weights, *W*(n), were obtained from column 6 of table 3 in annex 1.

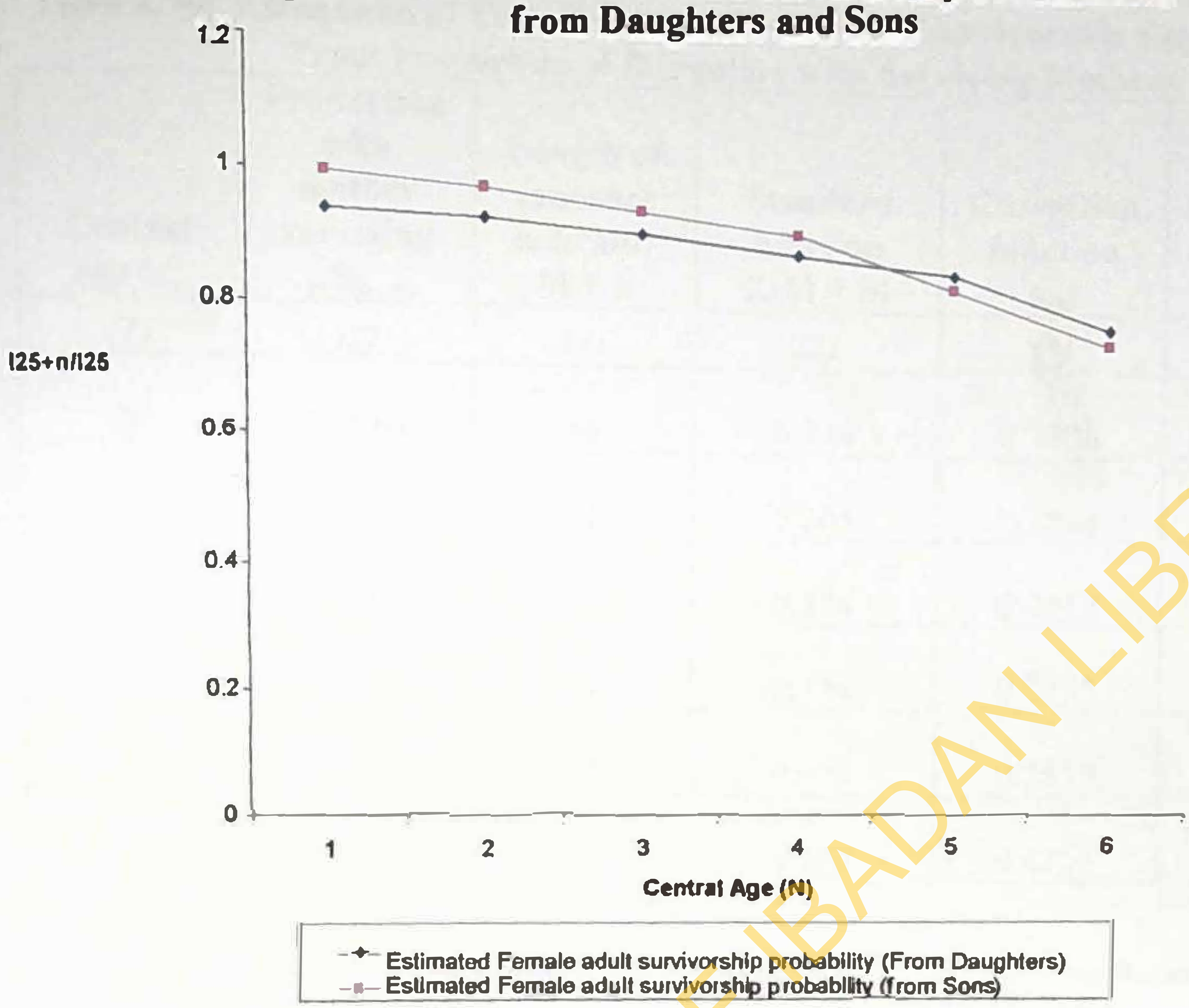
The female adult survivorship probabilities from proportion of sons with surviving mothers are higher than the estimates derived from proportion of daughters with surviving mothers, except for the last two age groups, where the male estimates are lower than the females'.

Table 4.73: Estimation of Female Adult Survivorship Probabilities from Proportion of Daughters with Surviving Mother

Central age (n)	Weighing factor W(n)	Proportion with mother surviving S(n – 5)	Complement of weighing factor (1 - W(n))	Proportion with mother surviving S(n)	Female adult survivorship probability $l_f(25+n)/l_f(25)$
(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
20	0.756	0.9429	0.244	0.9333	0.9405
25	0.809	0.9333	0.191	0.9110	0.9290
30	0.834	0.9110	0.166	0.8771	0.9054
35	0.844	0.8771	0.156	0.8627	0.8749
40	0.791	0.8627	0.209	0.7822	0.8459
45	0.708	0.7822	0.292	0.7053	0.7597
50	0.514	0.7053	0.486		

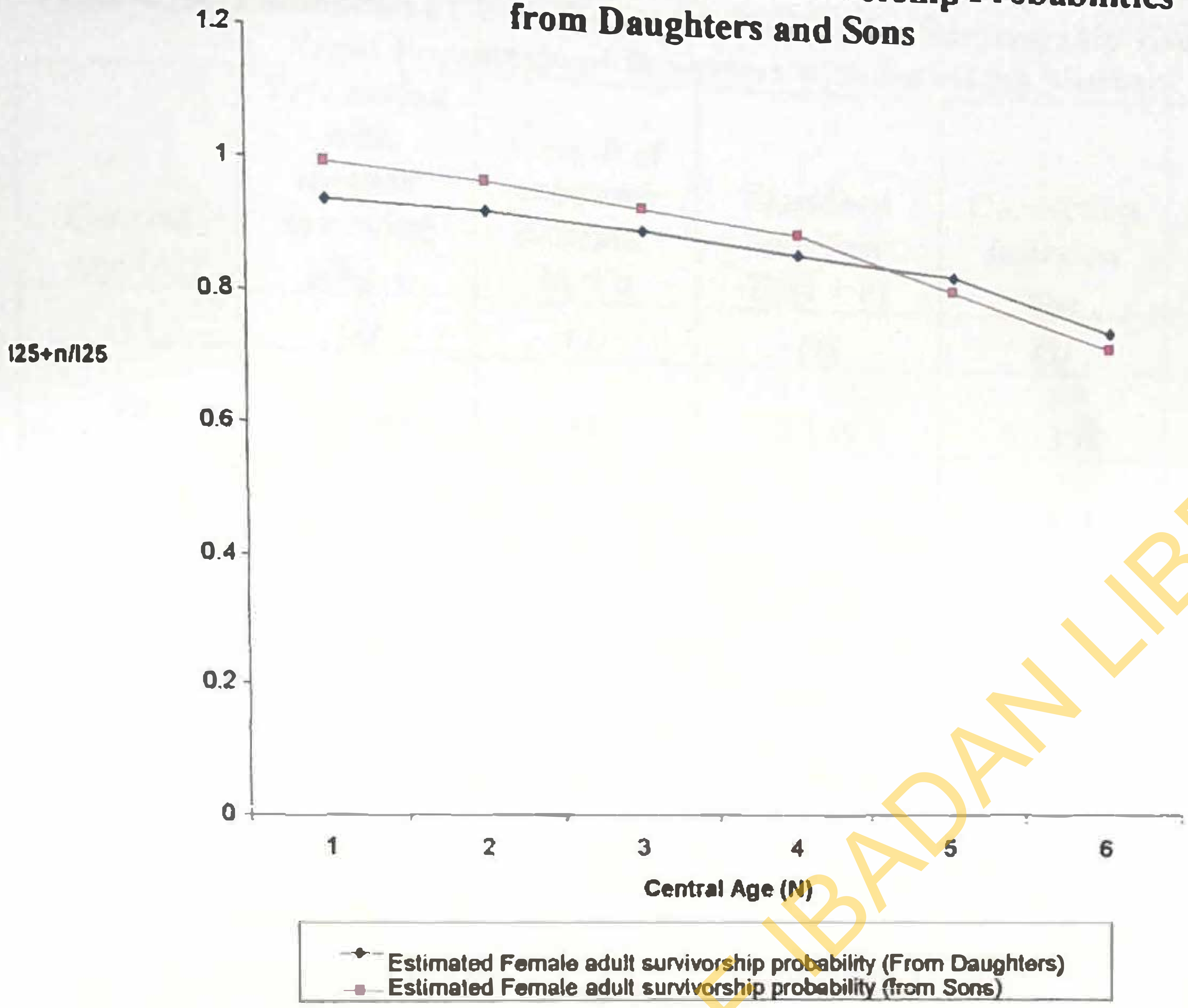
Table 4.75 shows the graduated values of the survivorship estimates. The values were obtained using Brass two-parameter logit model life table, α and β, estimated iteratively (table 4.81). The graduated values obtained reveal no significant difference from the estimated values. The adjusted female adult mortality level, summarized by the probability of dying between the ages of 15 and 60 years ($_{45}q_{15}$) was 33.2 per thousand.

