Population Dynamics of Malawi: A Re-examination of the Existing Demographic Data

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ABSTRACT

This thesis examines the dynamics of population growth in Malawi with particular reference to the two decades immediately following independence. Due to insufficient data little is known about the demography of Malawi. This dissertation is therefore an attempt to remedy the situation and provide additional questions for future inquiries.

Reliance has been on published demographic data obtained from the national censuses and demographic surveys. Reference has also been made to studies by independent researchers and other social and economic indicators obtained from various government publications.

The inquiry begins by reviewing previous attempts to examine the population of Malawi. The quality and quantity of data available in the country is also assessed. This is followed by a brief discussion on the geography, history, social and economic characteristics of Malawi. The reported age distribution is then examined before presenting various estimates of mortality and fertility derived from both direct and indirect techniques. The final section explores the relationship between population and development in Malawi.

The study has shown that (i) mortality has declined over the period under review, (ii) there was a reduction in the rate of mortality decline in the seventies, (iii) although fertility appears to have remained constant it is possible that it might have increased: however, if it

did the rate of increase must have been negligible, (iv) the level of social and economic development in Malawi has remained low and is consistent with the observed high fertility and mortality.

As a result of high and possibly increasing fertility and high but declining mortality, Malawi experienced a rapid population growth. This has inhibited improvements in some sectors of the economy. Therefore, to derive maximum benefits from future development projects population should form an integral part of the planning process.

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To all these people, I say, zikomo kwambiri, thank you very much.

LIST OF ABBREVIATIONS

CICRED	Committee for International Co-ordination of National Research in Demography Series
CPS	Centre for Population Studies
CSO	Central Statistical Office
DCS	Department of Community Services
DEPD	Department of Economic Planning and Development (formerly EPD)
DOI	Department of Information
EPD	Economic and Planning Division
GOM	Government of Malawi
GOZ	Government of Zimbabwe
ICS	Institute of Commonwealth Studies (University of London)
IDA	International Development Agency
ILO	International Labour Organization
IMF	International Monetary Fund
IUSSP	International Union for the Scientific Study of Population
KOL	Kingdom of Lesotho
KOS	Kingdom of Swaziland
LSE	London School of Economics and Political Science (University of London)
LSHTM	London School of Hygiene and Tropical Medicine (University of London)
MG	Malawi Government
MOE	Ministry of Education and Culture
MOH	Ministry of Health
NPDP	National Physical Development Programme
NRDP	National Rural Development Programme
NSO	National Statistical Office
OECD	Organisation for Economic Cooperation and Development
OPC	Office of the President and Cabinet
ROZ	Republic of Botswana
ROT	Republic of Tanzania
ROZ	Republic of Zambia
TCP	Town and Country Planning
UNDP	United Nations Development Programme
UNECA	United Nations Economic Commission for Africa
UNECWA	United Nations Commission for West Asia
UNFPA	United Nations Fund for Population Activities
UOM	University of Malawi
USAID	United States Agency for International Development
WHO	World Health Organization

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ERRATA

1. In this thesis all references of Odile, F. (1987) are actually of Frank, O.(1987).

2. Page 377. In the quotation from Read(1938), the Chichewa term "dongosolo" means planning.

3. Page 396. First line of paragraph two should read Schistosomiasis and not Schistomasis.

4. The following publications are missing from the Bibliography at the end of the thesis and should be included on the page numbers given in the brackets:

   a. FUTURE GROUP (1981) Malawi: The Effects of Population Factors on Social and Economic Development, Resources for the Awareness of Population Impacts on Development, Washington. (p. 494)

   b. HARRINGTON (1982) "Mortality in Infancy and Childhood in a Developing Economy: The Example of West Africa" in UDO, R.K. et. al. (ed) Population Education Source Book for Sub-Saharan Africa, Heinemann, Nairobi. (p. 495)

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A Map of Malawi and its sub-divisions

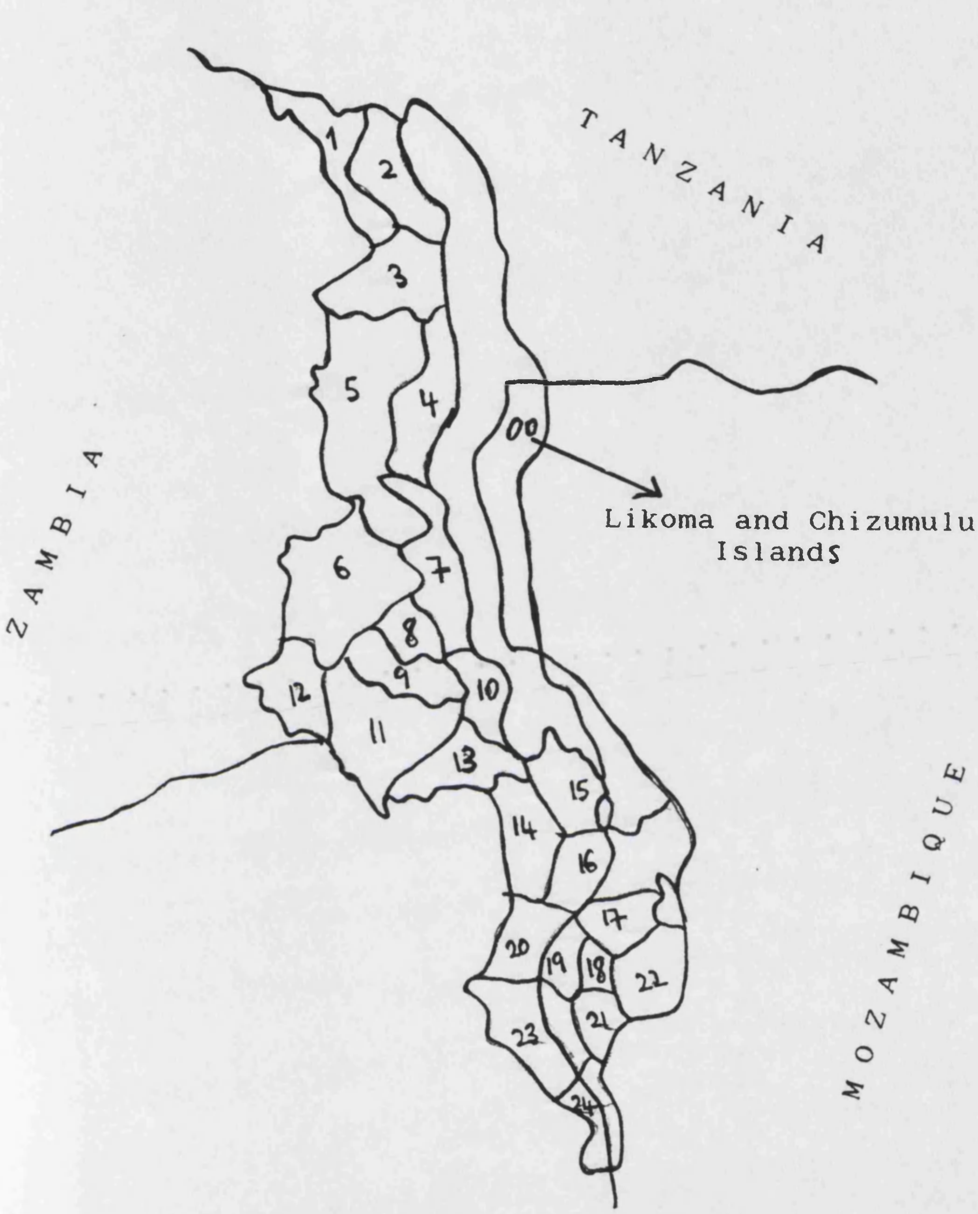

Fig 1.2

A Map showing Eth nic Divisions in Malawi

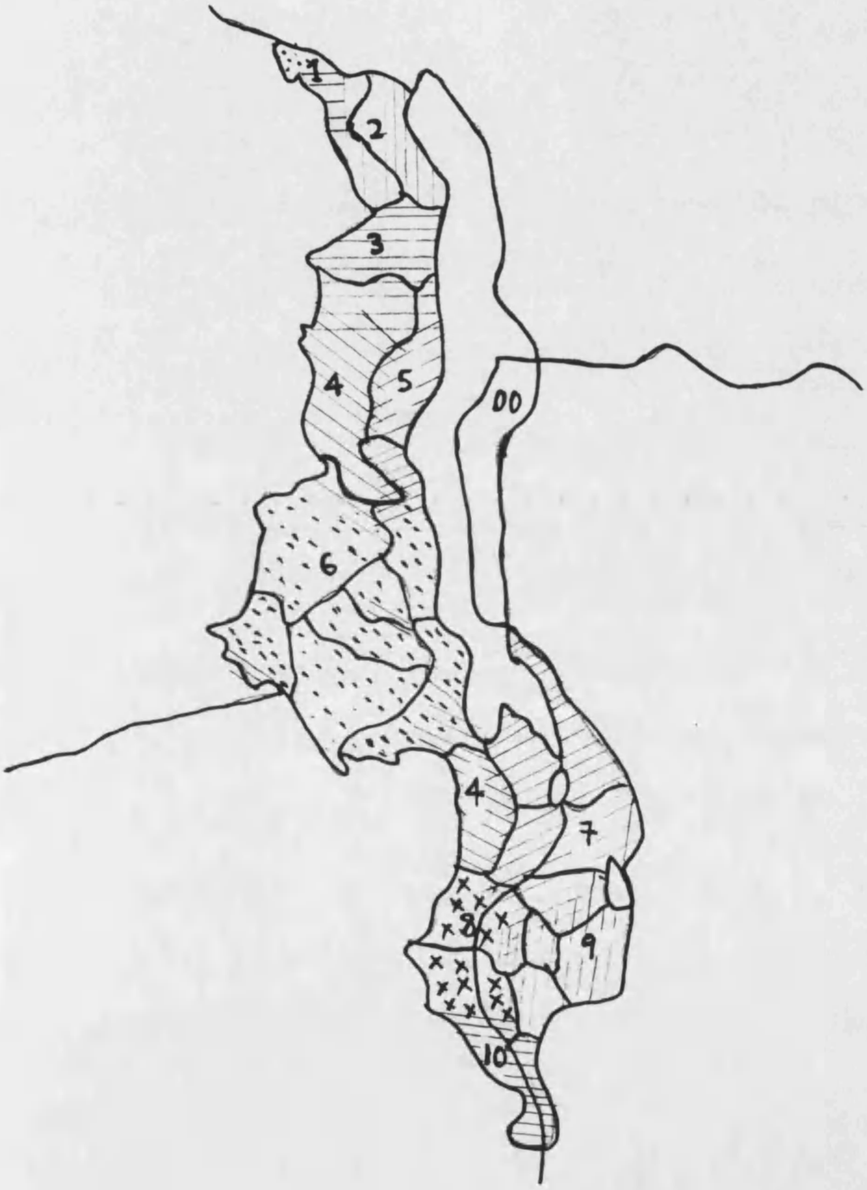

Figure 1.1

Malawi

Northern Region
1. Chitipa
2. Karonga
3. Rumphi
4. Nkhata Bay
5. Mzimba

Central Region
6. Kasungu
7. Nkhota Kota
8. Ntchisi
9. Dowa
10. Salima
11. Lilongwe
12. Mchinji
13. Dedza
14. Ntcheu

Southern Region
15. Mangochi
16. Machinga
17. Zomba
18. Chiradzulu
19. Blantyre
20. Mwanza
21. Thyolo
22. Mulanje
23. Chikwawa
24. Nsanje

Figure 1.2

1. Nyakyusa
2. Nkhonde
3. Tumbuka
4. Ngoni
5. Tonga
6. Chewa
7. Yao
8. Mang'anja
9. Lomwe
10. Sena

CHAPTER I

INTRODUCTION

"Every long journey begins with one small step"
A Chinese Proverb.

1.1 Population Growth: A Global Perspective

The period following the second world war has witnessed unprecedented growth in the world population particularly in developing countries. These countries have experienced these high rates of population growth as a result of mortality decline whilst fertility remained constant and at a high level. Mortality reduction is associated with improved medical and health technologies which took place in developed countries and were exported into the developing countries where they gained widespread use (Coale,1963; Taeuber,1963; Smith,1969, United Nations,1973). The use of antibiotics like penicillin, and insecticides such as DDT, also made a significant contribution in certain localities (Meegama,1967 Friederiksen,1968). Recent studies have further established that in some developing countries modernization induced a rise in fertility and thus exacerbated the rate of population growth (Nag,1979; Romaniuk,1980; Mott and Mott,1980; Lura,1985).

It is generally conceded in the literature that the high rate of population growth is detrimental to sound social and economic development of any country. This claim is by no means conclusive. The major thrust of this hypothesis being that rapid population growth implies an increased demand in education, health, housing, employment and consumption with the consequent reduction in savings, investment and per capita productivity (World Bank,1984). The proponents of this proposition find support in the fact that developing countries have a low per capita income in contrast to developed countries. Furthermore, they view the various problems faced by the former as a consequence of rapid population growth. Though this relationship (rapid population growth and low income) exists there are doubts whether it is a causal one.

Relatively few social scientists see rapid population growth as beneficial (Simon,1981; Clark,1967; Boserup,1968). Those holding this view argue that population growth and the related pressure on resources is the driving force of both agricultural and industrial innovations. They also stress the importance of the economies of scale and the labour force in exploiting the natural resources of any country.

Unfortunately research on this subject in the developing countries themselves is inconclusive. Restricting oneself to the continent of Africa one sees that studies by Som(1968), Farroq(1979) and Seya(1990) support the former hypothesis, whereas inquiries by Amin(1972), Todaro(1979), Adepoju(1979), Van De Walle(1975) and Sibanda(1988) favour the latter. In Malawi too the same picture emerges: Hooker(1972), Mlia and Kalipeni(1987) and Zamaere(1987) fall in the first group whereas Chilivumbo(1975) and Chipeta(1981) belong to the second category.

In the hope of finding a plausible explanation and solution to the pressing problem, there was naturally a recourse to social demographic theories. Some demographers wondered whether given the available resources, man will be able to feed himself: thus reviving Malthusian ideas (Ehrlich,1968)1. However, this time with even more threatening consequences. For instance, Paddock and Paddock(1967) prophesied famines that would purge the whole continent of Africa by mid-seventies. Other social scientists examined the relevance and applicability of the theory of demographic transition in so far as developing countries are concerned (Henin,1970, Conde,1971, Caldwell,1976; Kidane,1985). In particular, they questioned whether mortality decline in developing countries will be followed by a fall in fertility as was the case in most European countries2.

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1 "Malthusian" refers to those who follow the teachings of Robert Thomas Malthus an English clergyman and scholar who argued that food production increases arithmetically, whereas population tend to increase in geometric progression unless certain checks are operating. He distinguished two checks: preventive and positive. The former referred to all checks that are continually acting on the population to hold down the rate of population growth and include such <u>"vicious"</u> practices as homosexuality, abortion, adultery and <u>birth control</u> which he condemned. Also included here was the postponement of marriage and abstinence before it - <u>moral restraint</u> - the method he recommended. The latter which include disease, war, and famine was seen as the ultimate check when preventive measures fails. A brief outline of Malthus principle of population and recommended reading can be found in Keyfitz, N. (1982).

2 The "theory of demographic transition" describes the historical and empirical experience of the western developed countries with respect to fertility and mortality rates on the one hand and development on the (continued...)

These discussions on population growth culminated not only into demography or population studies as an independent field of study in the way we understand it today but also the development of three major themes within the discipline itself3. Firstly the need to provide more data to facilitate the study of causes and consequences of population growth; levels, patterns and trends in both fertility and mortality; revealed the inadequacy of traditional demographic procedures in applying them to the developing countries. This gave way to the development of a more specialized branch of demography called indirect estimation which has since become an integral part of demographic training and analysis.

Secondly, fertility emerged as the major component of population growth upon which all future growth rates are based. This meant that any attempt to check the rapid rate of population growth relies on it. As a result of this, a number of fertility related projects such as the Changing African Family Project, the Value of Children and the World Fertility Survey (WFS) were

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2(...continued)
other. It argues that at low levels of development, countries have high fertility and mortality rates, but as development proceeds mortality rates drop rapidly while fertility rates remain constant at high levels. Fertility rates eventually starts declining and at advanced levels of development both rates attain a new equilibrium at low levels. A summary description of the theory together with suggested readings can be found in Wilson (1987:52-54).

3 A brief outline of the development of population studies can be found in Caldwell, J. and Caldwell, P. (1986).

both initiated and implemented. Sometimes the importance of fertility appears to have been overemphasized. It was more or less used as a criterion to distinguish developed from developing countries. Countries with Crude Birth Rate (CBR) in excess of 30 births per 1000 population and Gross Reproduction Rate (GRR) above 2 are considered as developing, otherwise they are developed (United Nations,1963).

Thirdly, as a means of providing forums for dissemination of ideas and experiences on the population problem (as rapid population growth was by now treated), the last three decades have, more than ever in this century, witnessed many global and regional conferences on the subject. One major outcome of these conferences have been the overwhelming endorsement by almost all countries, Malawi included, that population should form an integral part of social and economic planning. For successful implementation of this resolution, countries agreed in principle to create population data base and conduct intensive and wide-ranging studies into various aspects of their demography.

It is with this global framework in mind that a study of the demography of Malawi to establish specific characteristics of the population in terms of age structure, fertility and mortality is proposed. Because of the scant nature of the data the intention is not to provide an explanation for the observed levels, trends and patterns in the above mentioned parameters, but rather to specify and rectify these in view of existing ambiguities. However, in order to provide a complete picture of the demography of Malawi, some plausible correlates of the observed demographic parameters are discussed. Inevitably, the next step is to bring to light some of these uncertainties. But before performing this task it is necessary to present the sources of demographic statistics available in Malawi and upon which the study is based.

1.2 Sources of Demographic Statistics in Malawi

1.2.1 Censuses

Malawi's demographic history goes back to 1891 when Sir Harry Johnston the first Consul General attempted to enumerate the people of the then "Nyasaland District Protectorate" which excluded the whole of the present day Northern Region and a large part of Central Region. Besides the Africans were not included in this count. In part this was due to the desire to collect population statistics designed to assist in drawing up a register of certificates of claim to land by the non-African population (Swanzie,1974; Mlia,1990). The earliest attempt to estimate the African population was in 1901. It was not until 1911, however, that the population of the entire country was first estimated, following the inclusion of the Northern Ngoni into the protectorate in 1904.

The 1921 population count completely changed the whole method of conducting a population census in Malawi. This time "enumerators were recruited" and some "planning", "mapping" and "training" took place before the actual enumeration, which was based on "group enumeration".

> As on previous occasions, it was not possible to deal with individual Africans separately. Each village, was treated as a separate entity and a return entered for that village. (NG,1945, p.2)

It was also the first to collect age statistics. Three broad age groups were used: five years and under, 5 to marriageable age, and marriageable adults. The same approach was repeated in the 1926 and 1931 population counts. In 1945 a slight modification was introduced in that four age groups were collected: infants under one year, children from 1 to 5 years, children from 5 to 18 years and adults over the taxable age of 18 years.

For reasons that will be explained later, the 1921 Census Superintendent recommended that censuses should be conducted every five years. Quinquennial censuses were subsequently discontinued on financial grounds perhaps induced by the world wide recession of the thirties or the financial difficulties experienced by the Nyasaland Government as a result of the building of the bridge over the Zambezi River in Mozambique (Vail,1977). The second world war pushed further the date of the next population count which was conducted in 1945. This was also the last population count to take place during the colonial period.

The political atmosphere in the country in the Fifties and early Sixties, combined with the unfair policies of the federal government, made it impossible to conduct any population count during the period of the

Federation of Rhodesia and Nyasaland[4]. The collection and analysis of statistical data was the responsibility of the Federal Government in Salisbury (now Harare). Whereas in both Zambia and Zimbabwe demographic sample surveys were conducted during the period of the federation, nothing similar took place in Malawi. To date no reason is available as to why this was the case. Most of the available literature on the federation describe Malawi as the "unhappy partner". It is often argued that Malawi did not gain anything from it despite the fact that its supporters argued that it was beneficial to the country. This may therefore be just another area where Malawi suffered during the federation. In part the tense political atmosphere in the fifties was due to resistance against the federation.

The above account dismisses Shyrock and Siegel(1976) reference to 1961 Nyasaland Census or Pike(1963) citation of 1963 census (Mlia,1990). The latter seems to refer to the survey conducted by a team of experts invited to study the education system in Malawi (USAID,1964).

With the gaining of independence in 1964, the government of Malawi quickly realized the need for population data in development planning. The first post-independence census was therefore conducted in August 1966. It was also the first census to be conducted by the newly established National Statistical Office

4 See chapter II for details on the federation.

(NSO)5. There were tremendous improvements in techniques, objectives and scope of the operation. In all, thirteen statistical items were collected (see Appendix I) and a special register of Malawians living abroad was compiled. However, a major drawback appear to have been the exclusion of questions on mortality and fertility6.

The second census in independent Malawi was carried out in September 1977 under the new 1967 Statistical Act and included, for the first time and at national level, questions on mortality and fertility. The data were subjected to extensive analyses and the results were presented in two analytical reports (NSO,1984a, 1984b).

In September 1987 the third census was conducted and included questions on housing conditions. A provisional report presenting data on population by sex in broad age groups and highest level of education attained for persons aged five years and over has been published.

1.2.2 Sample Surveys

Three nation-wide demographic surveys have so far been conducted: the Malawi Population Change Survey (MPCS) in 1970-72, the Malawi Demographic Survey (MDS) in 1982 and the Family Formation Survey (FFS) in 1984.

The main objective of MPCS was to provide a more

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5 Some demographers believe that improvements in data collection in Africa followed the establishment of statistical offices in these countries. See for example Smith and Blacker (1963,58). This observation appear to be relevant in the case of Malawi.

6 see Kamwambe(1971) for details about the methodology of 1966 census together with some weaknesses of the earlier counts.

accurate estimate of the population's growth rate (NSO,1973). It used a dual record method of data collection which involved initial recording of the general characteristics of the population and household composition and, thereafter, a monthly recording of vital events by the local registrars. An independent survey was conducted every six months and the matching of events was performed whilst in the field. A total of 31,000 households were interviewed and of these nearly half belonged to the urban strata (NSO,1973). Population data for the second year (February 1971 to January 1972) were published as they were deemed to be more accurate than those of the first year (NSO,1973).

MDS was conducted in order to update the available demographic data as the 1977 census was presumed to be out of date (NSO,1987). Interestingly enough, the analysis of 1977 MPC began in the same year (NSO,1984). A two stage sampling procedure was used and a total of 81,000 households, comprising 345,000 persons representing nearly 5.5 percent of the national population, were enumerated. The sampling technique involved dividing the 1977 enumeration areas (EAs) into four strata: two urban and two rural. A random sample of the EAs in each strata was drawn from which two sub-samples with equal probability were systematically selected and then replicated.

FFS was funded by the World Bank and conducted by the NSO on behalf of the Ministry of Health (MOH). The initial arrangement was that the survey should form part of the WFS project but this was later changed. WFS, however, retained consultancy services (NSO,1987). As a result of this, it may be worth attempting, at a later date, to carry out a comparative analysis of FFS and WFS data, especially for the African countries that participated in the latter project.

The aim of the survey was to collect data for the successful planning and evaluation of the Maternal and Child Health programme of the MOH7 (NSO,1987).

Three questionnaires were used: (i) the household schedule was employed for listing individual members of the household together with basic demographic data, such as age, sex, and literacy; (ii) the individual schedule (one for each sex) was used for the detailed interview of females in the age group 15-49 and males in the age group 20-54. The female schedule contained the following topics: fertility, birth history, marriage and attitude toward family size whereas the male questionnaire included the last two topics only. A total of 12,000 households (of which 9,000 were rural representing some 47,782 persons, 5,120 females in age group 15-49 and 3,553 males in age group 20-54) were interviewed; (iii) and finally the community questionnaire collected data on the distance to the nearest community facility: hospital, post office and primary school.

The sample design was similar to the MDS as far as

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7 The programme was launched in 1978 with the objective of improving the health of the mother and the child so as to reduce the level of infant, child and maternal mortality in Malawi. In 1982 a Child Spacing component was introduced in the project.

stratification is concerned. At the first stage a random sample of 200 EAs with equal probability of selection was drawn. The second stage involved systematically selecting 60 households from each EA and enumerating them using the household questionnaire. From these households and in each EA a sub sample comprising of 40 households in the Northern Region and 30 households in the Central and Southern Region were selected and interviewed using the individual questionnaire.

Generally speaking, the above described sample surveys were designed to produce results at national level only distinguishing between rural and urban areas. However, at request, it is possible to extract data for other smaller sub-divisions. For instance, four dissertations have recently been completed using data extracted from FFS data-set8. The analysis at the smaller levels, though desired, are affected by small numbers and care should therefore be exercised in interpreting the results.

In addition to the above described nation-wide demographic surveys, a few "independent" researchers have carried out studies which provide useful demographic information. Prominent among these are Mitchell's anthropological study of some Yao villages in Machinga district in 1949, Bettison's social and economic study of seventeen "peri urban" villages outside the then township

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8 This information is based on discussions with Rodwell Chinguwo, a senior official in NSO, who at the time of the writing was completing a masters degree in demography at LSE.

of Blantyre and Limbe in 1958 and Luckhman study in 1970 of 617 rural women aged 15 years and over from 16 districts. It is encouraging to note that the studies by Mitchell and Luckhman are tabulated in such a way as to allow some of the modern demographic techniques to be applied on them.

There are also other small scale surveys which provide useful but limited demographic data. These included the 1929 Native Labour Force Census, the 1972 Blantyre City Population Sample Survey, the 1973 Chiradzulu Population Pilot Census which was conducted as part of the 1977 pilot census, and the 1968/69 and 1980/81 National Sample Survey of Agriculture and Agro Economic Survey.

1.2.3 Vital Registration System

Like most developing countries, particularly those in Africa, a complete and reliable system of vital registration does not exit in Malawi. Vital registration is compulsory for the non-African population who form a very small proportion of the national population whereas for the majority of Africans registration is voluntary[9]. The statute demands that a birth should be registered within a period of three months while death registration should preferably take place within a month but should not exceed three months. Failure to register an event carries a penalty of £2.00 while supplying wrong information has a fine of £10.00 or a maximum sentence of

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9 Details about ethnic composition are presented in chapter II, section 2.3.

three months imprisonment with hard labour.

It is doubtful whether anyone has been prosecuted for failing to register an event. In any case the number involved must be very small. Moreover, in a country where emphasis should be on encouraging people to register vital events, one would expect a tougher penalty for those who don't report an event at all other than those who supply wrong information. As things are, at the moment, its better not to report at all!

1.3 Population Growth in Malawi

According to provisional census report the population enumerated in 1987 was 7,982,607 people. In 1977 the population was 5,547,460 people. Thus over a decade, the population has increased by 2,453,147 people (44 percent). During the previous intercensal period the population increased by 1,507,877 people (37 percent). These changes also indicate that the population of Malawi almost doubled within a period of twenty-one years (1966 to 1987) and if the present growth rates continue the country's population will be doubling every twenty years. Population figures enumerated at various population counts and censuses and corresponding growth rates are presented in Table 1.1 below.

No estimate of the population for the period before the establishment of colonial rule is available. In a country like Malawi, where no vital registration system exists, it is impossible to ascertain with precision the population totals for the pre-colonial period. Moreover, the little information that is available suggest that population growth during that period must have been very slow since inter-tribal warfare, slave raiding, drought and famine were frequent and mortality must have been very substantial.

Table 1.1

Total Population and Inter Censal Growth Rate

Census	Population		Growth Rate (percent)		
Year	De facto	De jure	De jure	De facto	Period
1901	-	737,724	-	-	-
1911	-	970,430	2.7 (25)	-	1901-11
1921	-	1,201,983	2.1 (32)	-	1911-21
1926	1,263,291	1,293,391	1.5 (46)	-	1921-26
1931	1,573,454	1,603,454	4.3 (16)	4.4 (16)	1926-31
1945	2,049,914	2,183,220	2.2 (25)	1.9 (36)	1931-45
1966	4,039,583	4,305,583	3.2 (22)	3.2 (22)	1945-66
1977	5,547,460	-	-	2.9 (24)	1966-77
1987	7,982,607	-	-	3.6 (19)	1977-87

Source: Figures are obtained from the various census reports.

Note: The figures in parenthesis indicate the doubling time (in years) corresponding to the growth rate.

Table 1.1 displays, among other things, severe fluctuations in the growth rates. This may serve to indicate the inaccuracies and limitations of the data. Furthermore, particularly for the earlier periods, the changing boundaries and consequently the reference population may also be responsible for the high rate of population growth for these periods. However some scholars believe that it is still possible that population growth rates for certain African countries were as high as 2 percent per annum (Caldwell,1974, 1983).

Of particular interest is the growth rate for the intercensal period 1926-31. Various researchers working on the demography of Malawi have commented on this abnormal growth rate. Kucynski(1949) suggested that either the 1921 or 1926 censuses were under-enumerated or that the 1931 census was over-enumerated. Nevertheless from the tenor of his report it is clear that he believed that the former was more likely than the latter with 1926 census being the greatest suspect. This is not surprising given that the common view among demographers is that under-counts are more likely than over-counts with the 1963 Nigerian census still regarded as a classic exception to this notion[10].

NSO(1966) warned that in the absence of any valid explanation it is tempting to attribute the irregularities in the growth rates to errors in previous counts. Surprisingly, NSO(1984) fell into the same trap when they ignored the 1926 count on the grounds that it under-enumerated the population. Although this can be taken as a sign of change in the original thinking in light of new evidence, it is in itself confirmation of deficiency in contemporary knowledge about the demography of Malawi, since no explanation was given as to how this might have happened given the social, economic and even

10 Several articles have been written on this subject. The most recent Ahonsi(1988).

political circumstances surrounding the count.

The current rate of population growth for Malawi is obviously very high. However, any attempt to outline the possible effect on the economy has the associated risk of being biased by one's inclination to the several schools of thought on the subject. Hooker(1972) and Mlia and Kalipeni(1987) see, for example, the jeopardizing effects of high and sustained rate of population growth on government's effort to develop the country unless "appropriate measures" to limit further growth are implemented.

Although the official government position may <u>seem</u> to be quite the contrary, be it on ethical, moral or religious grounds, it is worth noting that the issue of population growth has been recognized as instrumental among the policy and decision makers thinking in Malawi since the fifties. Commenting on the problem, the then Director of Agriculture wrote:

> Progress will ... be nullified unless Nyasaland's present rate of growth of population is substantially reduced. This could be helped by emigration of family units - instead of able bodied males alone - but ultimately it can be achieved only by the African learning the wisdom of the limitation of families.
> (NG,1955, p.7)

Thus viewing "population pressure" as the ultimate problem the country was facing at the time, and family planning as the only means of checking this, as both neo-malthusians[11] and supporters of demographic transition

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11 Neo-Malthusians refer to those who accept Malthus ideas but champion family planning or more generally birth control as the only means of checking the current rates of population growth instead of moral restraint as (continued...)

theory would advocate, the colonial government adopted a "controversial" agricultural scheme to accommodate the problem in the short run.

Basically the scheme involved reallocating the available land in such a way as to give a large amount of it to few industrious individuals - "master farmers" - to develop it under close supervision and assistance, and utilizing the rest elsewhere, mainly as a source of "cheap" domestic and migrant labour but this time encouraging the labourers to go with their family12. The government's position in the 1940s of encouraging family units to emigrate can be looked at as a reaction to the criticisms from a number of individuals including missionaries who argued that labour migration meant a breakdown of family units13. Parallels can be drawn between this policy and that followed by independent Malawi which has placed much emphasis on estate (plantation) farming other than peasant agriculture14.

As a result of this it can be argued that the government of Malawi acknowledges the existence of "population pressure" in certain areas, but regards that programmes like land re-organization projects (see

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11(...continued)
Malthus would have liked. For details, see Wilson (1987:134).

12 It should be noted that no study has so far examined the subject of "family migration" or "female migration".

13 See also section 1.5.3 below.

14 For further information on this aspect see, Kandawire, J.A.K.(1985).

Appendix II) and agricultural settlement schemes would not only accommodate the problem in the "short run" but also eventually solve the problem altogether in the "long run".

Despite the rapid population growth, there is no official population policy in Malawi and the government doesn't encourage "fertility or birth control" measures. As such, some observers have classified Malawi as pro-natalist (United Nations,1980). Contraceptives are not illegal as such but they are available only to those individuals (couples) who know how and where to get them. Induced abortion is punishable under the criminal law and with the exception of the newly established child spacing programme, family planning services are not "freely" available. Sterilization is tolerated only on medical or health grounds and on the advice of the medical authorities.

1.4 Population Distribution in Malawi

As a result of economic, geographic, historic and cultural factors the population of Malawi is very unevenly distributed (some of these factors will be described in chapter II) . Whereas Central Region has 38 percent, Southern Region has 34 percent and Northern Region has 29 percent of the total land area (see Table S1.1), both 1977 and 1987 censuses indicate that 11 percent of the population is in the Northern Region, 39 percent in the Central Region and 50 percent in the Southern Region (see Table S1.2). The districts of Dowa, Ntcheu and Lilongwe in the Centre and Zomba, Chiradzulu, Thyolo and Mulanje in the South have a proportionately higher population than their land area would suggest. In contrast, all districts in the Northern Region, and the rest of the districts in the Centre and South, are for all practical purposes sparsely populated.

The factors affecting population distribution in Malawi have long been studied by scholars. It has been demonstrated that in a traditional Malawian society the major determinant of settlement patterns appear to have been the availability of perennial water supply. This was the case during the pre colonial and early colonial periods (Dixey,1926, Baker and White,1935). The establishment of agricultural estates and light industries in the Southern Region especially the Shire Highlands area and the colonial administration in Zomba combined with the early education by the Scottish missionaries, initiated changes in the nature and pattern of population distribution in the country. This resulted into large influx of people from other areas both within and outside the country into the Southern Region. With the introduction of African Tobacco in the Central Region in the 1920s, the in-flow of people into the Southern Region was slightly abated. A major swing in the pattern of population movement in Malawi occurred after independence following the setting up of Lilongwe as the seat of the government and development of large-scale tobacco estates in the Central Region. The above-described situation is summarised in the first Statement of Development Policies in the following manner:

The effect of this historical concentration in the south was a much lower level of development in the central and, in particular, the Northern regions and southward migration of population.

A number of measures have been taken to bring about a more even spread of development, of which the most imaginative is the creation of a new capital city at Lilongwe.

By the end of the decade Lilongwe, ..., in conjunction with other development schemes in the Central and Northern Regions, should have brought about a more even spread of development throughout the country.

(OPC-EPD,1971, pp. 5-6)

1.5 Components of Population Growth in Malawi

1.5.1 Fertility

Very little is known about the level, trend, pattern and differentials of fertility in Malawi. This is largely due to the lack of reliable data. Most of the studies that are available are based on a small sample size drawn in a few pre-selected villages and in most cases in a single district. The resulting fertility estimates are therefore limited in both coverage and scope and have limited national significance and applicability.

The earliest attempt to provide fertility estimates for Malawi was in 1926, when in conjunction with the population count, District Residents[15], were asked to interview a hundred married women, who had passed their menopause, about the number of children they had ever born, the number of still and live births and those who died before they could walk and as children. Not much

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15 The name has since been changed to District Commissioner. In both cases the title refers to the government official in charge of the administration of a district.

can be done with this data as no information about fertility in childbearing ages is available. The estimated completed family size for various districts was in the range 5 to 7 children per woman with a national average of 6.3 children per woman (see Table S5.2).

The study by Mitchell in Liwonde area in Machinga District estimated Child Woman Ratio (CWR) to be 738 children per 1000 women. The respective estimates of GRR and Net Reproduction Rate (NRR) were 2.9 and 2.2 daughters per woman (Mitchell,1949). These estimates imply a Total Fertility Rate (TFR) of around 6 births per woman. A somewhat similar estimate of the TFR is given by Bettison(1958) who concluded that an average woman bears slightly over 6 births during her reproductive life.

Perhaps the most interesting of all fertility studies conducted in Malawi so far is that of Luckhman in 1972. He suggested a decline in achieved fertility from between 8 and 9 children per woman for women over 70 years of age (those who had completed child bearing before 1950) to about 7 for women over 50 years of age (those who had completed child bearing before 1970). He attributed the decline to the changing pattern of child bearing especially by young women who consistently favoured smaller families when asked about the best number of children a woman should have.

Furthermore, to date, it is the only study in the country which attempted to provide fertility differentials by educational level, religion, husbands occupation and marital status.

The reported TFR in 1970/72 MPCS was 6.7 children per woman. This declined to 6.6 children per woman in 1977 MPC and to 6.4 children per woman in 1982 MDS before rising to 7.7 children per woman in 1984 FFS. The reported values of CBR show a similar pattern of inconsistency varying from 54 births per thousand population in 1970/72 to 48.3 births per 1000 in 1977 to 46 births per 1000 in 1982 and to 52.4 births per 1000 in 1984.

The analysis of 1970/72 and 1977 by the NSO data revealed that fertility had been constant during the intervening period and that the estimated TFR was 7.6 children per woman (NSO,1984b). The same estimate was also obtained using both the 1982 MDS (NSO,1987a) and the 1984 FFS (MOH,1987b). A similar measure is presented by Hill(1986) who estimated that TFR in Malawi was 7.5 children per woman.

In addition to the above-described uncertainty, the analysis of the 1982 MDS looks somewhat suspicious. It appears to be based on the assumption that fertility has been constant, and then employing indirect procedures to support this hypothesis. It is therefore our belief that by re-examining each set of data (in turn) and applying the same and not just similar techniques, more plausible and robust estimates can be derived. In this way a more coherent picture about the levels, differentials and trends in fertility in Malawi can be studied.

1.5.2 <u>Mortality</u>

The mortality situation is even less well understood than that of fertility and comparatively few studies exist on the subject. All the studies referred to in section 1.5.1 above, except Mitchell(1949), present some mortality estimates.

From the beginning of this century, different observers, particularly government officials and missionaries, have reported that the level of mortality in Malawi, especially that of infants and children, is very high. This observation has often brought about the desire to collect reliable data on mortality. For instance the futile debates in the 1920's concerning the initiation of a vital registration system with the aim of providing reliable statistics about infant mortality are documented by Kucyznski(1949).

In the report of the 1921 population count, the Census Superintendent, recommended quinquennial population counts as parents would more easily remember births which occurred within the last five years (NG,1921). As a result of this, the 1926 population count provided the first estimate of Infant Mortality Rate (IMR) for the whole country which was believed to be around 188 infant deaths per 1,000 live births. Bettison's estimate for the villages around Blantyre was 180 infant deaths per 1,000 live births (Bettison,1958). A year later, basing his study on about 1,500 women who attended the clinic at Blantyre mission, Dabb estimated that IMR was 242 infant deaths per 1,000 live births (Dabb,1959). The difference between the last two estimates could be attributed to variations in the sampling and estimation procedures.

A Comparison of these earlier estimates with measures derived from more robust and widely used techniques suggest that the former were underestimated, unless it can be shown that mortality must have increased sometime in the past (see for example Table S4.2). Unfortunately, the way the data were tabulated, does not allow us to re-estimate the level of mortality using the new techniques.

The reported IMR in 1970/72 MPCS, the 1977 MPC and in the 1984 FFS was 142, 130 and 154 infant deaths per 1000 live births, respectively. Similarly for the Crude Death Rate (CDR) the figures were 27, 25 and 23 deaths per 1000 population, respectively.

A number of organizations and individuals give estimates that indicate that expectation of life at birth [e(0)] for both sexes has increased from 36 years in mid-sixties to 38 years in late-sixties, and to 40 years in late-seventies (United Nations,1980). The current estimates suggest that the e(0) for both sexes is around 45 years. In all known sources, the female e(0) exceeds male e(0) by about 3 years.

NSO(1984b) estimated that IMR was 190 per 1000 live births during the period 1967-76 which is centred around the early-seventies and declined to 176 per 1000 live births in the mid seventies. They also presented mortality estimates and projections for the period 1977 - 2002 based on the assumption that e(0) changes by 2.5 years every five years (NSO,1984b). This assumption of mortality decline was first suggested by the United Nations Secretariat in the late-fifties (United Nations,1980, 1982) and was based upon its vast experience and knowledge regarding mortality trends in different countries with adequate mortality statistics. As the desire to provide an up-to-date and comparable demographic parameters continued, combined with the growth of demographic data from the developing countries, the UN quickly discovered that the above assumption implies a faster change for some countries than is possible. Hence in their new set of mortality estimates and projections the UN has assumed that e(0) increases by two years every five years for countries where e(0) was under 60 years for males or 65 years for females (United Nations,1982). The estimated and projected values of IMR, as presented by NSO(1984) and United Nations(1982), are presented in Table S4.1c below.

1.5.3 Migration

Migration, especially labour migration, is of great importance in understanding both the demography and social and economic history of Malawi. Boeder(1974) has described it as "one of the key elements in Twentieth Century Malawian history". Consequently, migration studies have been a topic of some historical interest. It is the only component of population change in the country which can be said to be well documented although some aspects of it, such as the general characteristics of migrants, motivations to migrate, adjustments and adaptations to their new environment require further investigation. In Malawi, two forms of migration are important: external (or international) and internal migration. A brief discussion of the latter has already been presented in section 1.5.2 above that it will not be discussed here[16].

Emigration of "able bodied men" from Malawi to other neighbouring countries, especially Zambia, Zimbabwe and South Africa, has taken place since the beginning of this century. Different researchers agree that among the many and various "push" and "pull" factors, economic influences have been the major determinant (Read,1942; Mitchell,1959; Velsen,1960; Sanderson,1960, 1961; First,1961; Coleman,1979; Boeder,1974, 1982; Gregory and Mandala,1987; Whiteside,1988).

With a poor resource base[17], few manufacturing industries, low wages, hut tax, and early introduction of education by Scottish missionaries, so the argument goes, Malawians were forced to migrate southwards (Zimbabwe and South Africa) and westwards (Zambia and Zaire) in search of good employment opportunities and wages, which existed in the mining industries, settler plantations and thriving manufacturing industries of the "receiving"

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16 For additional information about internal migration in Malawi see Christiansen (1984), Segal(1985), and Wogugu(1987).

17 Although Malawi has some mineral deposits, their exploitation is hindered by lack of sufficient deposits to justify extraction; inaccessibility of the areas due to difficult terrain and lack of energy (electricity) for processing. Examples of mineral deposits available in Malawi include Bauxite, Condurun and iron ore. There are also prospects that oil may be found on the bed of Lake Malawi and detailed studies are currently underway.

countries. There are, however, some problems as far as the actual numbers involved in these movements are concerned (see appendix III).

The effect of emigration on Malawian society has been a subject of great debate (Boeder,1974; Read,1942; Velsen,1960). Available literature on the topic indicate that the social and economic aspects of the Malawian society has been greatly influenced by labour emigration. Some researchers have demonstrated that migrant labourers were partly responsible for the introduction in Malawi of new varieties of crops, fashion and dances (Price,1969; Kalinga,1990). This writer has further observed, with some interest, that most literary writings from Malawi have imbedded in them the "southern African connection", in that either the main character of the story was an ex-labour migrant: or a place in either Zambia, Rhodesia and South Africa is mentioned[18]. It should also be mentioned that the main bus station in the City of Blantyre is up to this date popularly referred to as "Wenela" in part because of its proximity to WENELA offices.

For a number of reasons, particularly the need to secure a constant supply of labour, missionaries, planters and businessmen argued the government to put a ban on labour migration on the grounds that it led to the breakdown of the "family unit" which resulted in unhappiness of wives and children without husbands and

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18 See for example Tito Banda(1987) and Kamkondo(1988).

fathers respectively. They further argued that the breakdown of social values and norms which resulted into immorality and promiscuity was a direct consequence of male emigration. Those holding this view, who can appropriately be labelled "moralists", were quick to point out that changes which were taking place in the society were responsible for the decline in both the birth rate and population growth (Boeder,1974; NG,1921, 1926). Although they didn't demonstrate the decline in fertility and population (exception being S.S. Murray in 1921; but he changed his view by 1926), they demonstrated that this was likely to take place as a result of the absence of men and the resulting increase of single women.

The above-mentioned claim forced some leading anthropologists to examine the effects of labour migration on "village life". These studies concluded that, contrary to the moralists perspective, local communities were able to respond and adjust to emigration. Mead(1942) for instance demonstrated that among the Ngoni where a "young man" was ready to marry after he has taken part in warfare activities, the introduction of British colonial rule and the migrant labour system meant that "young men" could have social approval only after making "one trip" to the centres of employment.

From a demographic point of view, this pattern of international migration appears to have caused striking consequences. It should be re-emphasised that emigration from Malawi is largely due to the desire to improve one's economic standing. Previous discussions have focused on how mass male emigration might have resulted in reduced birth rates by increasing the birth interval. Furthermore high rates of abortion and sterility are believed to have occurred as a result of the increased incidence of venereal diseases. The latter is said to have occurred following extra-marital sexual activities: females at home and males abroad. Sanderson(1960) has dismissed the former by demonstrating that the period men spent abroad coincided with the length of post-partum abstinence. No study has yet challenged the latter.

Quite recently some social scientists have argued that the demand for labour meant a lot of pressure on individuals to increase their fertility and thus they see rapid population growth in developing countries as a consequence of this pressure[19]. Even though these studies offer by no means satisfactory explanations[20], they are conducive to the study of the level and trend in fertility.

A review of the literature on international migration indicate that emphasis has so far been on emigration rather than immigration despite the fact that the latter has also been important (Baker,1959; Boeder,1982; Chilivumbo,1974a; Christiansen and

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19 See Corwell and Gregory (1987) for further information on this aspect. In this collection of seminar papers the Malawian perspective is presented by an article by Gregory and Mandala.

20 A critique exposition of these studies is presented by Iliffe (1989).

Kydd,1983). This may be due to the international or regional perspective of the former thus attracting a large number of scholars leaving the latter to indigenous researchers.

This may also be related to the legacy of colonial history which was inclined to focus on regional divisions based on the colonial rulers. Because of such terminology as "British Central Africa", "British East Africa", "Portuguese East Africa", "French West Africa" and "British West Africa" it is possible that any population movements between two or more countries within one group will appear to have a regional focus. Following the disintegration of these "empires" in the sixties and the birth of a multitude of nations, the "visualized" regional migration simply culminated into internal population movements. This partly explains the present focus of the latter in migration studies.

1.6 Statement of the Problem

A review of literature on the demography of Malawi has led us to conclude that very little has been done on the subject. The main reason for this state of affairs is definitely the paucity of data, Malawi being a relatively young country. But comparisons with other countries in a similar position such as Tanzania and Zambia reveal that more is known about their demography than is the case with Malawi. Thus, it appears that the absence of social scientists, in particular demographers, interested in the subject has exacerbated the problem.

Further a few studies that do exist tend to focus on migration at the expense of the other components of population change. The importance of migration in understanding the social and economic history of Malawi may be a factor, although most of the researchers who have carried out these studies have come from disciplines which have a vested interest in migration. Studies that have looked at fertility and mortality, often lack representativeness as a result of small sample size and based on "unscientific" sampling.

Acknowledging the dearth of basic knowledge concerning Malawi in general, MaCracken a distinguished "Malawianist" historian, in his introduction to the University of Edinburgh's Centre of African Studies' published seminar proceedings on Malawi, writes:

> otherwise well informed Africanists (himself included) were frequently ignorant of even the simplest facts concerning Malawi, though this did not always prevent them from commenting on aspects of Malawi's development. Much that was written ..... was of a <u>polemical nature,analytically superficial and offering broad generalisations,weakly supported by data</u>[21]

To illustrate this point, he continued with a footnote by writing:

> One small example must suffice. From personal experience it is clear that most Africanists assume Malawi to have a population comparable to that of Botswana or Gambia. The fact that Malawi's population is over 6.2 million, larger than that of Zambia and only slightly less than the population of Zimbabwe, is a constant source

21 Fyre, C. (1985), "Introduction", p. xi. (The words in brackets and those underlined for emphasis are by this author).

of surprise22.

That the example is demographic is of interest to us. Ironically, despite the fact that the population of Malawi "is a constant source of surprise" no paper on the subject was presented at the seminar and no one seemed to have complained about the absence of a demographic presentation although they (the participants) did remark about the absence of a migration study (Fyre,1985).

In addition most of the studies quoted above have been conducted by either researchers from other disciplines or demographers interested in other aspects of demography who simply want to use Malawian data to test or complete their hypotheses. For example, motivated by the desire to evaluate the performance of the orphanhood method (Blacker,1977a) and dual record method of data collection (Blacker,1977b), respectively, John Blacker was forced to use data from Malawi. This treatment becomes more apparent when one reads Blacker's description of Malawi as one of the: "three countries where it has been possible to compare them (that is, estimates derived from orphanhood method) with estimates of adult mortality derived from other sources". Timaeus(1986) makes a similar statement when he described Kenya and Malawi as the "two countries in which different sets of orphanhood data have yielded inconsistent mortality estimates". Therefore, it appears that, there is a general scarcity of demographic inquiries which have studied the population of Malawi and in its own right.