Figure 4.72: Estimated Female Survivorship Probabilities from Daughters and Sons



Tables 4.76 and 4.77 shows the estimation of time reference periods for which survivorship estimates obtained from above refer. The reference period of the survivorship estimates is 12.1 years to 8.7 years; this implies that the estimates obtained refer to mortality operating between January 1994 and July 1998.

Figure 4.72: Estimated Female Survivorship Probabilities from Daughters and Sons



Tables 4.76 and 4.77 shows the estimation of time reference periods for which survivorship estimates obtained from above refer. The reference period of the survivorship estimates is 12.1 years to 8.7 years; this implies that the estimates obtained refer to mortality operating between January 1994 and July 1998.

Table 4.76: Estimation of Time Reference Periods for Survivorship Estimates Derived From Proportion of Daughters with Surviving Mothers

Central age (n)	Proportion with mother surviving $_{10}S_{(n-5)}$	Length of exposure indicator M + n	Standard function Z(M + n)	Correction function $u_{(n)}$	Reference period $t_{(n)}$	Year
(1)	(2)	(3)	(4)	(5)	(6)	
20	0.9364	46	0.149	0.1308	8.69	1998.7
25	0.9197	51	0.205	0.1808	10.24	1996.2
30	0.8964	56	0.274	0.2412	11.38	1995.4
35	0.8705	61	0.356	0.3135	12.01	1994.0
40	0.8307	66	0.452	0.3939	12.12	1994.1
45	0.7449	71	0.568	0.4735	11.85	1994.9

Table 4.77: Estimation of Time Reference Periods for Survivorship Estimates Derived From Proportion of Sons with Surviving Mothers

Central age	Proportion with mother surviving $_{10}S_{(n-5)}$	Length of exposure indicator M + n	Standard function Z(M + n)	Correction function $u_{(n)}$	Reference period $t_{(n)}$	Year
(1)	(2)	(3)	(4)	(5)	(6)	(7)
20	0.9848	46	0.149	0.1476	8.52	1998.5
25	0.9645	51	0.205	0.1967	10.04	1996.0
30	0.9344	56	0.274	0.2551	11.17	1995.2
35	0.8889	61	0.356	0.3204	11.89	1995.9
40	0.7941	66	0.452	0.3789	12.42	1994.4
45	0.7222	71	0.568	0.4632	12.08	1994.1

4.8: DERIVATION OF A LIFE TABLE FROM THE SET OF SURVIVORSHIP PROBABILITIES

A smoothed life table was obtained by combining the data on female child mortality in table 4.36a and female adult mortality from proportion daughters with surviving mother in table 4.75. The female adult mortality from proportion of daughters with surviving mother was used due to differential age misreporting noticed among the male respondents. An exaggeration of reported ages by the male respondents caused an upward bias in the proportions with living mothers.

The iteration process to obtain the estimates of α and β parameters is shown in table 4.81 of appendix 4. The value of β converged to 0.870 after the third iteration, thereafter; the value of α was estimated as -0.877. Table 4.82 shows the estimated smoothed life table survivorship probabilities for females in Mokola obtained using the Brass two parameters logit system.

Table 4.82: Estimated Smoothed Life Table for Females, Mokola, 2006

Age	African Standard	Logit system
x	*ls(x)*	*l*(x)*
0	-	1.0000
1	-0.9970	0.9704
2	-0.8052	0.9591
3	-0.7252	0.9533
5	-0.6515	0.9472
10	-0.5498	0.9373
15	-0.7362	0.9338
20	-0.4551	0.9273
25	-0.6826	0.9184
30	-0.3150	0.9091
35	-0.2496	0.8992
40	-0.1816	0.8880
45	-0.1073	0.8744
50	-0.0212	0.8570
55	0.0832	0.8333
60	0.2100	0.8004
65	0.3746	0.7507
70	0.5818	0.6774
75	0.8611	0.5636
80	1.2375	0.3991

$\alpha* = -0.877$, $\beta* = 0.870$, $l*_{(x)} = [1.0 + \exp(2\alpha + 2\beta\lambda s(x))]^{-1}$

Table 4.83: Abridged Life Table: Females Mokola, 2006

Exact Age (x)	l*(x)	d_x	q_x	L_x	T_x	e_x
0	10000	277	0.02770	9806	667239	66.72
1	9704	251	0.02582	38214	657433	67.75
5	9472	99	0.01045	47113	619219	65.37
10	9373	35	0.00373	46778	572106	61.04
15	9338	65	0.00696	46528	525328	56.26
20	9273	89	0.00960	46143	478800	51.63
25	9184	93	0.01013	45688	432657	47.11
30	9091	99	0.01089	45208	386969	42.57
35	8992	112	0.01246	44680	341761	38.01
40	8880	136	0.01532	44060	297981	33.56
45	8744	174	0.01980	43285	253021	28.94
50	8570	234	0.02730	42258	209736	24.47
55	8333	329	0.03948	40843	167478	20.10
60	8004	497	0.06209	38778	126635	15.82
65	7507	733	0.09764	35703	87857	11.70
70	6774	1138	0.16800	31013	52154	7.70
75+	5636	5636	1.00000	21141	21141	3.75

CHAPTER FIVE

5.1 DISCUSSION

5.11 Age Distribution of Mokola

The population pyramid of Mokola reflects an ageing population structure and is an indication of a population with declining fertility. The finding is however not in accordance with the 1991 census result and the 2003 NDHS which reported about half of the population under the age 15. The ageing population structure observed in this community could be as a result of declining fertility and mortality. This is evident in the report of the 1990 and 2003 NDHS which indicate declining fertility in the region. The ageing population structure in this community has implications for future demand for social services such as health care, education, occupation and welfare. An excess supply of workers could for instance turn into an acute shortage of new entrants within a few years.

The sex ratios at younger ages were lower than the ratios reported in the 1991 census; this may possibly be a result of age misstatement or selective omission of births. The higher number of males than females in the 65+ age group was also observed in the 1991 census and the recent NDHS. This however is an indication of higher survival of males than females at older ages, an observation that contradicts the world trend, or sex-selective omission error.