22 op. cit., p. xvi.

There are some exceptions to this, for instance, the analysis of the 1977 MPC and the various survey reports published by NSO (NSO,1973, 1984a, 1984b, 1987a, 1987b). In fact, the voluminous analysis of the 1977 MPC can be regarded as the beginning of understanding of the demography of Malawi. Unfortunately, as in any pioneering work, this too is far from being complete since in most cases the evaluation of data were limited to national level statistics with few regional and district level analyses23. The problem with this approach is that because of heterogeneity - social, physical, cultural - aggregate national data may hide the real differences existing in different localities.

In a situation where insufficient knowledge exists with regard to the determinants of mortality and fertility in Malawi, a study which examines differentials by residence (rural-urban, regional and inter district) may shed some light on the major variables influencing demographic parameters.

In view of the nature of demographic statistics available in Malawi, most studies conducted in the country have so far relied on two sources of data: the 1970/72 MPCS and the 1977 MPC. Obviously this has stemmed from the absence of mortality and fertility data in the 1966 MPC considering that the 1982 MDS and the1984 FFS are relatively recent surveys. Two issues arise from

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23 It is well known that national statistical offices in developing countries are preoccupied with collection, compilation and dissemination of data and not analysis. Hence the above-described problem is expected.

this observation. Firstly, the need to re-examine the pattern and trend in vital rates in light of the new data collected in the 1982 and the 1984 sample surveys. This premise was emphasized in United Nations(1982) and Hill(1986). Secondly, the need to piece together all the relevant materials on the subject which are scattered in various reports and government publications, usually disjointed and in certain instances inconsistent with each other in order to try and build a coherent picture of the demography of Malawi.

In sum, the foregoing discussion has attempted to justify the study in terms of the lack of, and deficiency, in existing knowledge on the subject. Apart from that, the population of Malawi is of interest in its own right. Firstly, with a population density of 85 persons per square kilometre, Malawi is one of the most densely populated countries on the continent, exceeded only by Rwanda(238), Burundi(175) and Nigeria(107)24. Secondly, the estimated growth rate of 3.6 percent per annum makes Malawi to be one of the fastest growing populations in the world and is quite close to Kenya's world record growth rate of 4.0 percent per annum. Thirdly, Malawi being a least developed country and the government still having pro-natalist ideas, the relationship between demographic and development variables warrants a careful and thorough investigation.

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24 The figures in brackets represent population density per square kilometre for the corresponding country as presented in UN(1988).

1.7 Limitations of the Study

Any investigator involved in demographic research in Sub-Saharan Africa is faced with many problems. Principal among these is the lack of statistics or the lack of reliable statistics. In Malawi, reliable demographic data emerged only after independence in 1964. Prior to this date, estimates with only limited reliability existed. Even when trustworthy census and survey data are available, there is always the question as to the accuracy of the data, as a result of various problems confronting census/survey takers in Africa (Blacker,1969; Chilivumbo,1970)25. Therefore, any data used in the study, official or otherwise, must be considered with some caution.

Another issue that arises when studying the population of Malawi and one which can not be ignored is migration. For social, economic and political reasons in the region (Southern Africa) migrant labourers from Malawi sojourn southwards and at the same time Malawi plays host to people "fleeing" from Mozambique. It is possible to have a rough estimate of the numbers involved in the case of the former but the latter is problematic as it is "unrecorded" mostly "family migration" involving "kinship networks and solidarity" and based on tribal affiliations that lie across physical features and artificial boundaries" (Milazi,1984). Alifeyo Chilivumbo noted that:

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25 It is dissappointing that some of the problems mentioned in these papers remain unsolved.

> In certain parts of Malawi, especially on its Southern borders, ..., there is a constant influx of people from Mozambique, who enter the country by merely walking across the border without going through the formal immigration channels. Chilivumbo(1970, p.83).

As the preceding sections have pointed out, the issue of labour emigration has received a lot of attention from scholars whereas the subject of immigration has largely been ignored for most of the two decades following independence. It may as well be possible that these two forces cancel each other out.

In addition to male labour emigration and family immigration from Mozambique, there is rather a limited measurement and documentation of permanent migration from Malawi. The presence of African population of Malawi origin in somewhat notable quantities in neighbouring countries may bear witness to the existence of such migration. Also, the wide discrepancies in migration estimates as provided by the Malawi Government on the one hand, and the Governments of Zambia, Zimbabwe and South Africa on the other, may again be attributed to the existence of such a feature even though the occurrence of unregistered population movement may be a factor (see Appendix III).

These population movements may have a formidable effect on demographic parameters. For instance, in section 1.5.3 above we have outlined how labour migration was (is) believed to have decreased (increased) fertility. Also the calculated rate of population growth may not be a good estimate of the rate of natural increase. However immigration from Mozambique may be said to have little, if any, effect on fertility and mortality, as the people who come in normally have the same social and economic characteristics as the local population26.

Nevertheless the probable effect of migration on population growth may depend on the prevailing circumstances at the time. In 1966 migration would have been negligible for two reasons. Firstly, being two years after independence, it is plausible that the number of Malawians leaving the country was somewhat reduced as they could now find some attractive employment within the country. If anything, the most likely trend was for the Malawians who left the country before independence to return back to Malawi. Secondly the number of immigrants from Mozambique would have been quite small as it was the period before the intensification of the armed struggle. But it was still there and was being felt in certain areas, particularly the Lakeshore area. For instance NSO(1966) attributes the low sex ratio in Mangochi district to the presence of "new refugees" who were predominantly female.

Similarly, the 1977 census took place two years after the independence of Mozambique with the freedom festivity still in the air, and rebel activities at the time being just one or two isolated incidents. The most likely trend at this time was for the so called "refugees" to return back to their country (Isaacman and

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26 See also the report published by the Future Group for a similar perspective: Future Group(1981).

Isaacman,1983). In addition, it was three years after the 1974 plane crash in which 74 returning Malawian migrants were killed and labour migration to South Africa was temporarily banned. Although the ban was lifted in June 1977, it could rightly be assumed that by September 1977, when the census was conducted, the number of migrants leaving the country was still negligible. In fact it is worth noting that the number of "registered" labour migrants leaving the country after June 1977 has never reached the pre-1974 level (see Appendix III). However the current estimate of the rate of population growth is believed to have been affected by the influx of Mozambicans into Malawi probably following the intensification of rebel activities in the 1980s (NSO,1988). Therefore, in the two decades immediately following independence one can safely assume that the population of Malawi was least affected by migration as the two forces of immigration and emigration would have easily negated each other.

1.8 Outline of the Procedure

With all these limitations it appeared at first that the demographic data that were available in Malawi were inadequate for a worthwhile study of the population. However, it was realized that such drawbacks were expected in a developing country like Malawi. The application of indirect procedures to countries in a similar position and the plausibility of results they have produced has always been a constant source of inspiration. Moreover, inspired and encouraged by the advice that Brass(1969) gave: "where the data .... are bad heavy reliance has to be placed on simple models", a decision was reached to proceed with the study. This point is re-emphasised by Griffith Feeney when he notes that

> the need for understanding the quality of and characteristics of the data ... must usually be acquired through a careful scrutiny of the data, using relatively elementary tools. There is a danger that naive enthusiasm for elaborate formalism will result in the neglect of simpler and more traditional, but essential, preliminaries.
> (Feeney,1990, p.13).

Given the above-described deficiency in the existing knowledge about the demography of Malawi, there is an ever growing need among Malawian demographers to exploit as many methods for analyzing incomplete demographic data as the data may allow, so as to present a more plausible demographic picture (profile) for the country. Due to insufficient data, only the data given in Table 1.2 below can be used to estimate demographic parameters. As a move in this direction the present study is, therefore, aimed at applying some of these procedures in order to achieve three general objectives:

1. to <u>describe</u> the general demographic developments Malawi, with particular reference to the period 1964 to 1984;
2. to <u>outline</u> some interrelationships between demographic variables on the one hand, and social and economic variables on the other, as experienced in the country;
3. to <u>stimulate</u> further research in the subject

of demography of Malawi.

Table 1.2

Data From Which Vital Rates Can Be Derived*

Age	1966	1972	1977	1982	1984
1. Single year	-	x	x	x	-
2. Five year age groups	x	x	x	x	x
Mortality					
1. Children ever born by age of the mother	-	x	x	x	x
2. Children Surviving by age of the mother	-	x	x	x	x
3. Children ever born by age of the mother by sex	-	-	-	x	x
4. Orphanhood	-	x	x	x	-
5. Death in the household in the last 12 months by age of the deceased	-	x	x	+	x
Fertility					
1. Children ever born by age of the mother	-	x	x	x	x
2. Births in the household in the last 12 months by age of the mother	-	x	x	x	x

Notes: * A complete list of data collected in censuses and surveys in Malawi is given in appendix I.
x data is available for analysis
- information not collected
+ information collected but not published.

In carrying out the fore-mentioned objectives it was discovered that this study differs from other current studies in the discipline in two respects. Firstly, other studies appear to focus on determinants of demographic parameters (mortality, fertility) in order to predict, in one way or the other, the commencement of the demographic transition whereas this study attempts to describe the overall demographic developments in Malawi in relation to social and economic developments.

Secondly, some of the methods herein utilized have, very recently, been superseded by more robust procedures. This is not a deliberate advert to try and be different but rather the consequence of demographic data available in the country. Moreover, accepting the biblical teaching that "there will always be poor people in this land" (Deuteronomy 15 verse 11), then some countries will still be categorized as statistically developed and others statistically under developed. As long as this is true some countries will still have data of poor quality. In addition, as countries move from under-developed and developing states to a developed one, the criterion of what constitutes good data also changes. Evidently getting more stringent as time passes by.

1.9 Organization of the Thesis

The study is divided into seven chapters. In the present introductory chapter, previous attempts to study the population of Malawi have been presented together with the nature and sources of demographic statistics available in the country. This is followed by a discussion of the limitations and objectives of the study. The role of social demographic theories in understanding the demographic situation not only supplemented and added to the background information but also provided a framework for studying the population of the country. Chapter two present yet more background information. This time, however, the aim is to describe in <u>some</u> detail the geography, history, social and economic characteristics of the study population. This is important as any "demographic regime" is a product of existing social and economic conditions. Chapter three presents a detailed discussion of age and sex composition of the population of Malawi. Chapter four examines the level, trends and differentials of mortality in Malawi. A moderate decline in both infant and childhood mortality and adult mortality is observed. A similar study of fertility is presented in chapter five. Although the available data indicate no clear pattern of fertility trend a rise in fertility is suggested. This is attributed to social and economic development which has given rise to a reduction of widowhood, a reduction in breast-feeding, and an increase in the bottle-feeding and the proportion married. Chapter six attempts to provide the possible relationship between demographic change and social and economic development that have taken place in Malawi since independence. This subject is approached by describing the possible changes in the economy and then relating these to demographic changes described in the preceding two chapters. Finally, in chapter seven an attempt has been made to bring together the various issues that this study has raised.

CHAPTER II

BACKGROUND SITUATION OF MALAWI

> Experience is the name people give to their mistakes (Oscar Wilde).

2.1 Introduction

The understanding of the people of Malawi, their culture, standard of living, history and the environment they live in, serves as a useful background to anyone interested in studying the demography of Malawi. This is what the present chapter hopes to achieve. The first part of the chapter describes the country and its inhabitants giving due respect to the forces which helped to build the modern state of Malawi as we understand it today. In the process an attempt is made to highlight significant aspects of Malawian society bearing in mind the traditional (historic or otherwise) relationships and interactions which exist between the people of Malawi and neighboring countries. The second part presents some social and economic indicators for the country as a whole with particular emphasis on inter and intra regional variations. Attention is limited to those indicators of direct relevance to the understanding of demographic behaviour.

2.2 Geographical Background

Malawi is 901 kilometres in length and ranging from 80 to 161 kilometres in width. It lies between latitudes 9 and 17 degrees south of the equator; longitudes 33 and 36 degrees east; and is located in south east Central

Africa1. It is bordered by the United Republic of Tanzania in the north and north-east; the Republic of Mozambique in the east, south and south-west; and the Republic of Zambia in the west. Malawi shares relatively good relations with its neighbours and just like the other countries in the region, Malawi is greatly affected by the social, political and economic circumstances in the Southern Africa.

For administrative purposes Malawi is divided into three regions: Northern, Central and Southern; twenty-four districts: five in the North, nine in the Centre and ten in the South. Each district consists of a number of chief's (Traditional Authority) areas which are further subdivided into various villages. Coincidentally, this division, particularly at regional level, sub divides the country into more or less distinct physical, cultural, social and economic zones. The discussions in the following paragraphs and sub-sections (in this chapter) will attempt to amplify this observation.

Malawi has a total surface area of 118,484 square kilometres of which 20 percent is occupied by water: mostly by Lake Malawi - the third biggest lake in Africa and twelfth in the world. The lake is 580 kilometres in length and varies in width from 16 to 83 kilometres. It occupies approximately half of the country's eastern border and has one outlet, the Shire River, which is also the largest river in Malawi and runs 400 kilometres south

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1 see Agnew and Stubbs (1972) for a full geographical description of Malawi.

of the lake before joining the Zambezi River. Both the lake and the river fall within the "Great African" rift valley, whose geological faulting has given rise to the varied topography of the country.

Of the total land area 38 percent is in the Centre, 34 percent is in the South and 28 percent is in the North. Mzimba, with an area of 10,430 square kilometres is the largest district whereas Chiradzulu having only 767 square kilometres is the smallest. The rest of the districts range from 1,500 to 8,000 square kilometres. According to the National Physical Development Plan (NPDP), 31 percent of the country's land area is estimated to be of high agricultural potential2 of which 51 percent is in the South; 35 percent is in the Centre and the remainder in the North.

Northern region is a mountainous area varying from 1,500 to 2,500 meters in altitude. On the one hand, this has meant having less land available for cultivation. For instance, only 15 percent of the total land area in the region is estimated to be of high agricultural potential, of which, more than two thirds is in Mzimba district. Virtually, all districts in the region have less than the national average of proportion arable. The high altitude also accounts for many problems involving development and communication infrastructure. It was

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2 "High agricultural potential" may be equated with "arable land" although in the strict sense the two terms are different, the former being a subset of the latter. For instance United Nations Development Programme (UNDP) estimates that 31 percent of the country's land is arable [see UNDP(1985:8)].

because of these apparent difficulties that during the colonial period the region was referred to as the "dead north".

On the other hand, one can argue that, this has given rise to a healthy environment since one may expect that such tropical diseases as malaria may not be as virulent as in lowland areas. That this is true, historically, is illustrated by Dr Robert Laws choice in 1894, on health grounds, of building a mission station at Livingstonia - a highland of about 1,300 meters above the lake. Also since large areas of land are uninhabitable, human settlements are concentrated in certain localities and are relatively close to each other, thus making it easier and cheaper to provide such social services as primary schools.

Central region is a rolling country which rises to a high altitude of 1,200 meters. The soils are moderately fertile allowing cultivation of a number of crops including tobacco which is the mainstay of Malawi's economy. Twenty-nine percent of its land area is estimated to be of high agricultural potential, of which, just over 90 percent is in Lilongwe, Ntcheu, Dedza, Dowa and Salima districts. The same districts also record a higher percentage of arable land than any other district in the region.

Southern region shows the greatest variations. It has the lowest altitude of 37 meters above sea level in the Lower Shire[3] area and the highest of about 3,050 meters on Mount Mulanje. The soils are quite fertile with 47 percent of its land being of high agricultural potential and enables nearly every type of crop cultivated in Malawi to be grown in the region. All districts, except for Thyolo, have proportion of arable land in excess of the national average. This fact, together with a healthier climate in the Shire highlands and its closeness to the historical and traditional route which connects Malawi with the rest of the world by sailing from the Indian Ocean then up the Zambezi River in Mozambique onto the Shire River attracted a large number of Europeans to settle in the region (Robertson,1900).

2.3 Historical Background

According to oral tradition, early inhabitants of Malawi were a pygmoid type of people called Akafula or Mwandionelapati[4] who earned their living by hunting, fishing and food gathering. The country was later invaded by sedentary bantu groups who came from various places in Central, Eastern and Southern Africa. As a result of this invasion the former inhabitants "disappeared" from the land. One version says that they

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3 This name refers to the districts of Chikwawa and Nsanje when taken together.

4 These people were very short and whenever they met strangers who were usually taller than themselves their first question was "Mwandionera Pati" which translates to "From where did you see me?". If the answer was "I saw you from afar" they went away happy, rejoicing and saying "after all I am tall". Otherwise they were aggressive and used poisoned arrow to kill the stranger.

migrated southwards and joined the Bushmen in the Kalahari Desert and another claims fighting between the two groups and the latter being both stronger and better equipped, defeated and wiped the former from the land5.

The first people to enter Malawi were the Chewa in the 16th century. They came from the present day Zaire and established the Maravi (Malawi) Kingdom from which the country derives its name6. At the height of the Maravi empire, their sphere of influence stretched from east of Luangwa river in Zambia, encompassing all of the land north of the Zambezi River to Quilimane in Mozambique. The Chewa are now found in two major groups: those who have maintained their name as Chewa and are scattered in various places in Central region; and those called Man'ganja who have mainly settled in the Southern region. Some Chewa groups are also found in the lake shore area and here they are called Nyanja.

In the 18th century a number of related groups entered and occupied the Northern region. These included the Tumbuka who came from the northwest and northeast; the Tonga who broke away from the Chewa; Mlowoka the ivory traders from the land east of the lake and the

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5 It is interesting to note that one of books about the Bushmen of the Kalahari Desert has a title "I Saw You From Afar" which is similar to the name "Mwanionera Pati". See Perkins, C.M. and Perkins, M. (1965).

6 Malawi literally means "flames of fire" It is thought to have been derived from either the flickering fires of the iron smelters or from the spectacular rays during sunsets that seemed to set the lake in flames. Its adoption after independence (or during the struggle of independence and thereafter) symbolizes the dawn of freedom which was spreading over the entire country and continent.

Ngonde from Southern Tanzania. The extreme north of the country is settled by the Nyakyusa and Lambya who have their parent or sister populations in Southern Tanzania.

In the mid 1800s the militant Ngoni fleeing away from Chaka's military rule in South Africa entered, devastated and settled in Malawi in two main groups: the Zwangendaba Ngoni in Mzimba district and the Maseko Ngoni in Ntcheu and Dedza districts7. Breakaway Ngoni groups are also found in certain districts in the country, for instance, the Chiwere Ngoni in Dowa and Mlonyeni Ngoni in Mchinji.

At around the same time as the Ngoni invasion, groups of Arab-Swahili slave traders from the east coast of Africa penetrated inland into Malawi and established operating bases in the country. The most famous of these being Mlozi who settled in Karonga and Jumbe in Nkhota kota.

Last to enter Malawi, and probably still coming in, are various groups of people from Mozambique. The Yaos escaping famine, drought and Portuguese rule settled in the districts of Mangochi, Machinga and Shire highlands8. They later spread into the interior in search of slaves, ivory and other commodities to exchange for cloth and guns from the Arabs on the East African coast. As a result of these contacts with the Arabs most

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7 For a detailed account of the Ngoni migration see Phiri, D.D. (1982).

8 In its broadest sense the term include all the districts in Southern region apart from Mangochi, Machinga, Chikwawa and Nsanje (See also footnote one on page 5).

of the Yaos were converted to Islam and Malawi now has the largest number of Muslims in the former "British Central and Southern Africa"[9]. From late 1890s, reaching a peak in 1920s, there was a large influx of Lomwe immigrants who came in mainly because of good employment opportunities in the Shire highlands and especially on tea estates in Mulanje and Thyolo districts, even though reasons similar to those given for the Yao are also mentioned in the literature (Chilivumbu,1974; Baker,1961; Boeder,1984). Today, the Lomwe form the largest group in the Southern region and second only to the Chewa in so far as the whole country is concerned.

The Sena found in the southern end of Malawi also have their origin in Mozambique and their influx can in part be linked to the time when the Lower Shire was a very prosperous agricultural area as a result of the cotton industry.

Following David Livingstone's discovery of Lake Malawi in 1859 and his famous speech in Cambridge in 1860, a large number of Europeans started entering the country. This eventually led to the declaration of Nyasaland Districts Protectorate in 1891[10]. In 1893 the name of the country was changed to British Central Africa Protectorate and four years later was renamed

9 It is interesting to note that most African muslims in Zimbabwe came from Malawi. See Mandivenga (1989) for further details on this aspect.

10 "Nyasaland" means "the land of the lake". Nyasa or Nyanja in the local language means "a lake".

Nyasaland Protectorate the name it kept until independence.

Opposition to colonial rule was as old as its establishment. But Reverend John Chilembwe's uprising of 1915 is quite outstanding in so far as its setting is concerned. It had its headquarters in Chiradzulu, at that time, the most densely populated district in Malawi. It follows then that problems of land pressure were more sharply felt in this district than in any other district in the country. This problem was further aggravated by the alienation of huge proportions of arable land to European farmers in a district as small as Chiradzulu and the introduction by the latter of the "Thangata" system whereby Africans were allowed to settle on estate land in return for labour[11]. This system is believed to have attracted many people from Mozambique though some might have come in as a result of Chilembwe's own charisma on top of the socio-political factors which forced them to leave their country. Therefore, if one accepts the dogma that

> no amount of education, religious or secular, and no administration will ever raise a people from savage to the civilized state until <u>the population begins to press on the means of subsistence</u>[12] (NG,1921, p.5)

then one soon realize that for this district alone the

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11 A complete and useful study on this topic is Kandawire(1979).

12 The underlining is by this writer and is meant to stress that, S.S. Murry, the author of the 1921 census report, believed that population is the driving force to social change. Consequently, it remains to be verified whether this was indeed the view of the government at the time.

time for the people to rise up and fight for their rights was certainly ripe. It is interesting to note that Shepperson and Price(1959) in their book on the Chilembwe's uprising include population growth as a variable which may have contributed to stress in the district just before the rebellion.

During the colonial era, especially in its infancy, Asians were brought into the country to serve as soldiers and junior government clerks. They later retired and become shop keepers. From 1953 to 1963 the country was an unhappy partner of the Federation of Rhodesia and Nyasaland. It gained its political independence on July 6, 1964 after 73 years of British colonial rule and in 1966 Malawi became a republic within the commonwealth.

No reliable statistics exist about ethnic composition in Malawi. Despite this drawback, some researchers have attempted to provide estimates regarding different ethnic groups available in the country13.

The last census to ask the respondent about ethnic group was the 1945 census (see Table S2.2). The "abandonment" of the ethnic question in the post-independence censuses could be explained in terms of the desire by Malawian politicians to emphasize national unity. Although the political influence of the decision seem to be dominant, it can further be argued that the extent of intermarriage and ethnic migration has been so great that it could have been difficult to collect such

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13 See for example Chilivumbo(1974) and Kandoole and Phiri(1989).

information.

Africans constitute more than 99 percent of the population and have never in history fallen below this level. Most of the Europeans are expatriates, teachers and missionaries who are not permanently resident in Malawi. In 1977 they numbered 6,377 of whom 4,688 were resident in urban areas and 3,294 were in the City of Blantyre alone. The majority of the 5,682 Asians reported to be in the country in 1977 are traders and can be regarded as permanent settlers in Malawi. A law was passed in 1975 forcing all Asians to reside in the major urban areas only. From this, it follows then that, any reference to the population of Malawi will generally apply to the African population, and not necessarily to the European and Asian populations.

2.4 Social and Economic Characteristics

2.4.1 Urbanization

Urbanization in Malawi is a relatively recent phenomenon dating back to 1876 when the Scottish missionaries opened a mission station at a place they called Blantyre in memory of David Livingstone's birthplace[14]. Two years later, they were joined by traders, John and Frederick Moir, who established the

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14 Before this date, however, historical records reveal the existence of large settlements in excess of 10,000 inhabitants which could by Malawi standards qualify as urban localities. Examples of such settlements include Nkhota Kota and Kachindamoto's capital in Dedza. For further information on this aspect see Fetter (1983).

African Lakes Corporation, the first trading company in Malawi. Since then, following the opening up of shops by both Europeans and Asians, Blantyre has remained the country's major commercial haven. It is the oldest city in the former "British Central Africa" and assumed the status of a Town Council in 1895 and a Municipality in 1959. At the time of independence in 1964, only Blantyre could be regarded as a town and was consequently granted the city charter in 1966. To date, there are two additional cities: Lilongwe the new capitol in the Centre and Mzuzu[15] in the North. Zomba the old capitol and now the university town has a municipal council. Together these four constitute major urban centres in Malawi.

Table 2.1 shows the proportion of people reported as living in urban areas in the three most recent censuses and the inter censal growth rates of the urban population[16]. The urban population used in the table corresponds to the NSO's definition at the time of each census.

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15 The city of Mzuzu is situated in Mzimba district and is the only city in Malawi whose name differs from the name of the district in which it is found.

16 The census reports for the earlier periods (colonial census) did not distinguish between rural and urban population.

Table 2.1

Percentage urban, Distribution of urban population and Inter Censal Growth Rates for Malawi, Regions and Districts

Country/Region or District	Percentage urban 1966	1977	1987	Growth Rate 1966/77	1977/87
Malawi	4.7	8.5	10.8	8.3	6.0
Northern Region	3.7	6.9	10.0	8.1	7.1
Chitipa	2.4	4.3	5.4	7.1	5.2
Karonga	1.4	11.3	13.4	21.5	4.9
Nkhata Bay	1.4	3.8	4.8	11.1	4.7
Rumphi	4.1	6.4	7.6	6.7	5.8
Mzimba	5.5	7.4	12.0	4.8	8.8
Central Region	2.2	6.4	9.8	13.1	8.0
Kasungu	1.7	3.3	3.4	12.6	5.1
Nkhota kota	1.8	12.3	7.7	20.2	1.6
Ntchisi	1.8	1.9	2.5	2.8	6.2
Dowa	1.6	2.2	2.6	5.6	4.5
Salima	2.7	3.6	5.6	6.5	8.1
Lilongwe	3.9	14.0	23.7	14.8	8.6
Mchinji	1.0	1.2	1.8	7.8	8.4
Dedza	1.0	1.9	4.1	8.0	11.0
Ntcheu	0.7	1.4	1.6	9.3	6.2
Southern Region	6.7	10.5	11.7	6.7	4.7
Mangochi	1.2	2.0	4.5	7.0	13.1
Machinga	0.9	3.0	3.6	14.5	6.2
Zomba	7.0	7.4	9.8	1.9	5.7
Chiradzulu	0.4	0.4	0.7	1.1	7.5
Blantyre	39.2	53.7	56.4	6.3	4.2
Mwanza	-	3.4	3.9	-	6.9
Thyolo	0.9	2.2	2.1	10.7	2.2
Mulanje	0.4	0.9	1.9	9.8	10.5
Chikwawa	0.6	4.1	3.1	19.7	2.4
Nsanje	1.4	5.9	5.0	14.0	4.5

Source: Calculated from appropriate Census reports. NSO(1969, 1982, 1988)

A number of problems emerge in comparing 1966 and 1977 or 1987 urban populations[17]. First and foremost there is the problem of definition. Malawi categorises an area as urban solely on legal and administrative grounds. In 1966 an urban area referred to all townships and Town Planning Areas (TPA) and all district centres. In 1977 this was slightly modified to include gazetted towns, district centres and four special areas. All TPAs adjacent to gazetted towns were excluded. The effect of this was to drop some localities which were previously included as urban areas.

In addition there have been changes in boundaries of certain urban localities especially the major urban areas. More apparent is the redefinition of the boundaries of Lilongwe City following the establishment of Lilongwe as the new capital (TCP,1984; Segal,1985). This problem has been so extensively handled by Potts(1987) that it need not be repeated here.

To obtain a good comparative picture for the two periods some adjustment have to be done. One way of doing this is to apply the 1966 urban definition to 1977 data or the other way round. Unfortunately, only the latter, seems possible since some of the 1966 small urban areas do not appear in either of the census reports.

In the Final Report of the 1966 Census, there are three tables which presents urban population: Tables 2, 5

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17 1987 census employed exactly the same definition as the 1977 census. Therefore in this section the two are treated as being the same.

and 7. Tables 2 and 5 present population distribution by age and sex for districts, chief's/sub chief's area and special areas (which includes urban localities). Table 7 presents urban population by race and sex for selected places. The word "selected" suggests that some urban areas are excluded from the table. Nor are they presented anywhere else in the report. Moreover some of the areas included in table 7 are "missing" in the other tables.

A complete list of all urban localities is found in the 1966 provisional report. Scanning through the tables one notices that some of the areas that are included as urban are so small to be referred to as urban and their exclusion in the final report is by all means justified. For instance T.A. kalipula in Karonga district had an urban locality of only 59 people and Katowo in Rumphi district had a population of 99 inhabitants. Moreover if these are included both the results and interpretation are not affected in any way.

Surprisingly, to our advantage, the table that gives the breakdown of the 1966 urban population by district excludes the small urban areas probably due to their insignificance. For example, Domasi in Zomba district was by 1966 definition an urban area. But the population of Zomba urban presented in Tables 2, 5 and 7 referred to the population of the township of Zomba only. Nevertheless, small urban areas like Domasi appear to have been included in the total urban population. As a result of this, the 1966 urban population is slightly exaggerated. This inconsistency can be taken as additional testimony that the country lacks a universal definition of what constitutes an urban area.

Ngoleka Mlia, a leading Malawian expert on urban geography, faced with the problem of a lack of a universally acceptable definition of an urban area in the country, avoided the question by simply adopting the existing definition without questioning its relevance:

> For purposes of the present discussion it is not imperative that we offer a tight and neat definition of universal applicability. It should suffice to emphasize that in this context urban settlements include such relatively small places as Phalombe, Luchenza, Ntanja, Nathenje, Mponela and Ekwendeni, although by international standards these may be considered no more than villages. The settlements may have as few as 200 people ... (Mlia:1978, p.55).

Although in this study, the identification of urban areas has followed the same strategy as outlined in the above quotation, it is argued that there is need of having a nationally accepted definition of an "urban area".

Lastly, in terms of socio-economic functions, some urban localities are rural in nature, hence must be excluded from the analysis. On the assumption that the effect of this is the same throughout the country and in view of the difficulties associated with identification and isolation of the areas concerned, Table 2.1 should only be seen as indicating changes in urban population which has occurred over the years.

The level of urbanization in Malawi is admittedly very low by any standard, and is likely to remain so for sometime to come (See Table 2.2 for comparative statistics). In addition, the values in both Tables 2.1 and 2.2 reveal a rather modest rate of urban growth for Malawi. In 1966 5 percent of the population were living in urban areas, rising to 8 percent in 1977 and 11 percent in 1987. The annual inter censal growth rate of urban population was 8 percent during 1966-77 and 6 percent during 1977-87, implying a decline in the rate of urbanization[18].

The rate of urbanization in Malawi is in line with the experience of other African countries [see for example United Nations(1987) and World Bank(1986)]. This can be attributed to the fact that the 1960s saw the emergence of independent African states and the immediate consequent relaxation of some colonial rules which prohibited Africans from residing in cities or parts thereof, the Africanisation of certain jobs, the demand of labour in new industries and the resultant mass rural-urban migration. Also, the growth of entirely new urban centres such as the City of Lilongwe as in the case of Malawi is a factor.

Table 2.1 also reveals regional differences in the level and pace of urbanization in Malawi. Southern Region, is the most urbanized Region in Malawi with 7 percent, 10 percent and 12 percent of its population

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18 In view of the quality of data one should however be cautious in making these generalizations. The changing boundary as noticed in some urban localities may imply that some people who are for all practical reasons rural are included as urban dwellers. This may be suggestive that the urban population in 1977 MPC was again exaggerated and the true rate of urban growth is somewhat less than the one indicated in Table 1.1.

reported as urban dwellers in 1966, 1977 and 1987 respectively. In this region the City of Blantyre and the Municipality of Zomba jointly accounted for more than two thirds in 1966, one half in 1977 and two fifths in 1987 of the entire national urban population. At the same time Northern Region had an urban proportion of 4 percent, 7 percent and 10 percent while Central Region reported that 2 percent, 6 percent and 10 percent of its people were residing in urban areas. The city of Lilongwe accounted for 10 percent in 1966, 21 percent in 1977 and 25 percent in 1987 of the national urban population. The slightly high percentage urban for Northern Region is surprising. As we shall see below this could be attributed to the crudeness of the measure we are using.

Table 2.2

Proportion Urban For Selected Countries and Regions

	1980	1990	2010	2020
Angola	21.0	28.3	44.2	51.9
Botswana	15.3	23.6	41.3	49.2
Lesotho	13.6	20.3	35.6	43.6
Malawi	9.7	14.8	28.0	35.7
Mozambique	13.1	24.8	44.0	50.1
Swaziland	19.8	33.1	52.3	59.4
Tanzania	16.5	29.3	48.8	54.7
Zambia	42.8	55.6	71.3	75.9
Zimbabwe	21.9	27.6	42.5	50.3
Kenya	15.1	21.5	35.6	42.6
East Africa	27.7	32.6	45.6	52.2
LDC	29.2	33.6	46.2	53.1
World	39.6	42.6	51.8	60.1

Source: United Nations(1987) Table A-1, pp.46-61.

In addition to the increase in the level of urbanization in all regions, the regional differentials appear to have declined and the gap between Northern Region and Central Region have more or less disappeared. In 1966, Southern Region was 5 percentage points higher than Central Region and 3 percentage points in excess of Northern Region. In 1977 the difference in percentage points remained unchanged between Southern and Northern regions and Southern Region was 4 percentage points higher than Central Region a decrease of one percentage point. By 1987, both Central Region and Northern Region are 2 percentage points below Southern Region.

The inter censal annual growth rates for Central Region were 13 percent and 8 percent, whereas Southern Region had 7 percent and 5 percent over the respective periods 1966-77 and 1977-87. Similar rates for Northern Region are 8 percent and 7 percent. Therefore, the reduced regional differentials in the level of urbanization can be explained by high urban growth rates in Central Region, which in turn is a consequence of the move of the capital from Zomba to Lilongwe and the related opening up of industries in the Region.

If we exclude the districts of Blantyre, Zomba, Lilongwe and Mzimba, Table 2.1 suggest a rather interesting inter district differentials in the level and rate of urbanization. In doing this exercise we must emphasise that caution in interpreting the measure of urbanization used in this study is essential. Proportion urban is sometimes affected by the size of the urban locality vis-a-vis the population of the area. A small urban population with a small district population may lead to a higher urban proportion when in actual fact the true level of urbanization is quite low. The opposite is also true.

This seems to be the case with districts in Northern Region which on a comparative basis shows a higher proportion urban than most other districts in Central and Southern Regions: a feature which is perplexing to any one familiar with the Region. This may in part be due to population distribution and settlement patterns which was suggested in section 2.1 above. In 1966 all Northern Region districts had a higher proportion urban than any districts in the Southern Region; the same is true in 1977, with the exception of Chikwawa and Nsanje. The same position is also observed in 1987, if Nsanje is excluded. In all the census years, Central Region districts of Mchinji, Dedza and Ntcheu have lower rates than districts in the Northern Region; whereas the rest of the districts in the Region have rates which are more or less comparable to those of the North even though the superiority of the latter is clearly suggested. The districts of Nkhota Kota and Nsanje also (especially in 1977) indicate a suspiciously higher proportion urban than one would expect.

2.4.2 Education

Table 2.3 presents the level of literacy in Malawi as measured by two proxy variables: Percentage of adult population aged 15 years and over who have attended at least four years of formal education (Adult Literacy Rate) and School attendance rates calculated for primary and secondary school populations which are assumed to be age ranges 6 to 13 and 14 to 17 respectively.

The level of literacy in Malawi is quite low by any standard. (see Table 2.3). In 1977, 41 percent of the adult males and 17 percent of the adult females were said to be literate. Northern Region has the highest rates of adult literacy with 62 percent of males and 32 percent of females. In contrast, analogous rates for Central Region are 38 percent and 17 percent and for Southern Region very similar at 38 percent and 14 percent. All districts in the Northern Region have adult literacy rates which are higher than not only the national average but also any other district in the country apart from Blantyre. Chiradzulu and Zomba in the South, and Kasungu, Nkhota Kota, Ntchisi and Lilongwe in the Centre also have relatively high adult literacy rates. In contrast, the districts of Mangochi, Machinga, Dedza, Nsanje and Salima have very low rates of adult literacy.

Table 2.3

Adult Literacy Rate and School Attendance Rates for Malawi, Regions and Districts (1977)

	Adult Literacy Rate (percent)		Percentage of school attending population			
			6-13		14-17	
	M	F	M	F	M	F
Malawi	40.8	17.4	66.8	45.2	6.5	2.6
Northern Region	61.5	32.2	105.6	79.4	10.7	3.6
Chitipa	61.7	30.0	106.8	79.1	12.0	3.6
Karonga	59.2	30.2	113.1	82.1	10.7	3.0
Nkhata Bay	59.9	35.8	97.2	69.4	8.1	2.7
Rumphi	71.5	47.1	110.7	93.2	16.1	7.1
Mzimba	60.9	31.1	103.7	78.8	10.1	3.6
Central Region	37.9	16.8	61.0	41.6	4.9	1.9
Kasungu	48.6	21.8	85.3	55.5	5.0	1.7
Nkhota kota	43.4	15.3	76.7	43.5	6.7	2.2
Ntchisi	41.1	18.7	67.1	46.2	3.9	1.4
Dowa	36.3	16.4	65.6	48.0	3.3	1.2
Salima	30.9	11.2	55.0	34.2	4.6	1.7
Lilongwe	40.1	19.2	63.1	45.3	5.5	2.8
Mchinji	34.7	14.4	57.3	35.7	5.9	1.3
Dedza	26.3	11.6	38.7	26.7	4.0	1.2
Ntcheu	39.2	17.7	46.4	37.4	4.8	1.6
Southern Region	38.4	14.3	61.0	39.2	6.7	2.9
Mangochi	18.2	5.2	34.6	18.1	4.7	1.1
Machinga	26.1	8.4	47.8	26.4	4.0	1.1
Zomba	40.4	16.3	69.3	43.9	6.8	3.6
Chiradzulu	45.4	19.0	70.0	48.9	6.6	2.6
Blantyre	60.5	34.5	88.6	67.7	15.7	8.5
Mwanza	38.9	15.8	63.2	41.6	5.5	2.5
Thyolo	39.3	14.2	61.4	41.4	4.7	2.2
Mulanje	35.6	11.7	60.0	37.8	4.0	1.5
Chikwawa	34.6	7.2	52.9	23.1	4.4	1.4
Nsanje	27.0	5.7	51.4	21.2	6.7	1.6

Source: NSO(1980a, 1984a).

Table 2.4

Literacy above age 15 and Enrolment Ratios for Selected African Countries

	%age literacy 15 years and over (1)	Number enroled in schools as percentage of age group (2) primary	secondary	Higher
Botswana	41	102	23	-
Gambia	20	56	16	-
Ghana	30	76	34	1
Kenya	47	104	20	1
Lesotho	59	112	20	2
Malawi	31	62	4	-
Mozambique		104	6	-
Nigeria	34	98	16	3
Sierra Leone	24	40	12	1
Swaziland	55	111	42	-
Tanzania	46	98	3	-
Uganda	52	60	8	1
Zambia	69	100	17	2
Zimbabwe	69	131	39	3

Source: (1) Arthur (1988), (2) World Bank(1986)

Blantyre being a centre of commerce in the country has a high concentration of educational facilities particularly secondary and tertiary education. Moreover, one expects the educated elite to be found here since that is where good employment opportunities exists. Also the presence of large expatriate population in the district may be a contributing factor. Chiradzulu district obviously benefit from its proximity to Blantyre.

Throughout the country, males consistently enjoy higher rates of literacy and school attendance than females. (Other things being equal this may serve to indicate the low status enjoyed by women in Malawi). The regional and district differentials also suggest that the differences in literacy rates are higher for males than females.

As can be seen from the table, Northern Region persistently show very high rates of school attendance rates at each level of the educational hierarchy. The rates for Central Region and Southern Region are very similar with Southern Region showing higher rates for secondary education than Central Region and the latter performing relatively better than the former in so far as female education at primary school is concerned. In 1975 Myambo was surprised to observe the preponderance of northerners at the University of Malawi. They were reported to constitute one quarter of the students population despite the fact that the population of the entire Northern Region is under 15 percent of the national population (Myambo,1975).

Primary school attendance rates are above 100 percent for some cases (all arising in Northern Region!) indicating the presence of pupils who were either below the age of 6 or above the age of 13 or a combination of the two. This partly reflects the parents′ desire for their children to enter the education corridors early in life (which may again be taken as the value they attach to education) or repeated attempts by the children to secure a place at a secondary school (children′s value of education).

It should be mentioned at this point that Malawi has a three tier education system: Primary, Secondary and

Tertiary (University and Colleges). After eight years of Primary education (Standards one to eight) pupils sit for Primary School Leaving Certificate (PSLC) after which those who pass are selected to begin secondary education (Forms one to four). Due to limited number of places, this presents stiff "competition" and many intelligent pupils drop out at this level. For instance, in the 1986/87 academic session 88,454 candidates sat for PSLC examination, 61,905 passed and there were only 7,184 form one places to compete for[19]. It will be argued in chapter VI that the main factor responsible for this problem is population growth.

This pattern of educational attainment is attributed to accessibility to educational facilities. Northern Region have a high concentration of primary and secondary education, facilities followed by Southern Region which leaves Central Region at the bottom. Historically this is a result of the work of the various missionaries who laid down the framework of the education system in the country and is thus a function of people's response to christianity. As seen from section 2.2 above, Northern Region was settled by small ethnic groups which were under constant attack from the powerful and war-like groups such as the Ngoni. Thus, most northerners welcomed the early missionaries since the latter protected them from the Ngoni. Obviously, then, Northern Region benefited from the missionary activities. Most of the

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19 Further information on this aspect can be found in MOE (1986).

people in Central Region rejected christianity as it conflicted with their established tradition - in particular the Gule Wamkulu - which the missionaries were eager to abolish[20]. The Yao, most of whom are Muslims, saw it as a threat to their religion as education in those days was full of christian values[21]. In fact education itself was used as a tool for spreading the gospel. Furthermore, the Sena in the Southern Malawi being animist were not easily converted.

The continuation of the educational imbalance in the post-independence period can be explained by two factors both of which are related to the execution of social and economic planning in Malawi. Firstly, the concept of "balanced regional development" which dominates most development planning is more likely to be interpreted in terms of physical units other than the size of the population being served. Thus, if two schools are built in one region, the same number of schools should also be built in the other two regions. The most recent example is the building of Teacher Training Colleges in Karonga (in the north), Kasungu (in the centre) and Domasi (in Zomba in the south).

Secondly, the building of primary schools was left

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20 "Gule Wamkulu" translates to the "BIG DANCE" and refers to a masked dance which is performed at initiation ceremonies and funerals and is practiced as a religion in certain areas. A summary description of Gule Wamkulu (or Nyau as it is sometimes called) can be found in Rangeley (1948, 1949).

21 A brief outline of the problems of establishing western type of education in Moslem areas can be found in Bone (1985).

in the hands of the local community on a "self-help" basis whereas the provision of secondary schools is geared to satisfying unmet demand. Since northerners have a high regard to education (confirmed by enrolment ratios in excess of 100) as a result of early association with the missionaries, and the practical experience that those who are successful at school are likely to do better in life, they are more likely to build primary schools for themselves, thereby giving rise to many primary school leavers seeking secondary education, thus forcing the government to provide more additional secondary school places in the region.

2.4.3 Health

Health services in Malawi are provided by the central government, missionaries, major industries and, in the main urban centres, by the private sector. Government health services are provided on a centralized and referral basis. Ranging from top to bottom there are (i) the central and general hospitals which provide specialist treatment for the whole country; (ii) the district hospitals which are usually located at the district centres and form the nucleus of the district health system; (iii) the rural hospital and (iv) the health unit (maternity post and dispensary) which provide both protective and curative services to the rural population. The central and general hospitals also act as the district hospital for the districts in which they are located.

2.4.4 Economy

This section presents a brief description of the economy of Malawi. Detailed studies of Malawi's economic policies, performance and prospects can be found in Humphrey(1974), Kydd(1984) and Christiansen(1984)22.

The economy of Malawi has been variously described as a dual economy, a least developed economy and a dependent economy. All these descriptions emphasize the importance of foreign trade. At the time of independence in 1964, Malawi inherited an economy which was almost bankrupt and dependent on subsidies from the British government. Shortly after independence, the government's primary concern was to expand the export-oriented manufacturing industries, which in practical terms meant large investments in agriculture, particularly estate agriculture. Recently, attention seems to have shifted to import substitution industries.

2.4.4.1 Growth in Gross Domestic Product (GDP)

The GDP at current market prices, has risen from 153.4 Million Kwacha (MK) in 1964 to 1,707 MK in 1984, implying a growth rate of about 11 percent per annum. Over the same period GDP at fixed 1985 prices grew at an annual rate of 3 percent. A slightly better measure of economic growth can be obtained from GDP per head. At current market prices, GDP per head rose from 40.5 Kwacha in 1964 to 239 Kwacha in 1984, increasing at a rate of nearly 10 percent per annum. Between 1964 and 1984 GDP

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22 For a critical analysis of Malawi's economy see Thomas(1974) and Laslett (1984).

per head at fixed 1985 prices grew at the rate of 0.5 percent per annum (See Tables 2.4 and 2.5).

In general terms, one can say that the economy of Malawi, as measured by GDP improved significantly after independence, reaching its current maximum in-and-around the mid-seventies. From then, until the late 1970s, economic growth was more or less stagnant probably due to poor crop yields. Beginning in the late 1970s, the economy deteriorated following poor climatic conditions which culminated in poor agricultural performances, thus leading to a series of food shortages in a number of areas, especially in the Southern Region. As if to crown it all, in 1987, the country had to import food for the first time after being self sufficient for 23 years. The quantity and quality of export commodities, in particular tobacco, were also affected.

An appalling point revealed in Table 2.6 is that following the sluggish economic growth rates experienced in the late seventies and thereafter, combined with a high population growth rate estimated to be 3.6 percent per annum during the inter censal period 1977-87[23], GDP per head at fixed 1985 prices show negative growth rates for the periods 1980-84 and 1984-87 (although there are signs of some improvements lately). As seen in chapter I this high rate of population growth is believed to have resulted from large influx of refugees from Mozambique. Hence the negative economic growth rates may be taken as

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23 See also Venter(1989) for further details on this aspect.

showing the adverse effect the refugee problem is having on the economy of the country.

The decline in GDP per head may suggest a deterioration in the standard of living of the people. However, since GDP per head has some weaknesses as a measure of the standard of living, the preceding remark should be treated with some reservation. Likewise the whole section should be read bearing in mind the limitations in the compilation, presentation and the quality of the data.

Table 2.5

Gross Domestic Product for Malawi: 1964-1988

Year	GDP current prices	GDP fixed 1985 prices	GDP per Head current prices	GDP per Head fixed 1985 prices
1964	153.4	617.5	41.8	168.3
1965	180.2	729.8	46.1	186.5
1966+	204.4	801.7	50.6	198.5
1967	215.5	895.3	51.8	215.3
1968	225.4	845.3	52.7	197.5
1969	244.4	899.4	55.5	204.2
1970	267.1	912.7	58.9	201.3
1971	334.9	1,044.0	71.8	223.7
1972	359.1	1,122.3	74.8	233.7
1973	364.0	1,260.9	73.6	255.1
1974	461.5	1,354.8	90.7	266.3
1975	529.7	1,429.7	101.2	273.0
1976	612.0	1,518.7	113.5	281.8
1977+	728.0	1,584.5	131.2	285.6
1978	800.7	1,716.3	139.2	298.3
1979	864.5	1,773.6	144.9	297.3
1980	1,005.1	1,766.9	162.4	285.6
1981	1,108.1	1,674.2	172.7	260.9
1982	1,245.1	1,721.8	187.1	258.7
1983	1,436.9	1,782.8	208.2	258.3
1984	1,707.4	1,861.9	238.6	260.2
1985	1,944.9	1,944.9	262.0	262.0
1986	2,197.6	1,966.4	285.5	255.5
1987+	2,731.5	2,006.4	342.2	251.3
1988	3,552.3	2,073.0	428.8	250.3

Sources: IMF(1990)
* calculated using the exponential formulae and inter census growth rates.
+ obtained from appropriate census report.

Table 2.6

GDP Annual Growth Rates: 1964 - 1988

Period	G D P current prices	G D P fixed 1985 prices	G D P per Head current prices	G D P per Head fixed 1985 prices
1964-68	9.6	7.9	5.8	4.0
1968-72	11.6	7.1	8.8	4.2
1972-76	13.3	7.6	10.4	4.7
1976-80	12.4	3.8	9.0	0.3
1980-84	13.2	1.3	9.6	-2.3
1984-88	18.3	2.7	14.7	-1.0

Source: See Table 2.5 above.