5.12 Household and Socio-Demographic Characteristics of Respondents

The distribution of female respondents by age observed in this study shows an unusual trend with the number of women increasing from the first age group to the third and a sudden decline thereafter. This could be a result of age misstatement with a large number reporting into an age group (particularly 30-34 years). This observation is however not consistent with the 2003 NDHS report of decreasing number of women as age increases.

The high proportion of respondents with a form of education reflects a high literacy rate in the study population. This finding is consistent with the NDHS report for the southwest region which also reported a high literacy rate for women in this region.

5.13 Childhood Mortality

The pattern of proportion of children dead in this study appears irregular with low values in middle aged women and high values at younger ages. However, this could be due to the fact that young women are likely to be less experienced in child care practices.

This pattern may be affected by the age heaping noted in Table 4.32. If some women in their late thirties under-reported their ages but reported the births and deaths of their children correctly then the deaths would effectively be moved downward toward age 29. In addition, an examination of sex ratios at birth (not shown) suggests that the births of boys may have been underreported among women age 15 to 19, 20 to 24, 25 to 29 and 30 to 34 years for whom the sex ratio of births is less than 1. However, other ratios are in the plausible range of 1.07 to 1.18 for the remaining age groups.

The fact that women in the first age group (15–19 years) did not report any child death; this observation would indicate a favourable mortality in the age group. This finding is however not consistent with Ahonsi (1995) which reported high child mortality for Nigerian women in this age group. However, it is important to consider that the observed figure may not necessarily indicate a favourable mortality, but rather as a result of the small number of respondents (or mothers) in this age group (70 women) and/or failure of the women to report dead children. Again, another rationalization for the observed pattern could be better access to antenatal care by this group of women.

5.131: Infant Mortality Rate

The un-adjusted and adjusted infant mortality rates observed as 0 and 32.4 per one thousand respectively are very low when compared to the recent rate of 69/1000 obtained for the South-Western zone in the 2003 NDHS. However, the pattern of the estimates obtained here is similar to the NDHS as the two estimates reflect low mortality in the zone compared with other zones in the country. It should however be noted that the 2003 NDHS data was not disaggregated at the state level, it may therefore be difficult to compare the estimates obtained in this study with that of the 2003 NDHS as Mokola is exclusively an urban community in the southwest zone. Also, the 2003 NDHS reported a remarkable childhood mortality differential between urban and rural communities.

Studies have shown that women in the youngest age group may have socioeconomic characteristics significantly different from those of the total number of mothers whose infants die during a year. (Hill and Figueora 1997). They also have a smaller proportion married and a smaller number of births than women in older age groups, which can result in more sampling error in the estimates (Hill and Yazbeck 1993). A number of reasons can however be attributed to the observed mortality rate, one may be due to the small sample size of women in this age group, underreporting of recent child deaths, proximity of the study area to both government and private health institutions and also the educational level of the mothers (about 87% had at least secondary school education). The implication of the observed infant mortality rate is that this suggests there has been an improvement in the health conditions of people living in Mokola community in Ibadan. Also, it is evident from this study that educational status of women in Mokola has greatly improved thereby resulting in low childhood mortality rates.

5.132: Under-five Mortality Rate

The adjusted under-five mortality rate of 63/1000 is also very low compared to the 2003 NDHS estimate of 113 for the South-West region and the 2001 WHO under-five mortality rate (indirectly estimated) of 173 for males and 170 for females. The reasons for such deviation may not be far fetched from the proximity to health institutions and educational status of the mothers already outlined above for infant mortality.

The study also found a sex differential in the estimated under-five mortality rates. The proportion of children dead by mothers' age group also shows that the figure is higher among boys than girls, which is consistent with the findings from NDHS, 2003.

The finding of mortality differentials showed mother's education, ethnic group and access to sanitary latrine observed in this study are in consonance with findings from other studies in similar population (GDHS, 2003; Das Gupta, 1990; Onyemunwa, 1988). Maternal education is thought to act through more effective utilization of health facilities due to improved awareness, understanding and effective participation in decision making, and child care (Caldwell, 1979; Caldwell and Caldwell, 1985; Ware, 1984). Also, women with high educational attainment have been reported as more likely to practice good health-seeking behaviour (UN, 2006; Bicego and Boerma, 1991; Cleland et al, 1991) and they tend to have better employment opportunities with higher standards of living. This may explain the finding that the risk of experiencing child loss is about 5.5 times as high for children of mothers with primary education or lower than it is for children of mothers with tertiary education observed in this study. Also, it should be noted that the insignificance attained in the logistic regression analysis of child loss and mothers' occupation could be as a result of inaccurate reporting of death especially among unemployed mothers.

5.14: Adult Mortality

The smoothing process reveals slight under reporting of mothers' death in age group 15 -19 years and over reporting at older ages. That the proportions of male respondents reporting mother alive is higher than the corresponding proportion of female respondents in this study is consistent with pattern observed in African countries (Blacker, 1977). This fact has been attributed to differential age misreporting as, males have a tendency to exaggerate their ages, and since the proportions with mother alive falls rapidly with increasing age of respondents, any exaggeration of reported ages would bias the proportions with living mothers upwards (Blacker, 1977). The data does not reflect the "adoption effect" as observed in some studies in Africa (Blacker, 1977, Hill and Trussell, 1977, Timaeus, 1991, Mandela, 1994).

The adjusted female adult mortality level, summarized by the probability of dying between the ages of 15 and 60 years ($_{45}q_{15}$) obtained in this study reflect an overall low adult mortality level in comparison with mortality at younger ages (estimated in this study) and 2000 WHO estimates (Lopez et al , 2002). These mortality levels seem slightly too low and might have resulted from the low sample size used for the survey or improving child survival in Mokola.

5.15: Reference Period of Childhood and Adult Mortality Estimates

The reference period of the estimated childhood probabilities of dying observed as 9.6 to 3.4 years, implies that the estimates refer to those operating between July 2003 and May 1997 (the survey took place between November and December, 2006).

The reference period of the female adult survivorship estimates obtained as 12.1 years to 8.7 years, implies that the estimates obtained refer to ones operating between January 1994 and July 1998. A comparative assessment of this data alongside similar data for other African countries by Timaeus and Jasseh (2004) estimates the probability of dying between ages 15 and 60 around 1995 at 23% and 17% for Cameroon and Benin, respectively. These estimates are evidently on the high side compared to those presented in the current study, perhaps attributable to methodological or accessibility to health care differences.

5.16: Life Table

The life table is a key summary tool for assessing and comparing mortality conditions prevailing in populations. The α value indicates higher life expectancy in the study area than in the African Standard Life Table, that is, low mortality level. The resulting β values implies a high infant and childhood mortality and low adult mortality relative to the standard. The mortality pattern as evident in value of β obtained is consistent with, though slightly higher than that of 0.91 made by Ayeni (1974). The value is somewhat low and different from the central value of 1 suggested by Brass and others (Brass et al 1968). The β value is however inconsistent with those obtained from several other countries in sub-Saharan Africa. For example, Blacker, Hill and Timaeus (1985) found that, among the seventeen sub-Saharan African countries studied, female β values were greater than 1 in only three countries - Mali, Lesotho and Ghana.

This low value indicates that for females in Mokola community, mortality at the early ages is excessive in relation to that for adults in the context of the General African Standard. Since it is rare in African communities to relatively overreport infant deaths in relation to adult deaths, the relatively high mortality at the early ages here may be peculiar or might have been caused by underreporting of adult mortality as well as small sample size.

The observed low level of childhood and adult mortality accounts for the improvement in life expectancy to an average of 66.7 years for females in the community.