2.4.4.2 Structure of the GDP

The economy of Malawi largely depends on agriculture. This is shown by the fact that agriculture has the highest percentage share of the GDP for all the years in Table 2.7 and that agricultural products account for more than 95 percent of the country's export earnings. For instance, in 1982 export earnings from tobacco were 59 percent, tea 19 percent, sugar 8 percent, groundnuts 2 percent and that of other crops 12 percent of the total export earnings. However, the relative share of agriculture has declined over the years. In 1964 agriculture accounted for 55 percent of the GDP declining to 38 percent in 1979 and 37 percent in 1986.

Perhaps the most interesting changes in the structure of the economy are those taking place within the agriculture sector. Agriculture is sub divided into two sectors: smallholder and estate. The smallholder sector accounts for about 80 percent of the total agricultural production and produces almost all of the country's food requirements. Moreover, according to the 1977 census, over 80 percent of the economically active population (both sexes) were engaged in agriculture, of which some 70-75 percent belong to the smallholder sector. On the other hand, much needed foreign exchange is provided by the estate sector which produces the bulk of the country's exports - Tobacco, tea, sugar and cotton.

In 1964 the smallholder sector accounted for more than 50 percent of the GDP. By 1979 this had declined to around 32 percent and 29 percent in 1986. In contrast, the estate sector increased its share from about 4 percent in 1964 to 7 percent in 1979 and 8 percent in 1986. Thus the share of the estate sector has risen at the expense of the smallholder.

The changes taking place in the agriculture sector implies, among other things, a transfer of resources from the smallholder to the estate sector. Of the four factors of production (land, labour, capital and entrepreneur) the first two are particularly important in this context. Firstly, since land belonging to the estate sector is held under private ownership and is not freely available to the population at large, the changes of landownership implies an exacerbation of existing "land pressure". Thus higher population densities than those presented in Table S1.1 may actually prevail in Malawi. This premise may force one to attribute the existing land pressure to "misappropriation" of land. This problem has also been mentioned in analysis of the demographic situation in other African countries (Sibanda,1988).

Secondly, the movement of labour from the smallholder to the estate sector combined with the contribution of the latter, in so far as Malawi's development is concerned, illustrates that estate farming benefitted from the high population growth the country is experiencing. This observation can be extended to other sectors of the economy, especially if it is further assumed that the Malawi Government's policy of preventing "wage inflation" (MG,1971; Giles and Jennings,1982) can only work if there is a large "reservoir" of cheap labour: a situation which can arise when the population is growing rapidly. The foregoing statement can be further illustrated by quoting Giles and Jennings who justified the setting up of the pulp wood factory in Malawi as follows: "with over 43 per cent of the population below the age of 15 in 1970 ... and inexorably moving up into the working age groups, labour is not likely to be a bottleneck" (Giles and Jennings,1982, p.393).

Nonetheless this movement of labour may have been detrimental to the individuals concerned. This arises from the fact that agriculture is the least paying sector in the economy (see Table 1.9 below); and there is some evidence to suggest that the individuals who moved from subsistence farming to wage employment in the estate sector could have been better off if they remained as smallholder farmers. Chipande(1988) also makes a similar observation.

Table 2.7

GDP by Sector 1964 - 1986 : Selected years (%)

	1964	1968	1972	1976	1979	1983	1986
Agriculture	55.3	49.0	47.6	38.3	38.4	37.6	36.8
Smallholder	51.4	45.0	43.1	32.0	31.5	29.0	28.9
Estate	3.8	4.0	4.5	6.2	6.9	8.6	7.8
Manufacturing	9.0	10.3	11.0	12.5	13.2	12.7	12.1
Electricity and Water	0.7	0.9	1.0	1.4	1.9	2.1	2.1
Construction	3.7	3.8	4.9	4.5	3.6	4.3	4.2
Distribution	7.9	8.5	12.7	15.7	11.7	12.8	13.1
Transport and communication	3.7	4.6	5.6	5.6	4.9	6.0	6.2
Financial and Professional services	0.4	1.1	2.7	4.6	6.1	6.5	6.4
Ownership of dwellings	2.4	2.5	2.1	3.6	4.1	4.4	4.4
Producers of government services	11.6	10.8	7.9	7.7	8.9	12.0	13.1
Social and community services	2.6	2.7	2.6	3.6	3.7	4.3	4.5
Unallocables	0.3	-0.9	-1.1	-1.1	-2.9	-2.6	-2.7
	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Malawi Statistical Yearbook 1975 and 1985
OPC-DEPD (1987) Table 2.1, p.7.

2.4.4.3 Income Distribution by Region and District

Although the overall economic picture for Malawi as a whole looks somewhat impressive, what is needed in this study is to establish how the national income is distributed among the regions and districts. Data on income is generally less reliable and difficult to compile. Thus income distribution by regions and districts is even harder to get and is in most cases non existent. In order to try and overcome this problem and thereby establish a plausible income distribution for Malawi, an attempt will be made to exploit two sources of data.

The first source is the 1968/69 National Sample Survey of Agriculture (NSSA) which provides data on total recorded cash receipts and annual recorded cash receipts per household for the rural population (see Table 2.8 below).

As seen in section 2.3.1 above, the population of Malawi is predominately rural thus implying that in the absence of necessary data on income distribution for the entire country, income distribution for the rural population in Malawi, if available, may as well serve to indicate the disparities in income distribution in the country. Besides urban areas are already privileged over the rural areas in terms of the availability of good employment opportunities in the well paying sectors of the economy (see Table 2.10) and also in nominal terms, the minimum daily earnings are higher for urban than rural areas (see Table 6.1 in chapter VI).

Total cash receipts suggest that the rural population in Southern Region has highest receipts, followed by Central Region and Northern Region in that order (see Table 2.8). High values are recorded in the districts of Lilongwe, Mulanje, Blantyre, Machinga, Thyolo, Zomba and Dowa whereas Nkhota Kota, Salima, Rumphi and Ntchisi have very low values. The districts of Lilongwe and Nkhota Kota are at the opposite ends of the scale. Close examination of Table 2.8 reveal that districts which have high cash receipts belong to two classifications.

Firstly, there are those districts which contain a major urban locality as in the case of Blantyre and Zomba (at the time the seat of the government). These have good employment opportunities in well paying sectors of the economy (See Table 2.10). Secondly, there are the agricultural areas like Lilongwe and Dowa which grow tobacco; and Mulanje and Thyolo which produce tea. Therefore it is possible to assess the data as merely reflecting the nature and pattern of social and economic development in Malawi.

Table 2.8

Total Cash Receipts, Annual Income per Households and Proportion engaged in agriculture among the Economically Active Population (EPA) for Malawi, Regions and Districts

	Total Cash Receipts '00,000*		Income per household '000 **		Percentage engaged in agriculture among the EPA M	F
Malawi	352.8	100.0	15.9	100	76.0	94.3
Northern Region	50.4	14.3	17.2	108	73.2	91.7
Chitipa	6.6	1.9	18.2	114	84.3	96.4
Karonga	9.8	2.8	23.4	147	75.4	91.5
Nkhata Bay	14.0	4.0	23.3	147	59.0	85.0
Rumphi	4.7	1.3	20.4	128	67.2	91.5
Mzimba	15.3	4.3	11.6	73	76.1	93.0
Central Region	116.3	33.0	14.7	92	83.3	96.6
Kasungu	8.6	2.4	13.5	85	83.5	96.0
Nkhota kota	4.0	1.1	11.2	70	71.1	95.5
Ntchisi	4.8	1.4	12.1	76	94.0	99.2
Dowa	18.3	5.2	18.0	113	91.5	98.5
Salima	4.4	1.2	9.8	52	75.2	96.1
Lilongwe	39.2	11.1	16.8	106	77.3	95.0
Mchinji	9.5	2.7	21.9	138	91.0	98.1
Dedza	12.8	3.6	9.5	60	89.9	97.8
Ntcheu	14.7	4.2	15.5	97	85.0	95.9
Southern Region	186.1	52.7	16.5	104	70.7	92.7
Mangochi	10.8	3.1	8.3	52	76.5	94.0
Machinga	25.0	7.1	18.7	118	84.3	97.4
Zomba	18.6	5.3	14.9	94	72.5	89.2
Chiradzulu	14.1	4.0	16.8	106	67.2	91.7
Blantyre	29.7	8.4	26.4	166	31.5	73.5
Mwanza					87.9	98.5
Thyolo	23.6	6.7	17.0	107	75.8	93.3
Mulanje	37.4	10.6	14.6	92	81.8	93.8
Chikwawa	17.5	5.0	21.0	132	83.1	97.7
Nsanje	9.3	2.6	15.0	94	83.8	98.3

Source: * NSO (1970).
*** NSO (1980).
** calculated by the author using total cash receipts and 1966 population distribution.

In addition, comparing the distribution of total cash receipts by regions and districts on the one hand, and the distribution of the rural population by regions and districts on the other hand, certain features about income distribution in Malawi are exposed. According to the 1966 census 13 percent of the rural population were in the North, 38 percent in the Centre and 50 percent in the South. The distribution of total cash receipts was 14 percent in the North, 33 percent in the Centre and 53 percent in the South. This suggests that, other things being equal, the rural population in both Southern and Northern Regions earn proportionally more than their national share whereas the Centre gets less than that.

The data may also be distorted by the size of the population, as the larger the population of an area the higher the total cash receipts of that area. As a result of these problems it is tempting to rely on income per household as it more or less measures the income which is available for use by each individual household.

Income per household show that Northern Region has the highest income, followed by Southern Region; Central Region has the lowest. All the districts in the North except Mzimba have more than the national average figure, in contrast to only 6 districts in the Centre and 4 districts in the South.

The above finding is reaffirmed by the second source of data which comes from 1980/81 NSSA. Regrettably this data is not available at regional and district levels but only at Agricultural Development Division (ADD) level[24] (see Table 2.9). Total income range from 4.8 MK in Karonga ADD to 34.4 in Blantyre ADD. However, because of their similarities with total cash receipts these have been excluded from the analysis.

Table 2.9

Annual Household Cash Income and Annual Income per ADD

ADD	Total Income		Income Per HH	
	MK	INDEX	K	INDEX
Malawi	157.4	100	137	100
Karonga	4.8	4	140	102
Mzuzu	11.7	7	136	99
Kasungu	29.2	19	210	153
Salima	9.4	6	121	88
Lilongwe	26.4	17	115	84
Liwonde	32.4	21	134	98
Blantyre	34.4	22	142	104
Ngabu	9.1	6	124	91

Source: NSO (1984)

Annual income per household range from 115 Kwacha in Lilongwe ADD to 210 Kwacha in Kasungu ADD, both of which are in Central Region. Moreover all ADDs in Central Region, apart from Kasungu, have income per household which are lower than the national average. In fact the value of Kasungu ADD looks implausibly high unless it is greatly influenced by tobacco - the cash crop which is grown in the area. The values for Karonga and Mzuzu ADD are respectively 140 and 136 Kwacha implying 2 percent

24 For a brief description of ADDs see appendix II attached.

higher and 1 percent lower than the national average. Blantyre, Liwonde and Ngabu ADDs have respective values of 142, 134 and 124 kwacha which are 4 percent higher, 2 percent lower and 9 percent lower than the national average.

The analysis in the preceding paragraphs, indicate that the rural population in the Northern Region have more income at their disposal than the national average whereas Southern Region have slightly less than but closer to the national average. The situation in Central Region is difficult to assess. But the picture that emerges is that for the few households engaged in agriculture and are successful they have more income at their disposal than the rest who regrettably are in the majority and are at a great disadvantage.

Apparently, this is in line with what one would expect, given the sources of income available to an individual in Malawi. Both the 1968/69 and the 1980/81 NSSA's show that the main source of income for the rural population in Central Region is agriculture, whereas small scale business activities are important in both Northern and Southern Regions. Hence it can be argued that since most people in Central Region rely on agriculture, the least lucrative sector of the economy, for both food and income, then their incomes would be expected to be lower than the income of the northerners and southerners who supplement the income derived from agriculture by practising small-scale business activities. Between the last two, Northern Region may be expected to perform better largely because the people are literate. Thus they know where and how to get a good paying job and are in a position to migrate to urban centres. Furthermore, those who remain behind and are engaged in agriculture may benefit from their education by being in a privileged position to "easily" learn and adopt modern and scientific methods of farming. And for those in business, education may help them in (i) securing the required capital from such sources as SEDOM, and (ii) keeping and maintaining an up-to-date accounting system for the evaluation of the business.

Moreover, culturally, despite their education, the northerners in general are a "conservative group" of people who tend to stick together and there are reasons to believe that they help one another to find a good job and at the same time financially help those who remain behind. In fact the 1968/69 NSSA reveal that a relatively higher proportion of Northern Region's income (13 percent) is derived from cash transfers. Both Central Region and Southern Region showed that 8 percent of their income came from this source.

Table 2.10

Average monthly earnings of paid employees by Industry group by sector (in Kwacha)

	1977	1984
Agriculture	12.31	23.83
Manufacturing	43.31	72.42
Utilities	58.96	99.25
Building & Construction	35.80	52.00
Distribution	49.00	94.58
Transport	68.80	84.08
Financial	111.73	227.25
Community, Social & personal services	45.26	94.58
TOTAL	30.00	59.25

Source: NSO(1981, 1986)

2.5 Summary

This chapter has demonstrated that Malawi is not homogeneous. The Northern Region is devoid of physical "developmental" infrastructure such as roads, manufacturing and service industries in contrast to Southern and Central Regions (in that order). In this context, the Southern Region is the most "developed" region followed by Central Region whereas the Northern Region being the least developed. Northern Region however fairs very well in terms of social indicators - education, income and urbanization. The preceding statements , although somewhat contradictory, are consistent with what one would expect given the existing variations in the country.

The diversity of ethnic composition together with the small size of the country makes Malawi to be one of the most ethnically-mixed societies on the continent. As experience elsewhere has shown, this tends to produce problems of far reaching consequences on the political, economic and social framework of the country. To the demographer, however, this diversity offers interesting contrasts, and vast scope for research since different ethnic groups are known to differ in their levels of mortality and fertility, age and sex structure, and the nature and intensity of migration.

Furthermore, the spread of ethnic groups across international boundaries, combined with/in itself a consequence of artificial borders, and the fact that Malawi, Zambia and Zimbabwe once belonged to one "big" country, the Central African Federation, obliges students of Malawi, and justifies their decision, to draw examples from the neighbouring countries (these three in particular and all countries in the region in general).

In the next four chapters an attempt is made to establish the relevance of the observed levels of and differences in the social and economic characteristics in the understanding of the demography of Malawi.

CHAPTER III

AGE AND SEX COMPOSITION

One should never trust a woman who tells one her real age. A woman who would tell one that, would tell one anything.
(Oscar Wilde, A Woman of No Importance I).

I have always felt that a woman has the right to treat the subject of her age with ambiguity ....
(Helena Rubinsten, My Life of Beauty, Part I, Chapter I).

3.1 <u>Introduction</u>

Age is the most important variable in demographic analysis. It is both affected by and a determinant of fertility, mortality, migration and socio-economic variables. On the one hand, age determines entry into marriage, the labour force and education. On the other hand, high fertility or low infant mortality implies more people below the age of 15 whereas high levels of literacy leads to good knowledge and reporting of age statistics.

As a result of this two way relationship, age not only forms the basis of classification for most demographic variables but also its familiarity is essential for successful social and economic planning. To underline the importance of age United Nations(1980) strongly recommends that LDC should include a question on age in their censuses and demographic surveys; and Shyrock and Siegel(1973) argue that no census is worth the name if it excludes a question on age.

Unfortunately, for various reasons, studies on age statistics from the statistically underdeveloped countries have revealed enormous distortions

(Caldwell,1966; Blacker,1967; Van de Walle,1968; Caldwell and Igun,1971; Nagi et al,1973; Ewbank,1981; Byerlee and Terera,1981). It has been found out that people tend to round off to the nearest age and some ages like those ending in 0 and 5 are preferred whereas others like 1 and 9 are avoided. The causes of these distortions are many and include people's ignorance of their true age, the instructions given to enumerators, the method used to collect age statistics and various other social, cultural and even political reasons.

There is also a tendency to under-state or over-state one's age in order to suit certain social and biological expectations. In this respect young children below the age of five, found playing with their peers at the time of the enumeration, may be reported as belonging to age group 5-9 and females in age group 10-14 who have passed puberty (menarche) may be recorded in age group 15-19 especially if it is further observed that they are married and are mothers. Likewise women above the age of 40 who are still rearing (nursing) their own children may be assigned a younger age group. Then, for prestige purposes, perhaps arising from the desire to be granted a senior citizenship status which in some cases exempts them from paying tax, there is a tendency especially among the males to exaggerate their age.

Awareness of these distortions and inaccuracies in reported age statistics have preoccupied demographers so much that evaluation and adjustment of age statistics has become an integral part of demographic analysis.

In this study four reasons have compelled us to undertake such an analysis. Firstly, the desire to isolate genuine distortions caused by famine and natural disasters from age misstatements. Secondly, to determine the probable effect of these distortions on the reported levels of fertility and mortality. Thirdly, since it is hoped that the characteristics of the reported age distributions will later be used to estimate fertility, the examination of age data was felt to be of paramount importance as a means of providing an in-built mechanism of assessing the plausibility of the derived estimates. Lastly, it is further anticipated that age errors may provide clues to other weaknesses in the data.

3.2 Age Composition

The data from the 1966 and 1977 censuses; and the 1970-72, 1982 and 1984 sample surveys are presented in Tables S3.1 to S3.5.

Although these sets of data might to some extent be distorted by age misreporting, enumeration and (in particular in the sample surveys) by sample designs, they seem to reveal the main features of the population of Malawi.

The most outstanding of these is the extreme youthfulness of the population. This is expected in countries like Malawi, that are in their early stages of demographic transition experiencing high fertility and high but declining mortality. This contrasts with countries in the late stages of demographic transition whose fertility and mortality have declined to very low levels.

The population below age 15 was 44 percent in 1966 and 1970/72, slightly rising to 45 percent in 1977, 47 percent in 1982 and 48 percent in 1984. The value for the 1987 MPC is somewhat lower at 46 percent (see Table 3.1). Although the differences are small, it is clear that the population of Malawi is becoming more and more youthful. In fact recent projections by the United Nations, the NSO and the World Bank demonstrate that the proportion will climb to just under 50 percent by the end of the century[1]. This is not surprising given that the age structure described above implies that both the birth rate and the rate of population growth will remain high for some time to come.

The slight increase in the population aged 0-14, observed in the two censuses and in the three sample surveys, may be due to improvement in the reporting of ages of the infant, child and adolescent population or a genuine rejuvenation of the population caused by either a rise in fertility or a decline in infant and child mortality or a combination of these factors. Given the general belief that fertility has been constant in the past, its effect on the age structure can be said to be negligible. Similarly, the small increase in fertility, as suggested in chapter V, can have the same effect. Consequently, the slight increase in the proportion may serve to indicate the insignificance of fertility. The fact that age misreporting appears to have worsened in

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1 See also Tsui(1981).

1977, compared with 1966, may further suggest that a fall in infant and child mortality is the major factor.

The population aged 65 years and over show a moderate increase overtime. The proportion for this age group was 4.0 percent in 1966 slightly rising to 4.5 percent in 1977 and 4.8 percent in 1982. The values for 1984 and 1987 are somewhat lower at 4.2 percent and 4.0 percent, respectively.

As a result of modest improvements observed in the social and economic conditions in Malawi one would expect that the proportion of the elderly would increase overtime. The observed decline in 1984 and 1987 would therefore be attributed to sampling errors, age misreporting or a rise in adult mortality. Firstly, since the FFS was interested in interviewing females aged 15-49 and males aged 20-54 it can be suggested that fewer people aged 65 years and above were included in the sample. Secondly, it is possible that age misreporting in terms of age exaggeration by the elderly population is more pronounced in the 1977 MPC and the 1982 MDS than in the 1984 FFS and the 1987 MPC. This aspect will be explored later in the chapter.

Thirdly, the periods surrounding the 1984 FFS, and to some extent the 1987 MPC, were marked by recurrent food shortages in certain areas in Malawi. Thus the rise in adult mortality, as suggested above, could indeed be true since the population aged 65 years and over is one of the most vulnerable age groups (the other being infant and children). Unfortunately no statistics are available to support this hypothesis.

The population of Malawi when seen in comparison with other African countries, appears to indicate a relatively higher proportion aged 65 years and over than one would expect given its relative social and economic position. For example, all countries in Table 3.2 have a higher expectation of life than Malawi but only Botswana and Tanzania indicate a higher proportion of population aged 65 years and over than that of Malawi. This may be due to age exaggeration being more pronounced in Malawi than in other countries, or it can be argued that adult mortality is lower in Malawi than in the other countries. However, the fact that some of the other countries (namely Botswana, Tanzania and Swaziland) show a slight decline in the proportion over time instead of the expected increase given the observed improvements in mortality, casts doubt on the data from these countries.

Table 3.1A

Percentage Distribution by Selected Age Groups for Malawi, Regions and Districts: 1966 and 1977

Country,Region and District	1966 <15	1966 15-64	1966 65+	1977 <15	1977 15-64	1977 65+	1987 <15	1987 15-64	1987 65+
Malawi	43.9	52.1	4.0	44.6	50.9	4.5	46.2	49.8	4.0
Northern*	45.4	50.4	4.1	46.0	49.3	4.7	46.2	49.8	4.0
Chitipa	49.0	48.1	2.9	50.1	45.8	4.1	49.2	46.9	3.9
Karonga	43.5	53.3	3.2	45.8	50.4	3.8	46.4	50.1	3.5
Nkhata Bay	43.8	50.7	5.5	45.1	49.1	5.8	45.0	50.4	4.6
Rumphi	46.0	49.9	4.1	47.4	47.7	4.9	46.4	49.9	3.7
Mzimba	45.6	50.1	4.3	45.2	50.0	4.8	45.8	50.1	4.1
Central*	44.6	51.1	4.3	44.8	51.0	4.2	46.7	49.6	3.7
Kasungu	46.0	50.3	3.7	43.1	53.6	3.3	44.8	52.6	2.7
Nkhota Kota	42.6	52.8	4.6	44.6	50.5	4.9	45.4	50.7	3.9
Ntchisi	45.5	50.2	4.3	46.7	48.2	5.2	47.8	48.0	4.2
Dowa	45.3	54.7	0.0	45.4	50.4	4.1	46.9	49.3	3.8
Salima	41.1	54.2	4.6	43.2	51.5	5.3	45.1	50.5	4.4
Lilongwe	44.0	52.6	3.4	44.6	52.0	3.4	46.5	50.5	3.1
Mchinji	46.5	46.2	7.3	45.1	50.2	4.7	46.1	50.3	3.6
Dedza	45.2	49.6	5.2	45.7	49.2	5.1	48.5	46.9	4.5
Ntcheu	45.6	49.3	5.1	45.2	49.5	5.3	47.9	47.2	4.8
Southern*	44.8	51.3	3.9	44.2	51.2	4.6	45.8	50.0	4.2
Mangochi	42.5	52.9	4.7	50.1	45.8	4.1	45.0	50.6	4.5
Machinga	43.9	52.0	4.1	44.7	50.1	5.1	46.3	49.0	4.7
Zomba	42.0	54.1	3.9	42.4	52.7	4.8	44.8	50.6	4.6
Chiradzulu	44.7	51.1	4.2	44.5	50.9	4.6	45.4	50.0	4.6
Blantyre	41.2	55.5	3.3	42.9	54.4	2.7	43.5	54.1	2.4
Mwanza	-	-	-	46.4	49.0	4.6	48.5	47.9	3.6
Thyolo	44.4	52.3	3.3	45.8	49.7	4.5	46.6	49.4	4.0
Mulanje	44.2	52.4	3.4	45.2	50.1	4.8	47.2	48.2	4.6
Chikwawa	42.1	54.7	3.2	44.5	51.5	3.9	46.7	49.4	3.9
Nsanje	42.5	52.6	4.9	44.5	49.6	5.9	46.7	47.7	5.6

Source: calculated from various census reports.
Note: * Regions.

Table 3.1B

Percentage Distribution by selected Age Groups for Malawi: 1970-72, 1982 and 1984

	0-14	15-64	65+
1970/72	43.6	50.4	6.0*
1982	46.8	48.4	4.8
1984	48.3	47.5	4.2

* This refers to age group 60+ hence it is not comparable to the rest.