However, the expectation of life at birth obtained in the estimated abridged life table is not within reach of many sub-Saharan countries. The 2001 WHO female life expectancy was estimated as 48.2 which is far lower than the life expectancy obtained in this study.

5.2: CONCLUSION

The methodology adopted in the study presents plausible mortality estimates in the study area. The findings of this study reflect low level of mortality in Mokola compared to the 2003 NDHS estimates for women in the upper socio-economic echelon (using education as a proxy) and also the southwest geopolitical region. This would rather indicate a relatively good health standard or conditions of people living in Mokola or probably an over-estimation of the previous mortality rates. Also, the low estimates obtained in the study could be an upshot of proximity of the study area to a tertiary health institution and other health centers in the community. An expectation of life at birth of 66.7 years obtained for females in this study is still low, compared with developed countries.

The study has been able to establish the levels of childhood and female adult mortality in Mokola community where none exist before. The estimates therefore can serve as a basis for comparison for the ongoing heath survey in the study area.

5.3: RECOMMENDATIONS

- The discrepancies in the mortality estimates obtained suggest the need to invest in research and surveillance systems to improve on the estimation of mortality levels in Nigeria. Building monitoring capacity would facilitate better understanding of the number of people (especially) children dying and from what cause, and to assess which interventions are making a differencc.
- Since education (especially of mothers) creates the basic awareness of sanitation, nutrition and health issues, there is need for policies aimed at the expansion of educational opportunities particularly for women. This will give them greater access to information and improve their ability to make use of such information in order to live healthily.
- Questions on adult mortality should be incorporated in subsequent National Demographic and Health as observed in countries such as Cameroun, Malawi, Tanzania, e.t.c. This will serve as baseline estimates for adult mortality in Nigeria.
- Good vital registration offers the best means of monitoring the progress of countries in reducing premature deaths, particularly child deaths. There is therefore a need to improve the vital registration system in Mokola and other similar populations.

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ANNEX I

Table 1: Coefficients for Estimation of Child Mortality Multipliers Trussell's Variant When Data are Classified by Age of Mother

Mortality model	Age Group	Index i	Mortality ratio	Coefficients a(i)	b(i)	c(i)
North	15-19	1	Q(1)/D(1)	1.1119	-2.9287	0.8507
	20-24	2	Q(2)/D(2)	1.2390	-0.6865	-0.2745
	25-29	3	Q(3)/D(3)	1.1884	0.0421	-0.5156
	30-34	4	Q(5)/D(4)	1.2046	0.3037	-0.5656
	35-39	5	Q(10)/D(5)	1.2586	0.4236	-0.5898
	40-44	6	Q(15)/D(6)	1.2240	0.4222	-0.5456
	45-49	7	Q(20)/D(7)	1.1772	0.3486	-0.4624
South	15-19	1	Q(1)/D(1)	1.0819	-3.0005	0.8689
	20-24	2	Q(2)/D(2)	1.2846	-0.6181	-0.3024
	25-29	3	Q(3)/D(3)	1.2223	0.0851	-0.4704
	30-34	4	Q(5)/D(4)	1.905	0.2631	-0.4487
	35-39	5	Q(10)/D(5)	1.1911	0.3152	-0.4291
	40-44	6	Q(15)/D(6)	1.1564	0.3017	-0.3958
	45-49	7	Q(20)/D(7)	1.1307	0.2596	-0.3538
East	15-19	1	Q(1)/D(1)	1.1461	-2.2536	0.6259
	20-24	2	Q(2)/D(2)	1.2231	-0.4301	-0.2245
	25-29	3	Q(3)/D(3)	1.1593	0.0581	-0.3479
	30-34	4	Q(5)/D(4)	1.1404	0.1991	-0.3487
	35-39	5	Q(10)/D(5)	1.1540	0.2511	-0.3506
	40-44	6	Q(15)/D(6)	1.1336	0.2556	-0.3428
	45-49	7	Q(20)/D(7)	1.1201	0.2362	-0.3268
West	15-19	1	Q(1)/D(1)	1.1415	-2.7070	0.7663
	20-24	2	Q(2)/D(2)	1.2563	-0.5381	-0.2637
	25-29	3	Q(3)/D(3)	1.1851	0.0633	-0.4177
	30-34	4	Q(5)/D(4)	1.1720	0.2341	-0.4272
	35-39	5	Q(10)/D(5)	1.1865	0.3080	-0.4452
	40-44	6	Q(15)/D(6)	1.1746	0.3314	-0.4537
	45-49	7	Q(20)/D(7)	1.1639	0.3190	-0.4435

Table 2: Coefficients for Estimation of the Reference Period $t_{(x)}$ to which the Values $q_{(x)}$ of Estimated from Data are Classified by Age of Mother.

Mortality model	Age Group	Index i	Parameter estimate	Coefficients		
				a(i)	b(i)	c(i)
North	15-19	1	q(1)/D(1)	1.0921	5.4732	-1.9672
	20-24	2	q(2)/D(2)	1.3207	5.3751	0.2133
	25-29	3	q(3)/D(3)	1.5996	2.6268	4.3701
	30-34	4	q(5)/D(4)	2.0779	-1.7908	9.4126
	35-39	5	q(10)/D(5)	2.0775	-7.3403	14.9352
	40-44	6	q(15)/D(6)	4.1520	-12.2448	19.2349
	45-49	7	q(20)/D(7)	6.9650	-13.9160	19.9542
South	15-19	1	q(1)/D(1)	1.0900	5.4443	-1.9721
	20-24	2	q(2)/D(2)	1.3079	5.5568	0.2021
	25-29	3	q(3)/D(3)	1.5173	2.6755	4.7471
	30-34	4	q(5)/D(4)	1.9399	-2.2739	10.3876
	35-39	5	q(10)/D(5)	2.6157	-8.4819	16.5153
	40-44	6	q(15)/D(6)	4.0794	-13.8303	21.1866
	45-49	7	q(20)/D(7)	7.1796	-15.3880	21.7892
East	15-19	1	q(1)/D(1)	1.0959	5.5764	-1.9949
	20-24	2	q(2)/D(2)	1.2921	5.5897	0.3631
	25-29	3	q(3)/D(3)	1.5021	2.4692	5.0927
	30-34	4	q(5)/D(4)	1.9347	-2.6419	10.8533
	35-39	5	q(10)/D(5)	2.6197	-8.9693	17.0981
	40-44	6	q(15)/D(6)	4.1317	-14.3550	21.8247
	45-49	7	q(20)/D(7)	7.3657	-15.8083	22.3005
West	15-19	1	q(1)/D(1)	1.0970	5.5628	-1.9956
	20-24	2	q(2)/D(2)	1.3062	5.5677	0.2962
	25-29	3	q(3)/D(3)	1.5305	2.5528	4.8962
	30-34	4	q(5)/D(4)	1.9991	-2.4261	10.4282
	35-39	5	q(10)/D(5)	2.7632	-8.4065	16.1787
	40-44	6	q(15)/D(6)	4.3468	-13.2436	20.1990
	45-49	7	q(20)/D(7)	7.5242	-14.2013	20.0162

Table 3: Weighing Factors, $W_{(N)}$, for Conversion of Proportion of Respondents with Mothers Alive into Survivorship Probabilities for Females

	Mean age M, for mothers at maternity								
Age (n)	22	23	24	25	26	27	28	29	30
(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*	*(9)*	*(10)*
10........	0.420	0.470	0.517	0.557	0.596	0.634	0.674	0.717	0.758
15.......	0.418	0.489	0.556	0.618	0.678	0.738	0.800	0.863	0.924
20.......	0.404	0.500	0.590	0.673	0.756	0.838	0.921	1.004	1.085
25.......	0.366	0.485	0.598	0.704	0.809	0.913	1.016	1.118	1.218
30.......	0.303	0.445	0.580	0.708	0.834	0.957	1.080	1,203	1.323
35.......	0.241	0.401	0.554	0.701	0.844	0.986	1.128	1.270	1.412
40.......	0.125	0.299	0.467	0.630	0.791	0.950	1.111	1.274	1.442
45.......	0.007	0.186	0.361	0.535	0.708	0.884	1.063	1.250	1.447
50.......	-0.190	-0.017	0.158	0.334	0.514	0.699	0.890	1.095	1.318
55.......	-0.368	-0.220	-0.059	0.101	0.270	0.456	0.645	0.856	1.083
60.......	0.466	-0.352	-0.217	-0.084	0.053	0.220	0.378	0.579	0.800

Table 4: Values of the Standard Function for Calculation of the Time Reference for Indirect Estimates of Adult Mortality

Age	Standard function Z(x)	Age	Standard function Z(x)	Age	Standard function Z(x)	Age	Standard function Z(x)	Age	Standard function Z(x)
(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*	*(9)*	*(10)*
26	0.090	36	0.092	46	0.149	56	0.274	66	0,452
27	0.090	37	0.093	47	0.160	57	0.289	67	0.473
28	0.090	38	0.095	48	0.171	58	0.305	68	0.495
29	0.090	39	0.099	49	0.182	59	0.321	69	0.518
30	0.090	40	0.104	50	0.193	60	0.338	70	0.542
31	0.090	41	0.109	51	0.205	61	0.356	71	0.568
32	0.090	42	0.115	52	0.218	62	0.374	72	0.595
33	0.090	43	0.112	53	0.231	63	0.392	73	0.622
34	0.090	44	0.130	54	0.245	64	0.4411	74	0.650
35	0.091	45	0.139	55	0.259	65	0.431	75	0.678

Table 5: Logit Values for the Brass African Standard Life Table

Exact Age (x)	$l_s(x)$	$\lambda_s(x)$
1	0.8802	-0.9970
2	0.8335	-0.8052
3	0.8101	-0.7252
4	0.7964	-0.6819
5	0.7502	-0.6515
10	0.7362	-0.5498
15	0.7130	-0.5131
20	0.6826	-0.4551
25	0.6826	-0.3829
30	0.6525	-0.3150
35	0.6223	-0.2496
40	0.5898	-0.1817
45	0.5535	0.1073
50	0.5106	-0.1212
55	0.4585	0.0832
60	0.3965	0.2100
65	0.3210	0.3746
70	0.2380	0.5818
75	0.1516	0.8611
80	0.0768	1.2433
85	0.0276	1.7810
90	0.0059	2.5642

ANNEX II

DEPARTMENT OF EPIDEMIOLOGY, MEDICAL STATISTICS AND ENVIRONMENTAL HEALTH.

FACULTY OF PUBLIC HEALTH

UNIVERSITY OF IBADAN, NIGERIA

QUESTIONNAIRE ON CHILDHOOD AND ADULT MORTALITY IN MOKOLA AREA, IBADAN.

HOUSE HOLD SCHEDULE

.... Household No..................

.... Serial Number --------

I would like some information about the people who usually live in your household or who are staying with you now.

USUAL RESIDENTS AND VISITORS	RELATIONSHIP TO HEAD OF HOUSEHOLD	SEX	RESIDENCE	AGE	ELIGIBILITY		
Please give the names of the persons who usually live in your household, starting with the head of the household.	What is the relationship of (NAME) to the head of Household	Is (NAME) female or male	Does (NAME) usually live here?	How old is (NAME) as of last birthday?	CIRCLE LINE NO OF ALL MEN AGE 15 - 65	CIRCLE LINE NO OF ALL WOMEN AGE 15 - 49	CIRCLE LINE NO OF ALL CHILDREN UNDER AGE 5
(2)	(3)	(4)	(5)	(6)	(7)	(7)	(8)
		M F	YES NO	IN YEARS			
	[ ][ ]	1 2	1 2	[ ][ ]	01 02	01 02	01 02
	[ ][ ]	1 2	1 2	[ ][ ]	01 02	01 02	01 02
	[ ][ ]	1 2	1 2	[ ][ ]	01 02	01 02	01 02
	[ ][ ]	1 2	1 2	[ ][ ]	01 02	01 02	01 02
	[ ][ ]	1 2	1 2	[ ][ ]	01 02	01 02	01 02

		1 2	1 2		01 02	01 02	01 02
		1 2	1 2		01 02	01 02	01 02
		1 2	1 2		01 02	01 02	01 02
		1 2	1 2		01 02	01 02	01 02
		1 2	1 2		01 02	01 02	01 02

CODES FOR Q.3
RELATIONSHIP TO HEAD OF HOUSEHOLD

01 = HEAD
02 = WIFE OR HUSBAND
03 = SON OR DAUGHTER
04 = SON- OR DAUGHTER-IN-LAW
05 = GRANDCHILD
06 = PARENT
07 = PARENT-IN-LAW
08 = BROTHER OR SISTER
09 = BROTHER OR SISTER-IN-LAW
10 = OTHER RELATIVES
11 = ADOPTED/FOSTER/STEP CHILD
12 = NOT RELATED
98 = Don't Know

If household contains more than 10 persons, continue on the next page(s) and fill the continuation columns at the bottom right corner of the questionnaire. If interview for this household is continued on another page, tick 'continued?" and indicate the "page number."

Continued?	Page

HOUSEHOLD CHARACTERISTICS

Q001	What is the main source of drinking water for members of your household?	**PIPED WATER** Piped into dwelling.......11 Piped into yard/plot.......12 Public tap.......13 **WATER FROM OPEN WELL** Open well in dwelling.......21 Open well in yard/plot.......22 Open public well.......23 **WATER FROM COVERED WELL OR BOREHOLE** Protected well/ borehole in dwelling.......31 Protected well/borehole in yard/plot.......32 Protected public well/borehole.......33 **SURFACE WATER** Spring.......41 River/Stream.......42 Pond/Lake.......43 Dam.......44 Rainwater.......51 Tanker Truck.......61 Bottled Water.......71 Others(Specify) ______ 96	
Q002	What kind of toilet facilities does your household have?	Flush Toilet.......11 **PIT TOILET/LATRINE** Traditional pit latrine.......21 Ventilated Improved Pit (VIP) latrine.......22 **NO FACILITY** Bush/Field.......31 River.......32 Others (Specify) ______ 96	

Q003	Does your household have: Electricity? A radio? A television? A telephone/cellular phone? A refrigerator? A cooker? An electric iron? An electric fan?	YES NO Electricity 1 2 Radio 1 2 Television 1 2 Telephone/cellular phone 1 2 Refrigerator 1 2 Cooker 1 2 Iron 1 2 Fan 1 2	
Q004	What does your household **mainly** use for cooking?	Electricity........1 LPG/Natural gas........2 Biogas........3 Kerosene........4 Coal, Lignite........5 Charcoal........6 Firewood, Straw........7 Dung........8 Others (Specify) ________ 96	
Q005	How many rooms in total are in your household, including rooms for sleeping and all other rooms	Number of Rooms (Total)	
Q006	How many rooms are used for sleeping in your household?	Number of Rooms (Sleeping)	
Q007	Main material of the floor *Record observation*	**NATURAL FLOOR** Earth/Sand........11 Dung........12 **RUDIMENTARY FLOOR** Wood planks........21 Palm/ Bamboo........22 **FINISHED FLOOR** Polished Wood........31 Asphalt strip........32 Ceramic tiles........33 Cement........34 Carpet........35 Others (Specify)........	