Table 3.2

Percent Distribution for broad Age Groups for selected Countries (both sexes)

Country	Year of Census	Age Group <15	15-64	65+
Botswana	1964	45.6	49.5	4.5
	1971	47.5	46.5	5.6
	1981	47.3	47.5	5.1
Ghana	1960	44.5	52.3	3.2
	1970	46.9	49.5	3.6
Tanzania	1967	43.9	50.5	5.6
	1976	46.2	49.7	4.1
Kenya	1969	48.4	48.0	3.6
Lesotho	1976	39.1	58.0	2.9
Mozambique	1980	46.4	48.4	5.2*
Zambia	1969	46.3	51.5	2.2
Swaziland	1966	47.0	48.8	4.2
	1976	47.6	48.9	3.5
Zimbabwe	1969	49.3	48.9	1.8
	1982	47.3	49.6	3.1

* refers to 60 and over

Table 3.1 also indicates a decline in the economically active population assumed to be age group 15-64. According to the 1966 MPC 52 percent of the population belonged to age range 15-64. This proportion was 50 percent in the 1972 MPCS, 51 percent in the 1977 MPC and 48 percent in both the 1982 and 1984 demographic surveys. The provisional report for the 1987 census indicate that this proportion was 50 percent. In comparison with the proportion for the 1977 MPC, the percentage for 1987 suggest no change in the population aged 15-64. But comparing the latter with the 1966 value, the decline is evident. The fluctuations in the proportion could be attributed to age mis-statements and sampling variations.

As a result of the above-described changes, the dependency burden2 for Malawi rose from 92.1 in 1966 to 96.8 in 1977. These figures, however, indicate a heavy burden placed upon the economically active population and this poses a severe strain on the provision of public services (such as education and health) as well as employment and pressure on land, just to mention a few. The NSO projections show that Malawi´s labour force will more than double from 2.2 million people in 1977 to 4.8 million by 2002 (NSO,1984b).

The view that the heavy dependency burden placed upon the economically active population retard economic progress can however be challenged on the grounds that the burden is "lightened" by the early entry into the labour force by young children (those below 15 years of age) and late exit by the elderly (aged 65 years and above) who continue to work well after retirement age (Coleman,1978)3. We should recall, however, that children do very little work and that most of those above the age of 50 in Malawi like elsewhere in Sub Saharan Africa lack the required training essential in development projects. For example, according to the 1977 census 66 percent of the population above the age of 50 had never been to school, 0.3 percent had secondary education, 0.1 percent had university education and only

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2 Dependency burden refers to the ratio of the population aged below 15 and above 65 to the population aged 15-19, expressed per 100 population.

3 In Malawi the statute demands that people should retire at the age of 50 but because of the lack of skilled and experienced manpower more people continue working (for five or ten years or more!) after this age.

7 percent of the population could be said to be literate[4].

The dependency ratio shows considerable variations between the different regions in Malawi. Although this can be due to differences in fertility and mortality levels, the major reason appears to be migration. The districts of Blantyre, Zomba and Lilongwe have low dependency ratios due to heavy in-migration of the population of the working age groups. The opposite is true for the districts of out-migration of working males which have a very high dependency ratio.

The regional (and district) differentials (see Table 3.1A) in age composition may be explained in terms of differentials in age reporting and migration even though some of the disparities have to do with the differences in the levels of fertility and mortality. The effect of age misreporting is examined in this chapter while the influence of the last two is postponed until plausible estimates of fertility and mortality are presented.

The pattern of internal migration described in chapter I is likely to give rise to a higher proportion of population below age 15 and a lower proportion of population aged between 15-64 years in the Northern Region than in the Central and Southern Regions. Population aged 65 years and over may not be very much affected by migration following the tendency to return home after retirement and the small numbers reported in

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4 Literacy in this case refers to those who have had at least four years of formal education.

this age group. Table 3.1A appears to confirm this. For both censuses the proportion under 15 is highest in the Northern Region and lowest in the Southern Region. The slight increase in the proportion between 1966 and 1977 in the South may be attributed to the changing pattern of migration observed during the period between the 1966 and 1977 censuses in which Central Region surpassed Southern Region as the net importer of migrants5.

This interpretation does not fair very well when applied at district level. This may be due to population movements within the regions. However, in general terms, districts which are likely to attract more people from other districts in the region (or elsewhere in the country) as a result of the presence in those districts of agricultural or industrial establishments, tend to have a slightly lower proportion under the age of 15 and a higher proportion in age group 15-64. This is the case with the districts of Karonga, Nkhata Bay, Lilongwe, Salima, and Blantyre in both 1966 and 1977, Chikwawa in 1966 and Kasungu in 1977.

The districts of Nkhota Kota and Nsanje in 1966, and Mangochi in both 1966 and 1977, show the same features as outlined above. However, their cases cannot be entirely explained in terms of internal migration. To start with there is no reason why these districts should attract a lot of people from other areas. Admittedly, because of

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5 The effect of the changing pattern of internal migration on the age structure is also noticed when one examines the nature of the ASSRs. This aspect will be discussed is section 3.3.2.1 below.

its proximity to Likoma Island (see the map of Malawi in Figure 1.1), Nkhota Kota has traditionally provided "sanctuary" to some Islanders fleeing from floods. More recently, following the establishment of Dwangwa Sugar factory, there is an influx of people into Nkhota Kota.

In addition, beginning from the mid sixties, following the inception of the armed struggle in Mozambique in 1964 and the inevitable massacre of innocent civilians, a number of Mozambicans fled their country and settled in neighbouring districts in Malawi. No statistics are available to account for the numbers involved. In practice, it would have been rather difficult to assemble trustworthy information since most of the movements followed not only historical routes which were once used by "our" ancestors but were also based on people of the same ethnic group, in most cases governed by one traditional ruler but separated by political boundaries drawn up by the colonial masters. Fortunately, historical records do acknowledge these cross border movements as the following quotations illustrate:

> For the rest of 1964, though I kept on hearing that ... Frelimo soldiers, were infiltrating the more remote areas. Occasionally there were skirmishes with Portuguese troops, after which the near-by villagers would suffer. This in turn resulted in their flight to Tanzania or Malawi. (Paul,1975, p.114).

> The whole population of Cobue, ..., fled to Likoma Island. (ibid, 119).

> One thing, however, was quite clear, and that was that Likoma Island could not possibly absorb all these refugees. ... Eventually many of the refugees left to live in the other parts of Malawi (ibid,132).

A SKETCH MAP SHOWING THE POSSIBLE FLOWS OF MOZAMBICAN "REFUGEES"

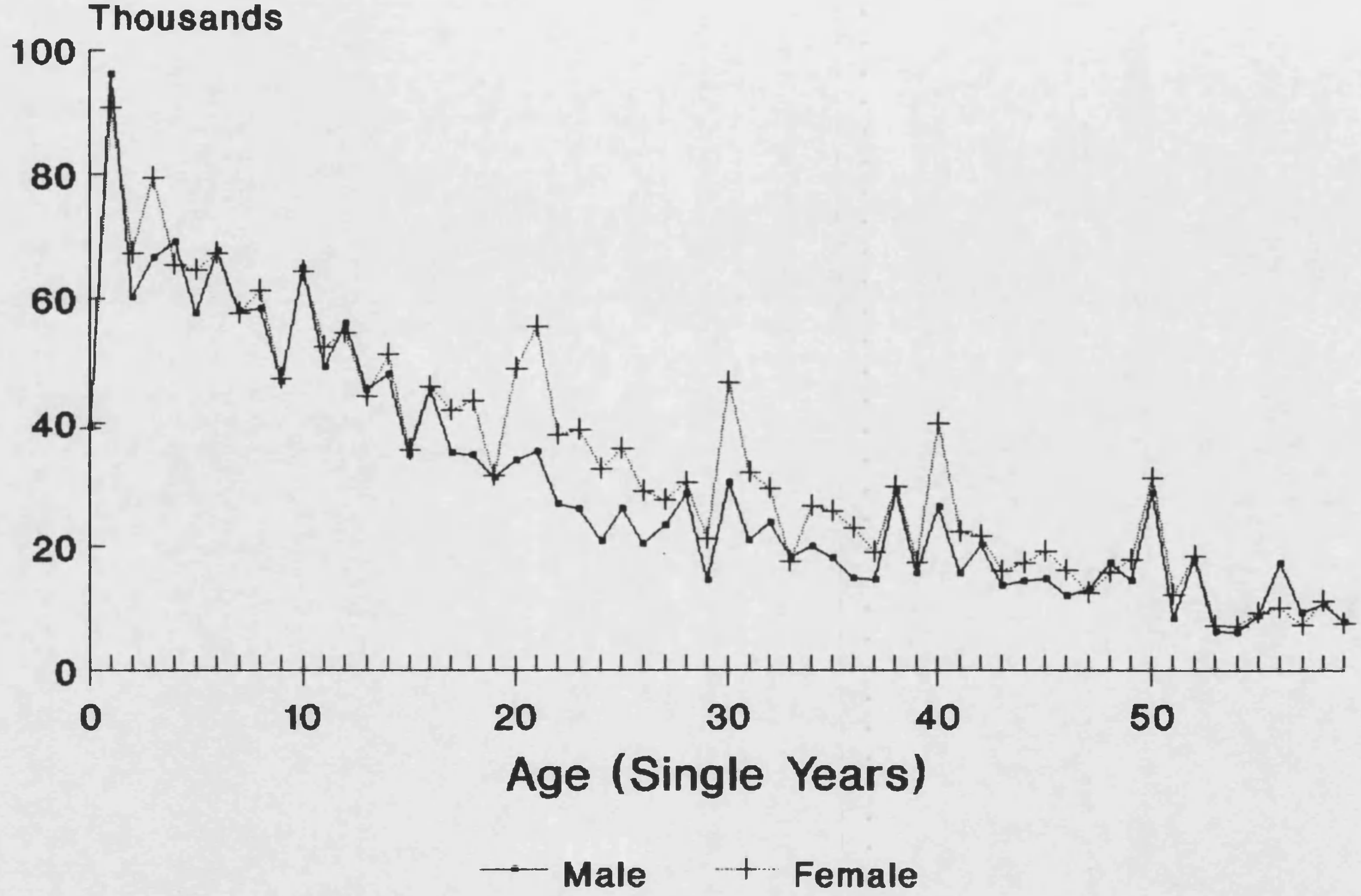
The commentator here is an Anglican missionary working on the Mozambican shores of Lake Malawi and his book is based on his personal account and experience in this area. It is a matter of speculation by this writer that similar stories could be reported in other areas where "the war of liberation" was being fought. According to the "war zones" (see Figure 3.1 above) it is clear that the districts of Nkhota Kota, Mangochi and Nsanje were within reach of the "refugees". In fact the 1966 census report notes the presence of refugees in Mangochi district (NSO,1966).

It must be noted that the effect of immigration from Mozambique is not limited to the above mentioned districts, but in general to the entire Southern Region; most parts of the Central Region, especially the Lake-shore area, the districts of Mchinji, Lilongwe, Dedza and Ntcheu and Nkhata-Bay in the Northern Region. For instance De Winter(1972) reported the existence of Mozambican refugees in Nkhata Bay district while Lindskog and Lindskog(1989) made a similar observation in the Chingale area in Zomba district. Therefore, considering the shape and size of the country, it is possible to argue that immigrants from Mozambique could be found anywhere in Malawi.

3.3 Single Year Age Distributions

FigureS 3.2 and 3.3A-C below shows the population distribution by single years of age and sex, for the 1970-72 MPCS, the 1977 census, and the 1982 MDS. The reports of the 1966 census and the 1984 FFS do not

Fig 3.2 Reported Male and Female
Distribution - Malawi 1972



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present age statistics by single years of age.

It is evident from these figures that there are certain irregularities in the reported age distributions. Population seems to be concentrated at some terminal digits, particularly those ending in 0 whereas other digits like 1 and 3 are avoided.

By applying Myers′ index to the data, it is found that the preferred digits were 0, 5, 8 and 9 in the 1977 MPC and 0, 2 and 8 in both the MPCS and the MDS (see Tables 3.3a-b and Figures 3.3A-C). There are sex differences in digit preference. The most favoured digit among the females was 0 in the 1970/72 MPCS and the 1977 MPC and 8 in the 1982 MDS whereas terminal digits 8 in 1970/72, 5 in 1977 and 2 in 1982 were popular among the males. The values of the index for males and females (in that order) were (14, 18) in the 1977 census declining to (10, 12) in the 1982 survey implying an improvement in the quality of age reporting. This is expected given the general increase in literacy levels observed in the population. Moreover the collective understanding of the concept of age by both the enumerators and respondents through repeated enumerations may have given rise to such improvements.

Table 3.2a

Patterns of Digit Preference and Avoidance and Myers Indices for Malawi 1977 and 1982

End Digit	1977 M	1977 F	1977 B	1982 M	1982 F	1982 B
0	+2.5	+4.5	+4.2	+2.5	+2.8	+3.2
1	-2.6	-2.5	-2.5	-1.9	-1.7	-1.7
2	-0.9	-0.9	-0.9	+1.5	+1.1	+1.1
3	-1.6	-1.6	-1.6	-0.7	-0.9	-0.9
4	-1.5	-1.7	-1.7	+0.0	-0.1	-0.1
5	+2.4	+1.6	+2.0	+0.0	-0.7	-0.7
6	-0.4	-1.0	-0.8	-0.6	-0.6	-0.6
7	+0.4	-1.0	-0.5	-1.7	-1.8	-1.8
8	+1.3	+1.8	+1.2	+1.1	+1.6	+1.6
9	+0.4	+0.9	+0.6	-0.3	-0.1	-0.1
Myers Index =	14.0	17.7	15.9	10.3	11.9	11.8

* calculated using age range 10-69 years.

Table 3.2b

Patterns of Digit Preference and Avoidance and Myers Indices for Malawi 1970-72, 1977 and 1982*

End Digit	1972 M	1972 F	1972 B	1977 M	1977 F	1977 B	1982 M	1982 F	1982 B
0	+3.0	+4.7	+3.9	+1.8	+3.6	+2.8	+1.8	+2.2	+2.0
1	-0.7	+1.2	+0.4	-2.5	-2.5	-2.5	-2.0	-1.9	-1.9
2	-0.9	+0.5	+0.7	-1.0	-0.9	-0.9	+1.3	+0.1	+0.7
3	-1.5	-1.8	-1.7	-2.1	-2.1	-2.1	-0.5	-0.9	-0.7
4	-1.2	-0.8	-1.0	-1.3	-1.5	-1.4	+0.1	-0.3	-0.1
5	-0.7	-0.5	-0.6	+2.5	+1.5	+2.0	+0.2	-1.0	-0.5
6	+0.0	-0.7	-0.4	-0.3	-0.7	-0.5	-0.2	+0.1	+0.0
7	-0.8	-1.5	-1.2	+0.6	-0.8	-0.1	-1.4	-1.5	-1.5
8	+2.3	+0.8	+1.4	+1.7	+2.2	+1.9	+0.9	+2.5	+1.8
9	-1.2	-1.8	-1.6	+0.1	+1.1	+0.9	+0.1	+0.6	+0.3
	12.4	14.3	12.3	14.4	16.8	15.1	8.4	11.1	9.5

* calculated using age range 10-59 years.

Fig 3.3b Myers' Index: Malawi 1977

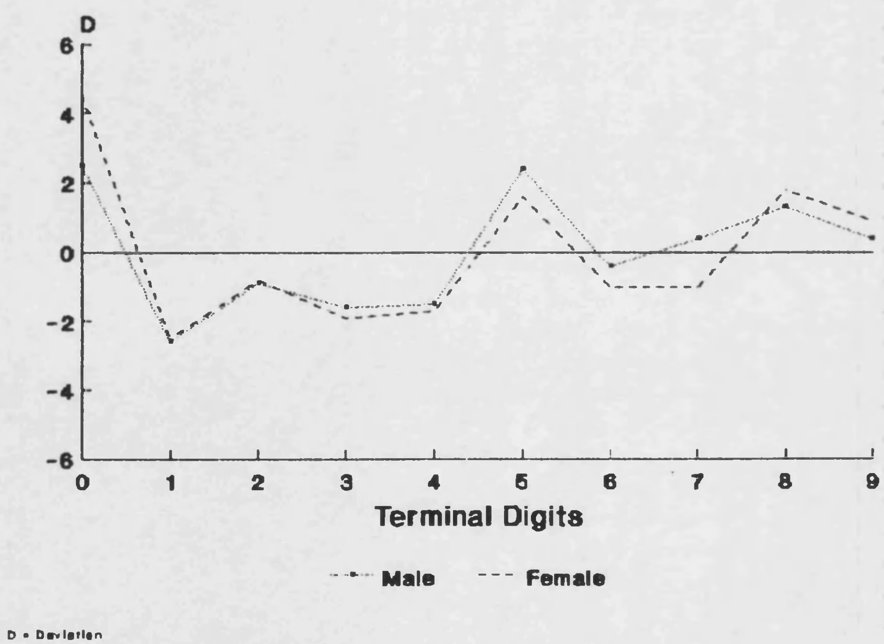


Fig 3.3a Myers Index: Malawi 1972

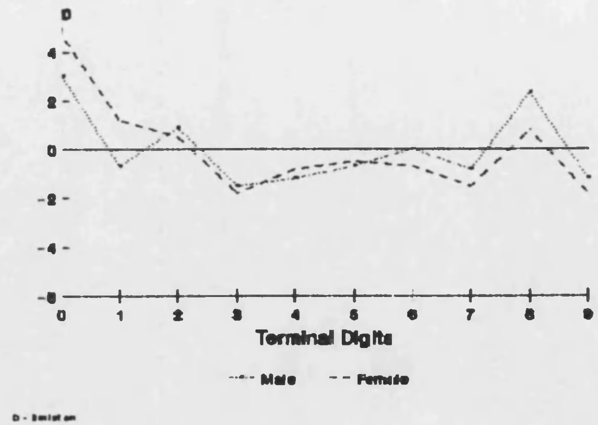


Fig 3.3c Myers' Index: Malawi 1982

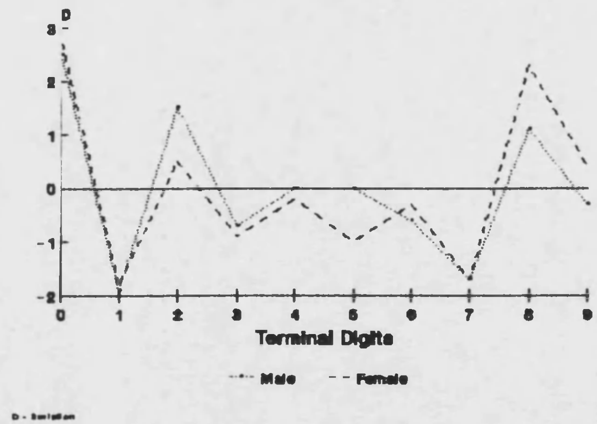


Table 3.2b presents the value of the Myers indices calculated over a comparable age range (10 - 59) for the 1977 MPC, 1970/72 MPCS and the 1982 MDS. The preferred digits in 1970-72 for (i) males were 0 and 2; (ii) females were 0, 1 and 2, and (iii) both sexes were 0 and 2. The most liked digits for both males and females was 0. Comparison of 1977 and 1982 values leads to the same conclusion as observed in the preceding paragraph. The same can be said of the 1970/72 and the 1982 results. However, examining the three sources together, the 1977 census appear to indicate enormous digit preference and no valid explanation is as yet available for this.

In general, the end digits 0 and 8 are preferred in all the data sources considered. The preference of digits 0, 2, 5 and 8 agrees very well with the findings from other developing countries (Carrier and Hobcraft,1971).

The preference of end digit 9 in general and that of 7, 8 and 9 in that order as seen in the male population in 1977 (see Table 1.2A-B and Figures 3.3A above) is rare though not unprecedented. For instance, the 1969 Zambian census show the preference of digit 9 (Ohadike and Tesfaghiorghis,1975) and Nagi et. al(1973) noted a slight preference for ages ending in 9 in Central African Republic, Swaziland and Botswana.

In the case of Zambia, Ohadike and Tesfaghiorghis tried to study this aspect further by examining the percentage of the population reported at each terminal digit in the 10 year age groups 0 - 9, 10 - 19, 20 - 29, and so forth, up to 60-69. The same procedure was applied to the Malawian data and the results not only confirms the liking of the terminal digit 9 but also further demonstrates that its preference was more apparent for the population beyond age 20 (see Table 3.3 below).

Table 3.3

Percentage Reporting at each end digit in each ten year age interval: MALAWI - 1977

Male

End Digit	0-9	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89
0	11.5	14.0	12.2	15.4	16.1	17.9	18.3	19.5	25.3
1	10.2	9.8	9.2	8.3	9.7	9.9	9.7	10.9	16.0
2	10.6	13.3	11.2	12.8	13.1	13.6	12.7	15.8	13.1
3	11.6	9.4	9.8	11.8	9.1	8.4	8.2	7.7	7.1
4	10.9	10.7	11.6	9.5	7.3	9.6	9.7	10.4	8.3
5	9.9	9.5	10.3	9.7	10.3	8.4	8.1	7.6	5.1
6	9.9	8.9	9.0	9.1	8.7	9.3	5.7	7.1	6.6
7	8.9	7.8	8.3	7.2	6.5	6.8	6.4	5.1	5.2
8	8.8	9.6	9.4	8.3	9.7	8.6	12.7	9.7	6.1
9	7.9	7.0	9.0	7.9	9.5	7.5	8.5	6.2	7.3
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Female

End Digit	0-9	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89
0	11.4	12.8	13.4	15.6	15.9	17.0	16.9	19.3	24.2
1	9.8	9.8	9.8	8.5	9.0	10.4	9.2	9.6	11.8
2	0.5	11.6	11.2	11.0	11.4	11.6	13.0	14.9	17.1
3	11.2	9.2	9.2	11.6	10.0	7.7	8.4	8.4	8.1
4	11.0	9.7	11.4	10.0	7.3	9.2	10.0	8.4	7.7
5	10.5	8.6	8.8	8.9	9.2	8.3	8.4	8.7	8.7
6	10.0	9.1	9.5	10.0	9.1	9.3	5.2	8.5	6.4
7	9.1	8.3	7.8	6.9	7.2	7.2	8.1	4.6	4.8
8	8.7	11.8	10.2	9.5	11.3	10.8	11.7	10.6	4.4
9	7.9	9.2	8.8	8.1	9.6	8.7	9.0	7.1	6.9
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Another measure of digit preference is given by Whipples' index. Table 3.4 presents the values of Whipples' indices for Malawi and its various sub-divisions (regional and rural-urban) and for selected countries. Since the 1970/72 data are tabulated up to age 60 years and over Whipple's index is incalculable. The indices for Males and females for both 1977 (132, 138) and 1982 (118, 111) reveal very rough reporting. Moreover, just as with Myers index above, comparisons between corresponding indices for the two sources indicate some improvement in the quality of age reporting, and the female population shows the greatest improvements.

Table 3.4

Whipple's Index by Sex for selected countries Malawi, Rural and Urban areas and Regions

		Male	Female	Both
Botswana	1971	125	122	123
Kenya	1969	158	159	-
	1979	146	163	-
Lesotho	1976	-	-	119
Swaziland	1966	139	131	-
	1976	132	130	-
Tanzania	1967	-	-	192
Zambia	1969	119	123	-
Malawi	1977	132	138	135
	1982	118	111	114
Rural	1982	117	111	113
Urban	1982	125	112	120
North	1977	130	138	134
Centre	1977	129	135	132
South	1977	136	137	137

With the exception of Whipple's indices for 1982, Tables 3.2 and 3.4 indicate that single year statistics are better reported for males than females. This observation could have arisen from the fact that most of the questions are answered by the heads of households, usually males, who though literate and able to state their age reasonably accurately, are ignorant about the true age of their wives.

Furthermore, and again contrary to expectation, Tables 3.2C and 3.4 also reveal that single year age statistics are better reported in rural than urban areas. Swembanje(1980) has noted the same in the case of Nigerian women. The rural-urban differentials are greater among females than males. In view of the dearth of information about this phenomenon explanation can only be speculative. Urban localities tend to attract a lot of people from the rural areas some of whom are illiterate and cannot accurately report their age. Since urbanites are in general regarded as relatively educated, well informed and more knowledgeable than their rural peers (or they treat themselves so until proved otherwise), they are not likely to admit that they do not know their age in case that will be interpreted to mean that they are not educated, illiterate or both. Hence they are forced to give the best guesstimate that comes to their mind. This appears more likely to occur among females than males.