DEPARTMENT OF EPIDEMIOLOGY, MEDICAL STATISTICS AND ENVIRONMENTAL HEALTH.

FACULTY OF PUBLIC HEALTH

UNIVERSITY OF IBADAN, NIGERIA

QUESTIONNAIRE ON CHILDHOOD AND ADULT MORTALITY IN MOKOLA AREA, IBADAN.

INDIVIDUAL QUESTIONNAIRE

Locality Name .... **Household No** ....

Building Number...................... SERIAL NUMBER ——————

Dear Respondent,

Introduction and Consent: My name is _ I am working with the principal investigator. We are interviewing people here in Mokola Area in order to find out mortality rates in this environment. I am going to ask you questions some of which may be very personal. Your answers are completely confidential and will not be shown to other persons. The information collected from you and people like you will be used solely for academic purpose. Your honest answers to these questions will be greatly appreciated.

SECTION A: SOCIO DEMOGRAPHIC CHARACTERISTICS.

NO	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP TO
Q101	Sex	MALE - - - - - 1 FEMALE - - - - -2	
Q102	In what month and year were you born?	MONTH _ _ _ _ _ YEAR _ _ _ _ _ DON'T KNOW - - -98 DON'T KNOW ----98	
Q103	How old were you as at your last birthday? [COMPARE WITH Q102 IF NEEDED AND CORRECT Q103]	AGE IN COMPLETED YEARS _ _ _ _	
Q104	Have you ever attended school?	Yes - - - - - - 1 No - - - - - - 2	Q106
Q105	What is the highest level of school you attended?	KORANIC - - - - 1 PRIMARY - - - - 2 SECONDARY - - - - 3 TECHNICAL COLLEGE ---4 TEACHERS' COLLEGE ------- - 5 NCE - - - - - - ------------ 6 POLYTECHNIC - - - - -------- -7 UNIVERSITY - - - -------- 8	
Q106	Religion	CATHOLIC - - - - - - - --1 PROTESTANT - - - - 2 PENTECOSTAL - - - - -3 ISLAM - - - - - - - - - - - - ----- 4 TRADITIONAL - ------ - - - 5 OTHER CHRISTIANS- - - - - - 6 OTHERS (SPECIFY)__________ 96	
Q107	Marital Status	SINGLE - - - - - - 1 MARRIED - - - - - -2 DIVORCED - - - -3 WIDOWED - - - - - - ------- 4 SEPARATED - - - - - - - ---- 5 LIVING TOGETHER - - - — 6	

Q108	To which tribe do you belong?	YORUBA --------1 IGBO --------2 HAUSA -------3 BIROM -------4 BURA --------5 FULANI -------6 GWARI -------7 IBIBIO --------8 IGALA ---------9 IJAW ---------10 IKWERE -------11 OTHERS(SPECIFY) ________ 96	ITSEKIRI -------12 KAJE --------13 KANURI -------14 OKRIKA --------15 NUPE ---------16 SHUWA-ARAB ---17 URHOBO ------18 TIV ---------19 IDOMA --------20 EDO ---------21 EFIK ---------22	
Q109	Occupation	DIRECTOR/UPPER MANAGEMENT ---------- 1 OTHER MANAGEMENT ---------- 2 SALES MANAGER/REPRESENTATIVE/INSURANCE ----- 3 PROFESSIONAL/SPECIALIST ---------- 4 SELF EMPLOYED/SELF EMPLOYED ---------- 5 SELF EMPLOYED(INFORMAL SECTOR /HAWKER) ---- 6 BLUE COLLAR SKILLED & SEMISKILLED ---------- 7 UNSKILLED ---------- 8 CLERK/CLERICAL ---------- 9 CIVIL SERVANT ---------- 10 FARMER/FORESTRY/FISHING/MINING ---------- 11 HOUSEWIFE ---------- 12 PENSIONER/RETIRED ---------- 13 UNEMPLOYED ---------- 14 STUDENT ---------- 15 OTHERS(SPECIFY)---------- 96		

SECTION B: REPRODUCTION AND MOTHER'S INFORMATION

S/NO	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP
Q201	Have you ever given birth to a boy or girl who was born alive. IF NO, PROBE: Any baby who cried or showed signs of life?	1. YES 2. NO 9. NO RESPONSE	Q301
Q202	Did you have a live birth during the past 12 months	1. YES 2. NO 9. NO RESPONSE	
Q203	Do you have any sons or daughters to whom you have given birth who are now living with you?	1. YES 2. NO 9. NO RESPONSE	
Q204	How many sons are alive and live with you? How many daughters are alive and live with you? IF NONE RECORD "00"	SONS AT HOME ______ DAUGHTER ________ NO RESPONSE ----- 9	

Q205	Do you have any sons or daughters to whom you have given birth who are alive but do not live with you?	1. YES 2. NO 9. NO RESPONSE	Q207
Q206	How many sons are alive but do not live with you? How many daughters are alive but do not live with you? IF NONE RECORD "00"	SONS ELSEWHERE ______ DAUGHTERS ELSEWHERE ___	
Q207	Have you ever given birth to a boy or girl who was born alive but later died? **If No Probe**: Any baby who cried or showed signs of life but did not survive?	1. YES 2. NO 9. NO RESPONSE	Q209
Q208	How many boys and girls have died?	BOYS DEAD --------------------------- GIRLS DEAD	
Q209	SUM ANSWERS TO Q204, Q206 & Q208, ENTER TOTAL IF NONE, RECORD "00"	TOTAL ___________	
	Just to make sure I have this right: you have had in TOTAL ________ births during your life. Is that correct? Yes, Go to Q301 No, Probe and correct 201-209 as necessary		

Q210 Now I would like to record the names of all your birth, whether still alive or not, starting with the first one. RECORD NAMES IN Q212. RECORD TWINS AND TRIPLETS ON SEPARATE LINES.

Q215 What name was given to (Last/previous) baby? (NAME)	Q216 Were any of these birth twins?	Q217 Is (NAMES) a boy or a girl?	Q218 In what month and year was (NAME) born? PROBE: What is his/her birthday?	Q219 Is (NAME) still alive?	Q220 IF ALIVE How old was (NAME) at his/her last birthday? RECORD AGE IN COMPLETED YEARS	Q221 IF ALIVE Is (NAME) living with you?	Q222 Where there any other live births between (NAME OF PREVIOUS BIRTH) and (NAME)
01	SING....1 MULT....2	BOY.....1 GIRL....2	MONTH YEAR	YES....1 NO.....2	AGE IN YEARS	YES....1 NO.....2	YES....1 NO.....2
02	SING....1 MULT....2	BOY.....1 GIRL....2	MONTH YEAR	YES....1 NO.....2	AGE IN YEARS	YES....1 NO.....2	YES....1 NO.....2
03	SING....1 MULT....2	BOY.....1 GIRL....2	MONTH YEAR	YES....1 NO.....2	AGE IN YEARS	YES....1 NO.....2	YES....1 NO.....2
04	SING....1 MULT....2	BOY.....1 GIRL....2	MONTH YEAR	YES....1 NO.....2	AGE IN YEARS	YES....1 NO.....2	YES....1 NO.....2
05	SING....1 MULT....2	BOY.....1 GIRL....2	MONTH YEAR	YES....1 NO.....2	AGE IN YEARS	YES....1 NO.....2	YES....1 NO.....2
06	SING....1 MULT....2	BOY.....1 GIRL....2	MONTH YEAR	YES....1 NO.....2	AGE IN YEARS	YES....1 NO.....2	YES....1 NO.....2
07	SING....1 MULT....2	BOY.....1	MONTH	YES....1	AGE IN YEARS	YES....1	YES....1

		GIRL....2	YEAR	NO.....2		NO.....2	NO.....2

SECTION C: ADULT MORTALITY

NO	QUESTIONS AND FILTERS	CODING CATEGORIES
Q301	Is your mother alive? Probe I mean your biological mother	1. YES 2. NO 9. NO RESPONSE
Q302	Is your father alive? Probe I mean your biological father	1. YES 2. NO 9. NO RESPONSE

This is the end of my questionnaire. I thank you very much for taking time to answer the questions.