Table 3.2C

Patterns of Digit Preference and Avoidance and Myers Indices for Malawi for Rural and Urban Populations

Urban areas

	1972 M	1972 F	1972 B	1982 M	1982 F	1982 B
0	+3.5	+4.0	+3.7	+2.6	+2.6	+2.6
1	-0.5	+1.8	+0.5	+2.6	+2.0	+2.4
2	+3.5	+2.6	+3.5	+1.4	+1.5	+1.4
3	-1.8	-1.6	-1.7	+0.7	+0.1	+0.4
4	-1.1	-0.7	-0.9	+0.1	+0.3	+0.1
5	+0.6	-0.2	+0.2	+0.8	+0.6	+0.2
6	-1.7	-2.1	-1.9	+0.1	+0.5	+0.3
7	-2.0	-1.0	-1.6	+1.5	+2.1	+1.8
8	+1.9	+0.3	+1.2	+0.9	+1.2	+1.0
9	-2.3	-3.1	-2.6	+0.7	+0.3	+0.5
Myers Index =	19.0	17.3	17.4	11.5	11.2	10.7

Rural areas

	1972 M	1972 F	1972 B	1982 M	1982 F	1982 B
0	+2.9	+4.8	+3.9	+1.8	+2.2	+2.0
1	-0.7	+1.2	+0.3	-2.0	-1.9	-1.9
2	+0.5	+0.3	+0.4	+1.3	+0.1	+0.7
3	-1.5	-1.8	-1.7	-0.5	-0.9	-0.7
4	-1.2	-0.8	-1.0	+0.1	-0.3	-0.1
5	-0.9	-0.5	-0.7	+0.1	-1.0	-0.5
6	+0.2	-0.5	-0.2	-0.2	+0.1	+0.0
7	-0.6	-1.6	-1.1	-1.4	-1.5	-0.5
8	+2.3	+0.8	+1.5	+0.9	+2.5	+1.8
9	+1.1	-1.7	+1.4	-0.1	+0.6	+0.3
Myers Index =	12.1	14.0	12.3	8.4	11.1	9.5

The 1977 census also permits the study of regional differentials in single year age statistics (see Tables 3.2D and 3.4). The Myers index for both males and females is lowest in the north (11, 15) and highest in the south (16, 19). The value for the centre being mid way (13, 17). In the case of the south its relative position is maintained when we examine the values obtained from Whipple's index while the centre and the north have swapped their positions (see Table 3.4).

Table 3.2D

Patterns of Digit Preference and Avoidance and Myers Indices for the three Regions of Malawi

	North			Centre			South		
	M	F	B	M	F	B	M	F	B
0	+1.9	+4.0	+3.0	+2.1	+4.4	+3.3	+2.9	+4.7	+3.9
1	-2.0	-2.1	-2.1	-2.6	-2.6	-2.6	-2.7	-2.5	-2.6
2	-1.3	-1.3	-1.3	-1.1	-0.9	-1.0	-0.7	-0.6	-0.7
3	-0.2	-1.2	-0.8	-1.5	-1.8	-1.7	-1.9	-2.2	-2.1
4	-1.3	-1.1	-1.2	-1.2	-1.5	-1.3	-1.8	-2.0	-1.9
5	+2.5	+2.0	+2.2	+2.2	+1.4	+1.8	+2.6	+1.6	+2.1
6	-0.7	-1.1	-0.9	-0.1	-0.7	-0.4	-0.6	-1.1	-0.9
7	+0.6	-0.7	-0.1	+0.5	-1.0	-0.3	+0.2	-1.1	-0.5
8	+0.3	+0.7	+0.6	+1.1	+1.6	+1.4	+1.6	+2.2	+2.0
9	+0.2	+0.7	+0.5	+0.5	+1.0	+0.7	+0.4	+0.9	+0.7
Myers Index =	11.0	14.9	12.6	12.7	16.9	14.4	15.6	19.0	17.2

Fig 3.5a Percentage Distribution for Malawi and Regions (Male): 1966

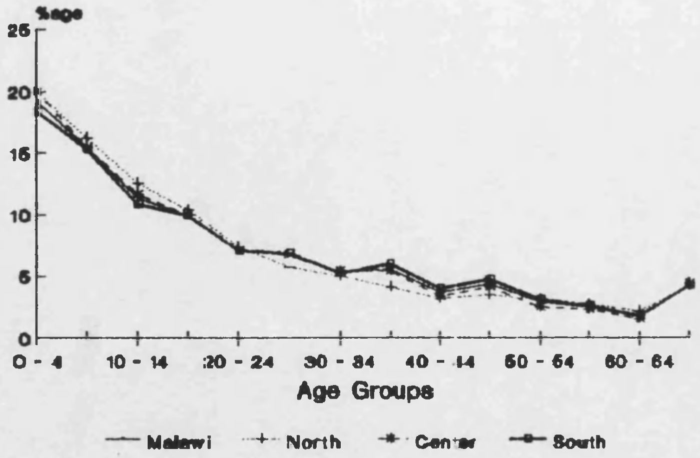


Fig. 3.5b Percentage Distribution for Malawi and Regions (Female): 1966

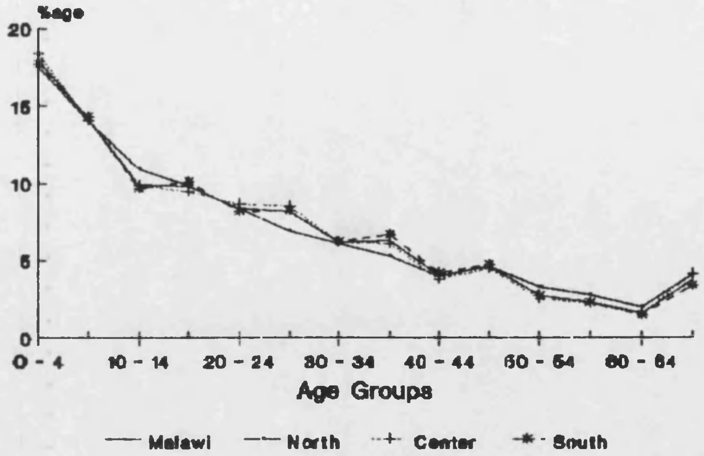


Fig 3.5d Percentage Distribution for Malawi and Regions (Females): 1977

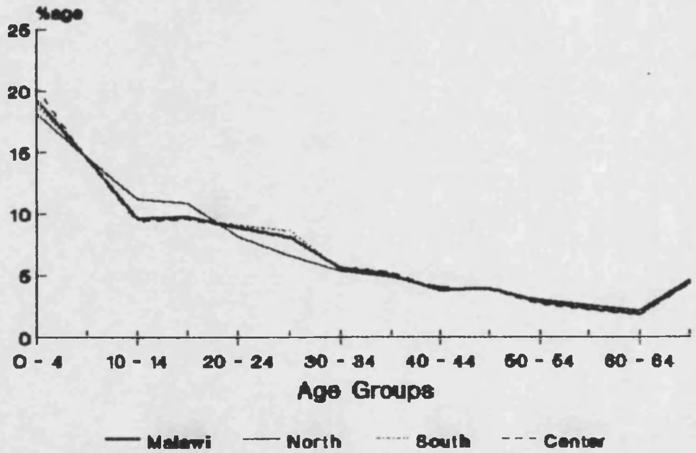
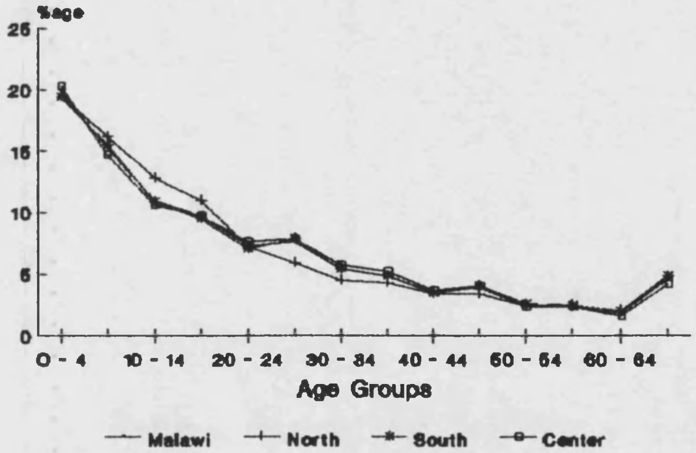


Fig 3.5c Percentage Distribution for Malawi and Regions (Male): 1977



3.4 Five Year Age Groups

Population distributions by the conventional five year age groups are presented in Tables S3.1 to S3.3 and Figures 3.4A-B. Clearly the usual assertion that grouping eliminates some of the distortions in age data is verified. However, the increase or slight decrease or near constancy observed between such neighbouring age groups as 10-14 and 15-19, 20-24 and 25-29, and 40-44 and 45-49 indicates the occurrence of certain irregularities.

Examining age statistics in this way, two observations can be made. Firstly, the 1966 census appears to be less distorted than the 1977 census because it has few anomalous age groups. Secondly, regional differentials appear to suggest that age distributions are less distorted in the Northern Region than in the other two regions while the distortions in the Central Region and Southern Region are similar. These remarks are derived from the fact that, for the Northern Region, the increase in the percentage distribution appears only in age group 40-44 in contrast to the Central and Southern Regions which in addition to this age group show increases in the other age groups. The same features are in general true for individual districts.

The following two points should however be borne in mind when examining the 1966 reported age distribution. Firstly, the "not stated" category were prorated although we are not given the formulae used. Secondly, as seen in appendix I, the 1966 MPC employed the "year of birth" question for obtaining age statistics. The "recorded" age was then determined by subtracting the reported year of birth from the date of the census. This meant that the "recorded" age was actually about four months younger than the "true" age for the whole population. The effect of this bias was likely to be the same in all the age groups. The possible exception being the younger age groups where, because of the large number of population recorded in these age group, proportionately more people are expected to be affected than in the older age groups.

Studies in other countries have established that age distribution obtained from the reported "year of birth" are less distorted than those obtained from "age in completed years" question. Probably this explains why age distortions are less pronounced in 1966 than 1977. In practice, however, there seem to be little distinction between the two. Frequently, one encounters that when respondents are asked to report their year of birth, they answer by giving their age. The opposite is also true. This finding prompted the Demographic Unit to include both questions in the same survey so that the reply is recorded under which ever column is appropriate6.

It must be noted that peculiarities at age group 15-19 where they exist, are more apparent in the female than male age distributions. In fact all the cases that show a noticeable percentage increase as one moves from age group 10-14 to age group 15-19 appear in the female age distribution. This may serve to suggest that whatever factors are responsible for this abnormality more pressure is exerted on females than males.

Furthermore the data shows a significant deficiency

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6 see the final version of the questionnaires used in the survey entitled The Traditional Methods of Child Spacing in Malawi which was jointly conducted by the Demographic Unit, University of Malawi and the Ministry of Health.

of males in age groups beyond 20 and in particular in the age range 20-39. This can be attributed to labour migration which is predominately masculine. The loss of males through migration is also reflected in the low values of the overall (general) sex ratio in the population. The overall sex ratio in Malawi was 90 males per 100 females in 1966 and 93 males per 100 females in 1977. Similar values for the 1970/72, 1982 and 1984 sample surveys were 89, 92, 95 males per 100 females respectively. The slight improvement of the general sex ratio as revealed in Table 3.5 below may be attributed to improvements in the quality of data or the reduction in labour migration. The overall effect of the latter would be to increase the proportion of the male population and Srivastava(1990) has demonstrated that this is indeed what is happening in the population of Malawi.

Table 3.5

Overall Sex Ratio For Malawi: 1911 -1987

Year	Sex Ratio*	Year	Sex Ratio*
1911	79	1966	90
1921	87	1972	89
1926	87	1977	93
1931	89	1982	92
1945	86	1984	91
		1987	95

Source: Calculated from various census and survey reports.
* males per 100 females.

The preponderance of females in the age group 20-34 may arise from the transference of females from age groups outside this range. This feature has also been observed in other African countries (Blacker,1969;

Swembenje,1980) and is usually attributed to the concentration of females towards the centre of child bearing age groups.

The most commonly used method of evaluating age reporting in five year age groups is the procedure advocated by the United Nations (United Nations,1952, 1955). This procedure involves calculating sex[7] and age ratios[8] separately. Age ratios are calculated for each sex and United Nations(1955) recommends that more reliance should be placed on sex ratio analysis because they are less affected by irregular population trends. To obtain a summary measure of the quality of age reporting a weighted mean of the average of age specific sex ratio (ASSR) and age ratio by sex is calculated. With the aim of trying to isolate the underlying causes the two components are examined individually before presenting the summary measures.

3.4.1 Sex Ratios

In a stationary population, sex ratios by age can be expected to decline gradually as age increases (see for example Table 3.10 below). At age zero, the beginning of life, the sex ratio is determined by the sex ratio at birth[9]. But since the actual population experiences some migration and growth, sex ratios will in general fluctuate more than the ideal condition outlined above. However, very wild fluctuations are usually attributed to

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7 Sex ratio is the number of males per 100 females, that is males divided by females multiplied by 100.

8 Age ratio is the ratio of the reported population in any given age group to the average of its two adjoining age groups.

9 Sex ratio at birth is defined as the number of male births per 100 female births.

differences in enumeration between the sexes unless the incidence of migration which tends to be both age and sex selective is very high.

Single Year Distribution

Sex ratios by single years of age and five year age groups are presented in Figures 3.6A-C. A close examination of these figures reveal a number of irregularities.

Firstly, the sex ratio by single year of age show a surplus of females at all ages ending in the preferred terminal digits. This feature is most pronounced at ages beyond 20 years. This seems to have resulted from the differential reporting of age by sex and in particular the less common digit preference in the case of males than females as observed in section 3.2.1 above.

Secondly, there is a relative surplus of females at all ages below age 15 except the age group 10-14. Although insufficient data exists to show relative age-sex selectivity in favour of males, it is possible to claim that this feature is a consequence of more females in age group 10-14 being recorded in the next higher age group (age group 15-19), probably arising from their marital status or inception of motherhood. This may be the case especially in a society like that of Malawi where entry into marriage and the beginning of motherhood occur early in life. This feature is common in African data[10] and it is also found in other developing countries[11].

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10 See for example Blayo and Blayo(1971).

11 Vietamese data presented in Feeney(1990) appear to show this feature.

Fig 3.6a: Age Specific Sex Ratios (Single Years) - Malawi 1972

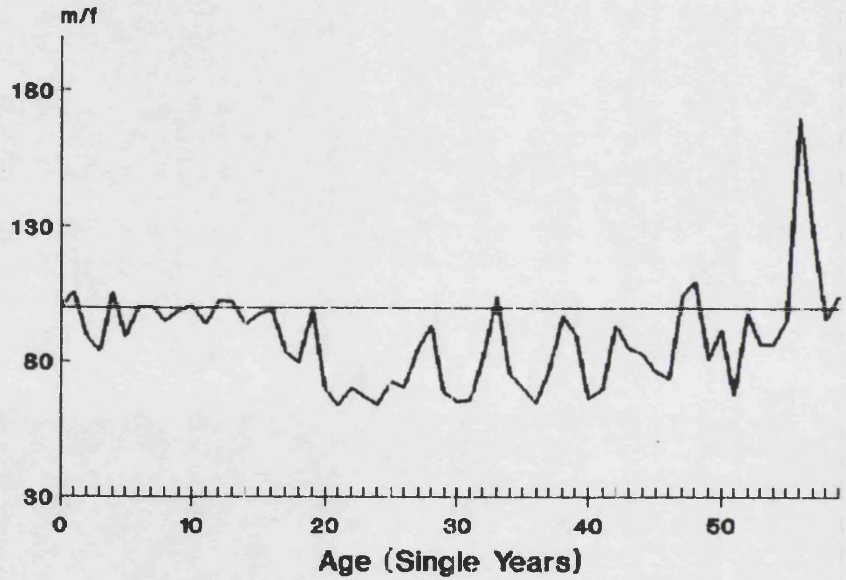


Fig 3.6b: Age Specific Sex Rations (Single Years) - Malawi 1977

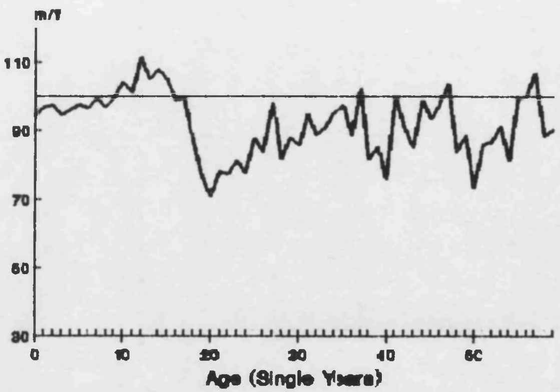
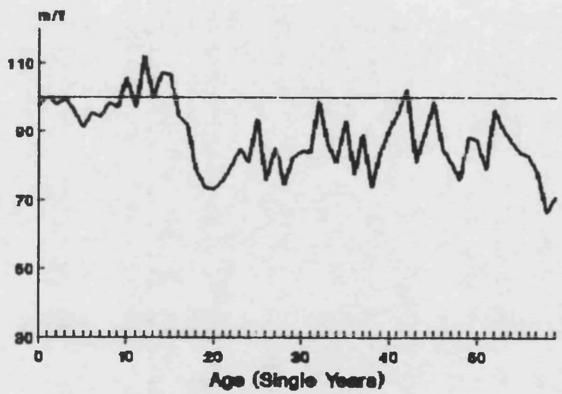


Fig 3.6c: Age Specific Sex Ratios (Single Years) - Malawi 1982



Thirdly, there seem to be a gradual increase in the ratio between age groups 0-4 and 5-9. This may arise from male children aged 0-4 being under-enumerated, or female children aged 0-4 over-enumerated or infant and child mortality being higher among females than males. As we shall see in the next chapter, the limited statistics available on sex differentials in mortality indicate that females enjoy a relatively lower mortality than males. This suggests that the last supposition is almost certainly incorrect and the phenomenon is a consequence of age misreporting.

Moreover, looking at the population reported at each terminal digit in the age group 0-10 (see Table 3.3 above) one notices high percentages for the males on end digits 0, 1, 2 and 3 whereas percentages are higher for the females on terminal digits 4, 5, and 6. This pattern of digit preference results in more males than females recorded in age group 0-4 and the situation is reversed in age group 5-9. This probably stemmed from the tendency to estimate the age of the respondents based on physical body developments. That this approach of age estimation was used can be deduced from the following quotation:

> Another useful exercise for pupils in standard 1, 2 or 3 is that of hand over head to see if the pupil can manage to touch the top of the ear on the opposite side of the head. If the hand goes beyond the top of the ear, the child is over five, and if he cannot touch the ear, he is under five years. (NSO,1977, p.8).

Since females in general appear to grow faster than males they may have been assigned a higher age than they actually are.

Lastly, there is a relative shortage of females at older ages: say over 50 years in the 1970/72 survey and over 60 years in the 1977 census. This may again be indicative of age exaggeration which is more common among elderly males than females.

Five Year Age Groups

The reported sex ratios in five year age groups indicate an increase in the first three age groups rising above 100 in the age group 10-14, followed by a rapid fall up to age group 20-24 and a very gradual increase throughout the middle and advanced age groups. Occasionally the sex ratios for the older age groups (above 50 years) rise above 100 (see Figure 3.5D).

The overall pattern resembles that reported in other African countries (see Table 3.6a and Figure 3.7b below), except that in Malawi the deficiency in the male population appears over a prolonged age interval and persists up to very advanced ages. Two factors may be suggested to account for the "apparent" loss of males: excess male mortality or permanent migration. Conclusive evidence can be found for neither of these suppositions.

We have noted in chapter I that migrant labourers from Malawi are found in South Africa, Zimbabwe and Zambia among other places. Two issues arise from this. Firstly, in the case of South Africa, there has been at least one period in the past when the recruitment of mine labour from Malawi was banned on the grounds that labourers from Malawi have very high mortality (Coleman,1978). Secondly, for those who are eventually recruited, it is possible to argue that conditions in their working and living environments (say in the mines) could give rise to excessive levels of mortality. Thus it may indeed be true that adult male mortality is quite high in Malawi. Moreover this may not be surprising given that the observed levels of social and economic indicators are quite low in comparison with the neighbouring countries. Unfortunately, despite all these, the available data in Malawi indicates that female supremacy in mortality persists into adulthood and the sex differentials are in line with the other countries: thus implying that excess male mortality may not be the factor.

Table 3.6a

ASSRs for Selected African Countries

	Kenya		Tanzania		Ghana	Liberia	Gambia
	1969	1979	1967	1978	1960	1974	1973
0-4	101.4	100.0	98.0	96.0	99.1	102.5	98.8
5-9	102.6	100.2	101.0	98.0	100.9	104.8	101.1
10-14	107.7	102.6	111.0	103.0	105.3	115.5	107.5
15-19	102.8	96.2	90.0	96.0	81.4	90.5	90.9
20-24	95.1	93.5	70.0	79.0	84.9	81.2	92.1
25-29	85.0	95.0	81.0	87.0	88.8	80.2	90.5
30-34	93.9	98.2	89.0	91.0	103.5	81.7	99.8
35-39	95.2	89.2	102.0	98.0	99.3	103.0	110.4
40-44	96.0	95.5	94.0	92.0	112.5	117.0	108.1
45-49	105.3	98.6	109.0	103.0	107.1	125.0	133.9
50-54	95.2	95.7	97.0	98.0	115.8	129.5	120.4
55-59	112.2	104.6	106.0	117.0	105.9	151.4	166.4
60-64	108.4	98.3	94.0	98.0		129.9	127.1
65+	117.9	120.0	-	115.0			

	Zambia		Swaziland		Botswana			Mozambique
	1969	1980	1966	1976	1964	1971	1981	1980
0-4	96.2	101.7	94.2	95.4	96.8	96.8	100.0	95.7
5-9	99.2	97.0	97.6	98.5	99.1	98.6	100.0	97.3
10-14	106.9	95.8	99.7	97.7	104.0	96.8	96.0	115.0
15-19	93.8	91.4	94.2	82.5	98.9	88.5	87.0	105.2
20-24	69.8	89.2	67.9	65.4	85.5	83.6	71.0	76.7
25-29	77.3	89.0	78.4	69.2	90.4	90.1	73.0	79.9
30-34	80.6	89.0	82.6	78.4	89.3	92.2	79.0	81.1
35-39	97.9	87.5	104.9	88.1	94.8	87.4	82.0	80.3
40-44	100.9	90.8	88.9	90.7	91.5	93.5	86.0	90.2
45-49	110.9	95.8	96.7	97.3	107.1	92.5	87.0	99.8
50-54	109.9	108.3	104.2	88.9	103.4	100.8	89.0	100.5
55-59	154.9	111.8	102.4	90.7	105.3	93.5	85.0	102.2
60-64	113.4	109.5	90.3	95.3	103.1	90.1	98.0	92.0
65+	132.3	115.0	86.5	82.6	93.5	88.2	79.0	-

Source: calculated by author using data compiled from various issues of Demographic Yearbooks.