Date ....

Signature of the Investigator ....

CONSENT FORM

Introduction

We are currently undertaking a study to estimate Childhood and Female Adult Mortality in Mokola Area of Ibadan North Local Government.

Confidentiality and Consent

You will be participating in a study that involves you divulging some personal information about yourself. Your answers are completely confidential. Your name shall not be used in connection with any of the information you tell us. You have a right to refuse participating in the study and you can withdraw from the study when you want to. However, your honest answers and cooperation will help in the write-up of a research which is strictly for academic purpose.

Statement of person giving consent:

I have read the description of the research or have had it translated into language I understand. I understand that my participation is voluntary. I know enough about the purpose, methods, risks and benefits of the research study to judge that I want to take part in it. I understand that I may freely stop being part of this study at any time. I have received a copy of this consent form and additional information sheet to keep for myself.

DATE:___________ SIGNATURE: ____________________________

Phone No(s) ____

Contact Address ____

____

ANNEX III

Figure 4.31: Average Parity per Woman

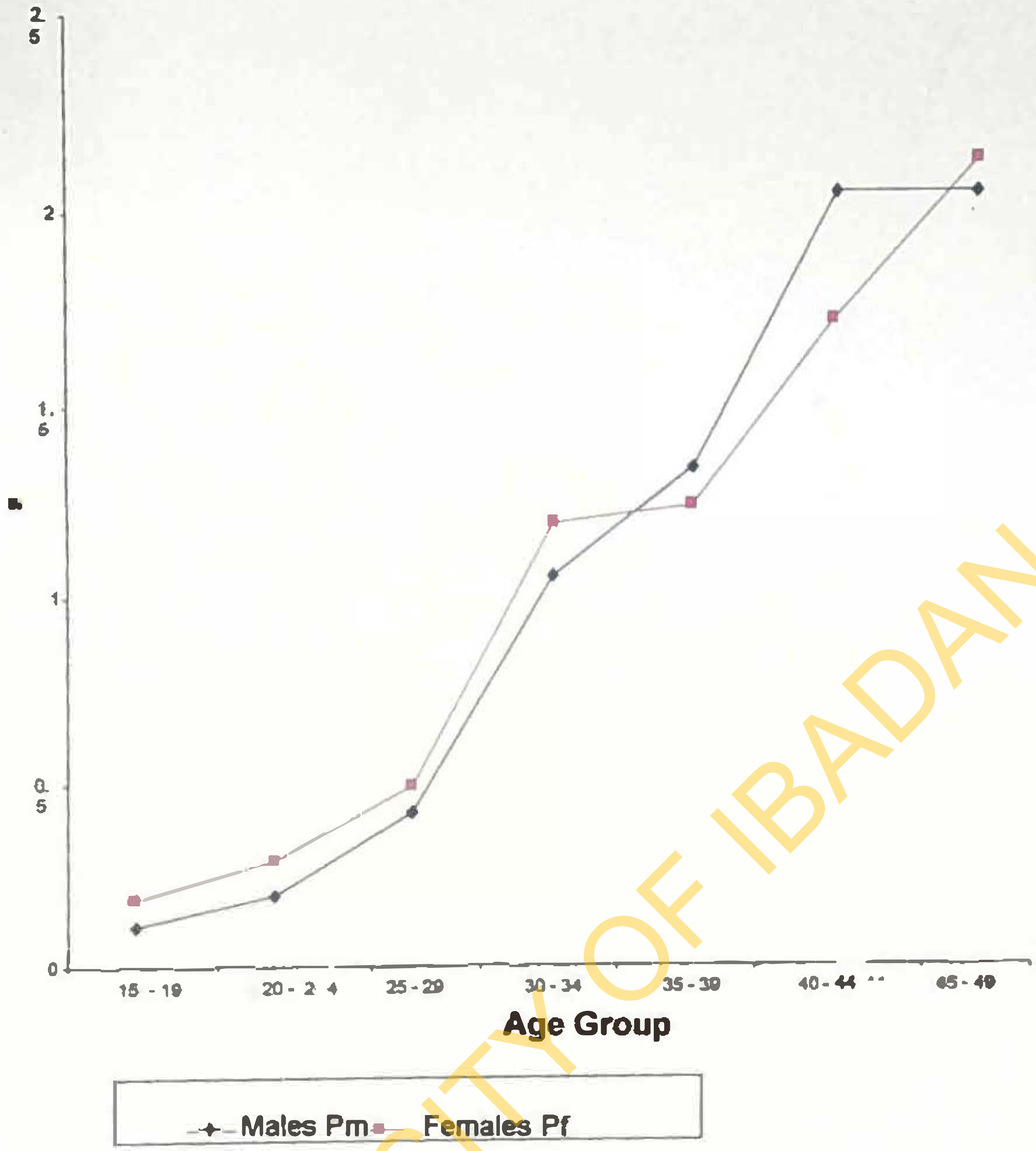

Figure 4.32: Proportion of Children Dead by Sex

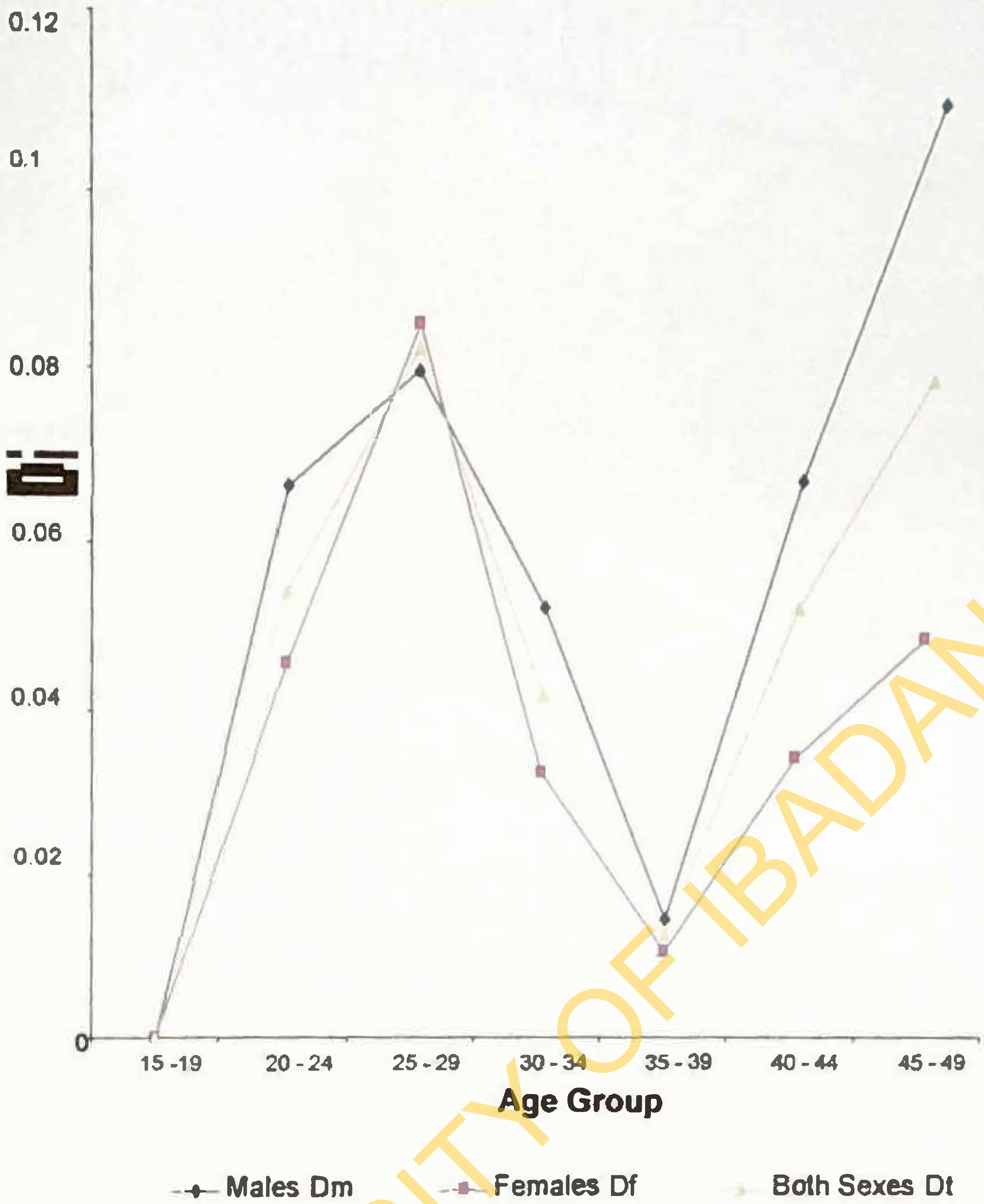

Figure 4.81: Estimated and Graduated Female Survivorship Probabilities

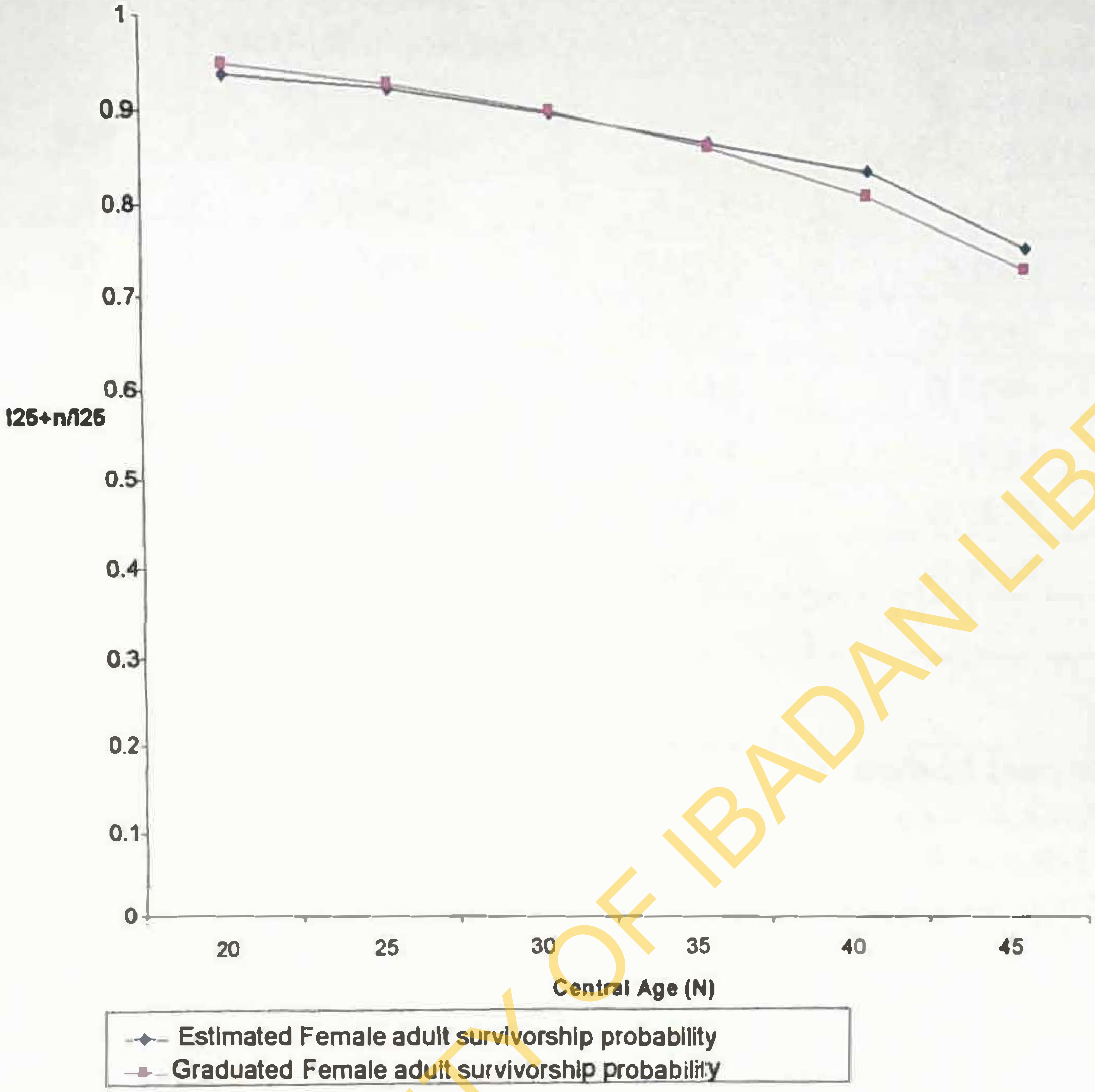

Table 4.81: Iteration Process to Estimate the α And β Parameters Defining a Life Table for Females in the Logit System Generated by the African Standard

Age	Estimated conditional female survivorship probability		First Iteration $\alpha_1 = -0.7828$ $\beta_1 = 1.0000$ l_1 (25) = 0.9114	
X	$l(x)/l(25)$	$l_1(x)$	$\lambda_1(x)$	$\beta_2(x)$
45	0.9405	0.8572	-0.8961	0.990
50	0.9290	0.8467	0.8545	0.928
55	0.9054	0.8252	0.7760	0.906
60	0.8749	0.7974	-0.6851	0.880
65	0.8459	0.7710	-0.6070	0.820
70	0.7597	0.6924	-0.4057	0.844
				0.895

Age	Estimated conditional female survivorship probability		Second Iteration $\alpha_2 = -0.8592$ $\beta_2 = 0.895$ l_2 (25) = 0.9171	
X	$l(x)/l(25)$	$l_2(x)$	$\lambda_2(x)$	$\beta_3(x)$
45	0.9405	0.8625	-0.9181	0.955
50	0.9290	0.8520	-0.8752	0.899
55	0.9054	0.8303	-0.7939	0.884
60	0.8749	0.8024	-0.7007	0.864
65	0.8459	0.7758	-0.6207	0.807
70	0.7597	0.6967	-0.4158	0.836
				0.874

Age	Estimated conditional female survivorship probability		Third Iteration $\alpha_3 = -0.9034$ $\beta_3 = 0.923$ $l_3(25) = 0.9251$	
X	$l(x)/l(25)$	$l_3(x)$	$\lambda_3(x)$	$\beta_4(x)$
45	0.9405	0.8636	-0.9228	0.947
50	0.9290	0.8530	-0.8792	0.893
55	0.9054	0.8313	-0.7974	0.879
60	0.8749	0.8033	-0.7035	0.861
65	0.8459	0.7767	-0.6233	0.805
70	0.7597	0.6976	-0.4179	0.834
				0.870