Fig 3.7a Age Specific Sex Ratios for Malawi (1966 - 1984)

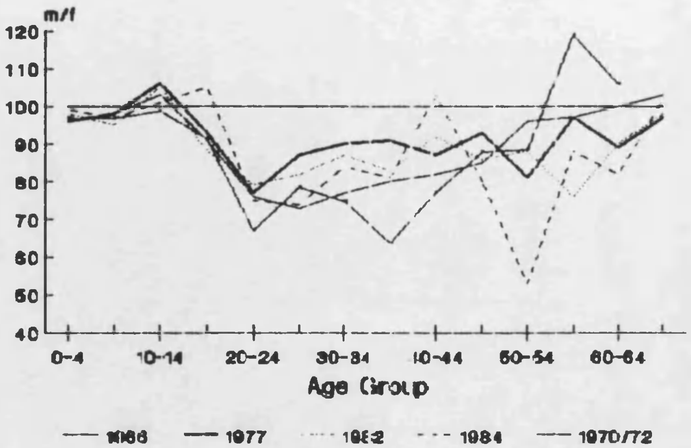


Fig 3.7b Age Specific Sex Ratio For Selected Ccountries

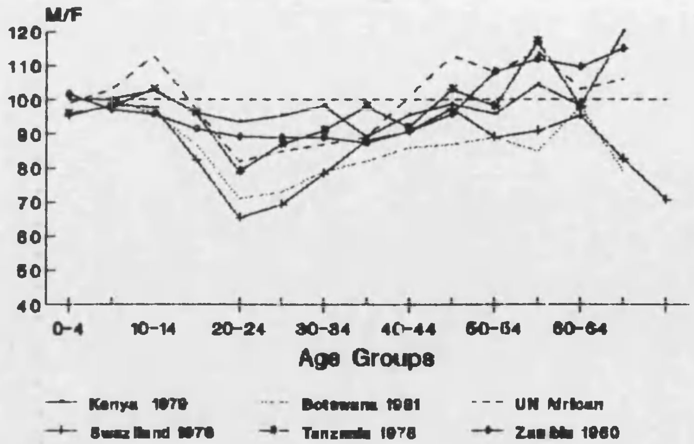


Fig 3.7c: Age Specific Sex Ratios for Malawi and Regions - 1966

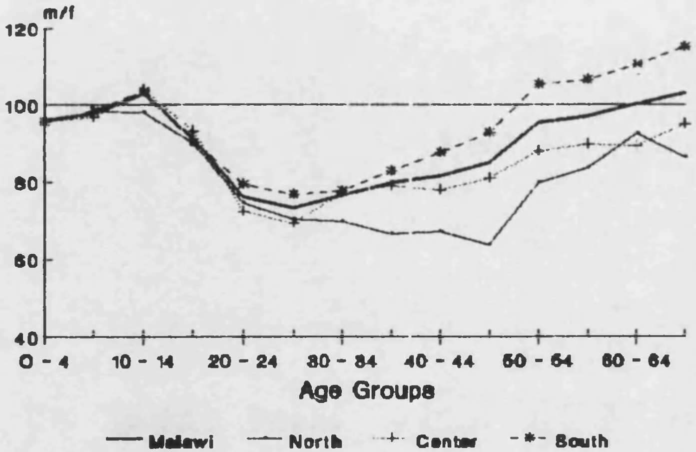


Fig 3.7d Age Specific Sex Ratios for Malawi and Regions: 1977

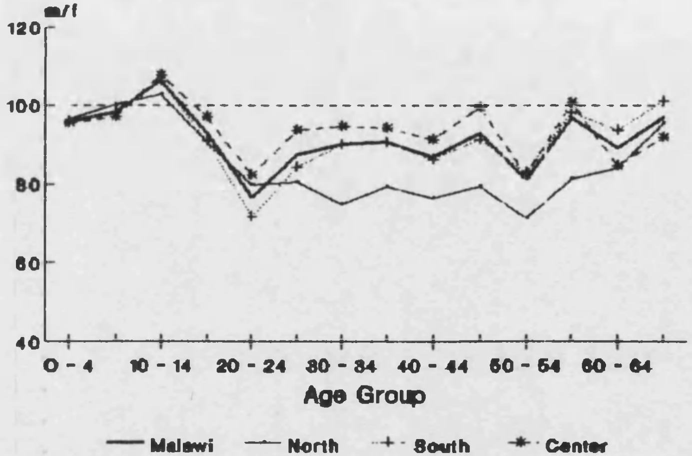


Fig 3.7G Age Specific Sex Ratio:
Rural areas (1972-1984)

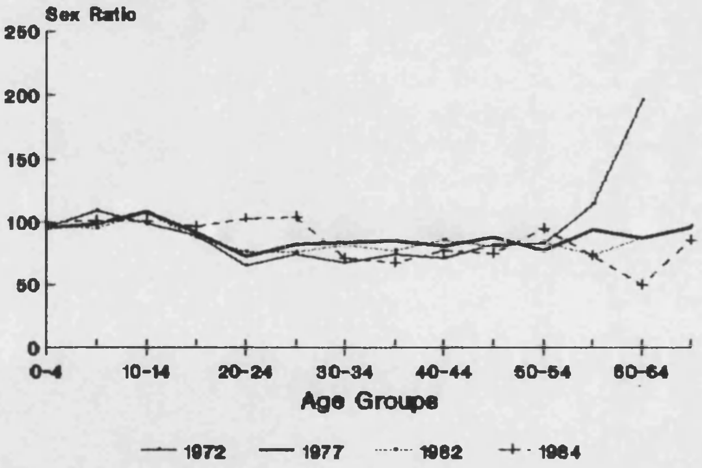
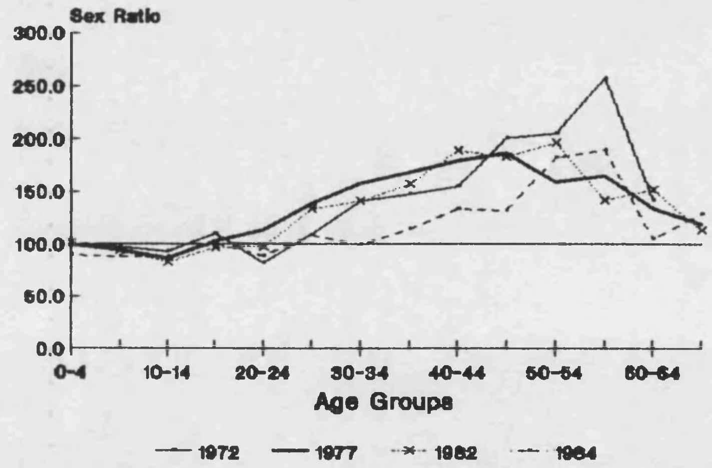


Fig 3.7H Age Specific Sex Ratio:
Urban Areas (1972-1984)



It is equally possible that a large proportion of migrants remain outside the country. In view of the absence of sufficient data required to support this claim, suffice it to say that the on-going conflict that exists over the reporting and interpretation of labour statistics between Malawi and the receiving countries may be a reflection of this phenomenon (see appendix III).

The consistency of the above described pattern in the two censuses and the three sample surveys (see Figure 3.5D) probably suggests that the same underlying causes are operating in all the data sources. The small differences observed may be attributed to sex differentials in enumeration, the incidence of migration, age misstatement and sampling errors in the case of the demographic surveys. Nevertheless, some of the differences are worth commenting on.

The 1984 ASSRs show an increase in age group 15-19 instead of age group 10-14 as seen in the other sources of data. This may be due to over-enumeration of males in the 15-19 age group, omission or under-reporting of females in the 15-19 age group or the transfer of women in this age group to the next higher age group. Apparently there is nothing in the male distribution to suggest that in this age group males were over-enumerated. The second and third factors may have taken place as a result of the survey being conducted during the months of May and June when most males and females in the age group 15-19 were at school and thus faced a greater chance of being omitted and under reported. However there are no reasons to make us believe that the likelihood of this error is higher for the females than males, since the analysis of the sex ratio for children ever born by the age group of the mother indicate no preferential reporting of children of one sex relative to the other (see chapter IV). If anything, because of high school attendance rates for males, more males than females should be expected to be affected by this error. In addition, seminar proceedings on the "Value of Children in Malawi" suggest that parents in the country give equal preference to male and female children although in one family some sort of a "mixture" of the two sexes is desired (Demographic Unit,1987).

In the case where the respondents (or enumerators) had to estimate their age (the age of the females) based on physical and biological factors such as marital status and the number of children they have, it appears that they may have reported (or assigned) a higher age than they actually are. This resulted in females in age group 15-19 being shifted into age group 20-24. Also this may have been a deliberate undertaking (either on the part of the respondent or the enumerator) so as to include the females in the individual survey. The fact that more females were recorded in age group 20-24 than in age groups 15-19 and 25-29 probably confirms this assertion.

The very low sex ratio at age group 50-54 may be due to the transfer of females (males) in age group 45-49 (50-54) to age group 50-54 (45-49 or 55-59) or age group 55-59 to age group 50-54 or a combination of these. These cases may have originated from a premeditated attempt by either the respondent or enumerator in their desire to avoid the inclusion of females in age group 45-49 and males in age group 50-54 in the individual survey.

The fact that more females were reported in age group 50-54 further suggest that the former was more likely than the latter.

The slight upward shift noticed in the 1977 ASSRs, especially in age range 20-45, may be a consequence of the common belief concerning an increase in the inflow of "return" migrants. Thus the zig-zag nature of the ratios may be attributed to the fact that most of these were not educated and could not state their age correctly.

In addition since the 1977 census took place three months after the lifting of the ban imposed in 1974 on the bureau responsible for recruiting migrant labourers for the South African mines, this sort of explanation fails to account for the effect the ban might have on the sex ratios. There is some evidence to suggest that after the ban a more stringent criterion was employed by the Malawi Government to attest for migrant labourers. As a consequence of this, few individuals are now leaving the country (see Appendix III).

Moreover, the slight improvement in the ASSRs may simply be a reflection of (i) the reduction in the number of "new" migrants arising from the presence of alternative employment within Malawi; (ii) the reduction in the number of labour contracts issued in a single year; and (iii) the obvious difficulties in the present-day situation to leave one country (and enter a foreign country) without proper documentation (passport, visa, work permit, medical certificates)12. There is some

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12 One of the arguments often encountered in the literature is that a large number of labour emigrants leave Malawi unregistered. There is no doubt that because of the "artificial boundaries" some unregistered cross-border movements do take place. The argument presented in

evidence to suggest that, the foreign countries which (up to the time of independence in 1964) were "traditionally" centres of attraction to Malawians, have over the years, implemented policies that tend to discourage foreign labour immigrants (Smith,1969; Boeder,1974) and encourage "internalization" of the labour force. More recently, the South African mines, preferred to recruit labour from the "homelands" rather than from the independent African states13. Commenting on this aspect Mare and Hamitton(1989,58) noted:

> The need to recruit mine labour locally, i.e in South Africa had been forced on the industry by a number of factors, including the liberation of Mozambique. In 1974 only 22% of the mine's labour force came from within South Africa, while by 1981 a full 60% were recruited within the country.

On the assumption that the fluctuations observed in the sex ratios are solely explained by age mis-reporting and differences in enumeration procedures, and accepting that the reported pattern of ASSRs is the same in both censuses and sample surveys, one may argue that the number of migrants who actually returned back home in the early seventies may not be as "large" as the available literature tend to suggest. Given that most labour migrants are males, the "return migration" phenomenon would end up increasing not only total male population but also the reported ASSRs, especially for age groups above age 25. Apparently, this feature is absent in the data.

The overall pattern of ASSRs is the same in all the

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this paragraph is simply that with the changing social and political environment the numbers involved has certainly declined.

13 For a detailed discussion on this aspect see Milazi(1984).

regions and the slight differences can be explained in terms of internal migration (see Figure 3.7c-d). With the exception of a low sex ratio for the age group 10-14 in the 1966 census in the Northern Region, the values for the age groups below age 25 are similar for all the regions in both the 1966 and 1977 censuses. After age 25 the sex ratios for both Central and Southern Regions show a gradual increase, a feature which is noticed in the Northern Region after age 50. The explanation for this seems to lie in the fact that up to this age the Northern region continues to send people to work in either the Central Region or the Southern Region. A very rapid increase in the Southern Region in 1966 and in the Central Region in 1977 probably indicates the net effect of migration being in favour of the former in 1966 and the latter in 1977.

The same pattern of ASSRs is also noticed at the district level (see Tables S3.7 and S3.8). The only exception arises in urban localities and districts having facilities to attract people from other districts. The districts are Blantyre in 1966 and Blantyre, Lilongwe, Kasungu and Mchinji in 1977. The ASSRs for these localities resembles the general pattern described above up to age 25 after which the ratios increase with age.

To summarize the analysis of the sex ratio, UN Sex Ratio Scores were calculated and these are presented in Table 3.5 below. The sex ratio scores indicate that the quality of data for Malawi as a whole has been getting poorer and poorer at each succeeding enumeration. Regional differentials reveal that the quality of data is better reported for the Northern Region in contrast to

Central and Southern Regions. The regional differentials are however very small in the case of the 1966 census. Although the quality of data (as measured by sex ratio score) deteriorate in all the Regions, the decline is more pronounced in Central and Southern Regions than in the Northern Region. Moreover, the districts which show the largest increase in sex ratio score (Mzimba in the North; Kasungu, Ntchisi and Mchinji in the Centre; Mulanje, Chikwawa and Nsanje in the South) have either been observed to have experienced substantial in-migration or are likely to be affected by large influx of people from Mozambique. It is therefore tempting to attribute the observed changes in the sex composition of the population to changes in the structure of the population which has been caused by migration rather than errors in age reporting. At the national level, it can be suggested that the way migration has affected the reported age distribution may be more in terms of a reduction in the number of people leaving the country than the influx of return migrants.

3.4.2 Age Ratios

Age ratios are expected to be close to 100 and any deviation from this is an indication of the presence of age errors. Age ratios greater than 100 represents over-enumeration at that age or age group. In the case of under enumeration the ratio is less than 100. Thus, viewed in this way, age ratios serve as measures of net age mis-reporting. Age ratios for the two censuses and three sample surveys, are presented in TableS S3.10-14 and summary age ratio scores are presented in Table 3.7A-B.

The overall pattern in the two censuses is the same.

Age groups 5-9, 15-19, 25-29, 35-39, 45-49, 55-59, are over- enumerated and the rest are under enumerated. The 1972 and 1982 sample surveys indicate over-enumeration at age groups ending in digit 4. In case of the 1977 census where age statistics are tabulated by single years, this is certainly due to the concentration of the population at the preferred end digits in these age groups (NSO,1984a). For the 1966 census, what can be inferred from this observation is the likelihood that the same end digits were preferred, especially end digit 5.

The degree of fluctuation in age ratios increases with advancing age and is higher among males than females. This underlines the fact that age mis-reporting occurs more often at older ages: as it is at these age groups where most people are likely not to know when they were born and thus cannot state their age accurately. The pressure to exaggerate one′s ages in the case of males is also higher in advanced age groups.

3.4.3 UN Joint Age Sex Score

The UN Joint Age and Sex scores (UN score) presented in Table 3.7 represent summary measures of age distortions and merely confirms what has already been said in the preceding paragraphs. The UN has provided two standards for explaining these scores. United Nations(1952) suggested that if the joint score is less than 20 then the distribution is accurate, if the score lies between 20 and 40 then the distribution is inaccurate, otherwise for scores above 40, as in the case of Malawi as a whole, the age distribution is highly inaccurate. United Nations(1955) further recommended that the age ratio of 2.6 for males and 2.4 for females and the sex ratio score of 1.5 implying a joint score of 9.5 should be accepted as a minimum standard. Thus, by any standard, the age distributions for Malawi are highly distorted reflecting very rough reporting. The overall quality however, is comparable to that found in neighbouring countries and is expected for a developing country (see Table 3.7a).

Regional differentials show that the age distributions for the Northern Region are the least distorted, followed by the Central Region and the Southern Region in that order. This pattern is expected given that the level of literacy is high in the Northern Region (see chapter II for details). In addition, the mere fact that western education has a long history in Northern Region following the pioneering work of Scottish missionaries, may further imply that the understanding of the "western concept of age" together with the various social stigma attached to it are very well established and understood in this region than elsewhere in the country. Thus one expects good knowledge and reporting of one's age in this region.

The very process of "age estimation" which in certain cases involves estimating the age of one member of the household with some precision and then reckoning the age(s) of the other member(s) relative to the first one is likely to work better in the Northern Region than in the other regions. This stems from the fact that the probability of finding one member of a household who can estimate his/her age with some precision is higher in this region than in the remaining two regions. The following quotation indicates that this method of age estimation was used in Malawi:

> once a year of birth for one child in the family is known and the difference (which might be given in terms of ... two or three rain seasons) is known, there can be some association from one year of birth enabling the dates of birth of the other children of that family and also their cousins living near them to be determined. (NSO,1977,p.7).

Table 3.7A

Sex and Age Ratio Scores and UN Joint Age-Sex Score: Malawi, Regions and Districts

	1966 SEX SCORE	1966 AGE SCORE M	1966 AGE SCORE F	1966 UN SCORE	1977 SEX SCORE	1977 AGE SCORE M	1977 AGE SCORE F	1977 UN SCORE
Malawi	5.5	15.1	16.1	47.6	8.3	15.1	9.9	49.5
Northern Region	5.3	5.5	7.4	28.6	5.9	9.5	6.2	33.2
Chitipa	8.4	8.2	8.2	41.6	8.3	12.0	10.8	47.6
Karonga	5.9	7.6	8.2	33.5	5.8	9.5	7.9	34.8
Nkhata Bay	9.3	6.5	10.7	44.9	6.9	9.6	7.1	37.4
Rumphi	6.1	8.3	4.9	31.6	6.1	9.6	3.8	31.8
Mzimba	4.9	6.3	8.7	29.8	6.7	9.4	5.6	35.3
Central Region	5.9	16.4	16.5	50.6	8.8	16.5	9.2	52.9
Kasungu	7.0	9.9	13.8	44.5	10.8	15.8	8.2	56.4
Nkhota Kota	7.4	18.2	18.7	59.2	7.8	14.4	11.0	48.5
Ntchisi	8.2	12.5	9.8	46.9	11.4	15.3	10.9	60.3
Dowa	6.8	20.0	21.8	62.2	9.9	18.4	12.0	60.0
Salima	7.5	21.5	24.5	68.4	9.3	14.4	12.4	54.6
Lilongwe	6.5	18.0	20.8	58.4	8.6	17.0	10.6	53.3
Mchinji	7.1	12.3	12.1	45.8	11.0	17.2	9.6	59.6
Dedza	6.9	17.3	17.0	55.0	9.9	18.1	10.1	57.8
Ntcheu	8.2	11.3	5.7	41.5	9.4	17.0	9.5	54.6
Southern Region	5.8	17.0	18.2	52.7	8.8	15.7	11.4	53.4
Mangochi	10.8	24.9	33.2	90.6	11.2	15.7	13.2	62.4
Machinga	8.5	21.4	22.4	60.7	9.8	16.7	14.3	50.6
Zomba	5.4	16.7	13.9	41.4	8.2	15.5	11.3	43.2
Chiradzulu	7.8	13.9	11.9	49.1	9.8	14.7	8.8	53.0
Blantyre	5.2	11.4	8.4	35.5	8.7	11.4	8.2	45.9
Mwanza	-	-	-	-	9.8	17.2	9.5	56.2
Thyolo	6.2	15.4	17.2	51.1	8.5	15.2	12.1	52.7
Mulanje	8.3	17.3	18.9	61.0	10.3	18.4	13.1	62.2
Chikwawa	6.9	17.9	21.7	60.3	10.4	19.9	14.0	65.0
Nsanje	8.4	22.2	21.0	68.4	11.7	21.9	14.9	71.7

Table 3.7B

Sex and Age Ratio Scores and UN Joint Age-Sex Score: Malawi 1970-72, 1977 and 1984

		SEX SCORE	AGE SCORE M	AGE SCORE F	UN SCORE
	1966	5.5	15.1	16.1	47.6
	1972	6.9	8.8	16.0	45.6
Total	1977	8.3	15.1	9.9	49.5
	1982	9.0	9.6	6.6	43.3
	1984	14.7	6.5	15.5	66.1
	1972	11.3	13.5	2.9	68.4
Rural	1977	9.0	15.8	10.4	53.2
	1982	7.6	8.5	6.2	37.4
	1984	14.7	7.4	16.1	67.6
	1972	8.6	8.7	17.7	52.5
Urban	1977	13.4	11.7	9.4	61.3
	1982	18.1	9.6	9.5	73.4
	1984	23.7	4.7	15.9	90.6
Blantyre City	1977	17.6	12.2	10.2	75.2
Lilongwe City	1977	22.3	13.3	10.6	90.7

Table 3.7C

Sex and Age Ratio Scores and UN Joint Age-Sex Score for selected African Countries

		Sex Score	Age Score Male	Age Score Female	UN Joint Age Sex Score
Botswana	1981	4.6	3.2	4.7	21.7
Sudan	1973	9.2	17.7	20.6	65.2
Egypt	1975	8.1	11.2	14.2	49.6
	1976	11.1	15.7	8.5	52.1
Lesotho	1966	10.0	9.7	6.5	39.2
	1976	9.2	8.6	5.5	34.4
Mozambique	1980	7.7	12.3	13.1	48.5
Swaziland	1966	9.5	22.6	15.4	66.6
	1976	7.4	10.1	6.1	38.3
Tanzania	1967	12.0	16.1	15.1	67.5
	1978	9.1	10.1	8.8	46.1
Zambia	1969	12.3	13.0	7.6	57.4
Zimbabwe	1982	13.7	8.6	8.7	48.5

3.5 Stable Population Analysis

Stable population analysis has been widely employed in the analysis of demographic data from the developing countries. This has stemmed from the observation that in most of these countries fertility has been constant and mortality decline has been gradual. As mentioned earlier, in common with the other countries, there have been no major fluctuations in fertility and mortality in Malawi. Moreover, mortality decline appears to have been slow. Consequently, there are reasons to believe that the population of Malawi is stable or at least quasi-stable. The only condition of stability which may not be appropriate for Malawi is migration. But on the assumption that emigration and immigration cancel each other, the overall effect of migration may be assumed to be negligible. Furthermore, the nature of migration that characterize Malawi (labour migration) affects mainly the male population in the economically active age groups. Thus, whatever the case, the female population can be regarded to be stable.

The procedure employed in this section involves estimating a series of birth rates at a given level of mortality, in our case mortality level 13 (an arbitrary choice) of an appropriate stable population model (West family of Coale-Demeny set) that have the same proportion under age x, C(x), for any age x (x = 5, 10, 15, 20, ..., 65) as the population in question14. Ideally under the assumption of stability, the estimated birth rates are supposed to be constant. Higher birth rates indicate a

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14 For a detailed description of the procedure see UN(1983).

high concentration of respondents in the respective age groups and lower birth rates show the opposite. Thus the extent of age mis-reporting is reflected in the degree of inconsistency in the series of the estimated birth rates over the age groups15.

Table 3.8A

Proportion of Population under age X, C(X) and the implied birth rate based on West Model Level 13: Malawi 1970-72 MPCS

	Male		Female	
AGE	C(X)	BR(X)	C(X)	BR(X)
5	0.1760	0.4350	0.1572	0.3888
10	0.3190	0.4481	0.2941	0.3968
15	0.4546	0.4663	0.4166	0.4044
20	0.5479	0.4485	0.5078	0.3910
25	0.6216	0.4268	0.6060	0.4035
30	0.6796	0.4028	0.6720	0.3918
35	0.7381	0.3919	0.7418	0.3980
40	0.7856	0.3760	0.7946	0.3944
45	0.8322	0.3700	0.8486	0.4061
50	0.8691	0.3578	0.8861	0.4037
55	0.9039	0.3513	0.9212	0.4118
60	0.9318	0.3401	0.9421	0.3951

Source: calculated from 1970/72 survey.
Notes: C(X) = proportion under age X
BR(X) = estimated or implied birth rate.

15 The method was applied at national level since it was felt that at both regional and district levels, the reported age statistics are greatly affected by migration. Hence the assumption of stability could not be expected to hold at these levels.

Table 3.8B

Proportion of Population under age X, C(X) and the implied birth rate based on West Model Level 13: Malawi 1966 and 1977 MPC

	1977				1966			
	Male		Female		Male		Female	
AGE	C(X)	BR(X)	C(X)	BR(X)	C(X)	BR(X)	C(X)	BR(X)
5	0.198	0.513	0.180	0.486	0.191	0.495	0.192	0.451
10	0.350	0.505	0.322	0.471	0.346	0.497	0.337	0.444
15	0.460	0.475	0.421	0.428	0.460	0.474	0.433	0.411
20	0.558	0.462	0.520	0.420	0.560	0.465	0.531	0.406
25	0.631	0.440	0.604	0.420	0.631	0.440	0.619	0.401
30	0.707	0.440	0.686	0.428	0.698	0.427	0.700	0.410
35	0.761	0.426	0.748	0.419	0.750	0.409	0.756	0.407
40	0.811	0.417	0.810	0.414	0.806	0.409	0.807	0.420
45	0.846	0.395	0.851	0.401	0.842	0.388	0.845	0.411
50	0.885	0.391	0.897	0.401	0.886	0.393	0.884	0.428
55	0.910	0.366	0.924	0.388	0.915	0.379	0.912	0.421
60	0.934	0.347	0.947	0.371	0.940	0.367	0.936	0.414
65	0.953	0.318	0.963	0.353	0.957	0.341	0.955	0.391

Source: Calculated using 1966 and 1977 censuses.
Notes: See Table 3.8A above.

Table 3.8C

Proportion of Population under age X, C(X) and the implied birth rate based on West Model Level 13: Malawi 1982 MDS and 1984 FFS

	1982				1984			
	Male		Female		Male		Female	
AGE(X)	C(X)	BR(X)	C(X)	BR(X)	C(X)	BR(X)	C(X)	BR(X)
5	0.200	0.521	0.187	0.471	0.193	0.500	0.177	0.443
10	0.366	0.535	0.346	0.487	0.368	0.539	0.341	0.479
15	0.488	0.518	0.453	0.456	0.504	0.605	0.464	0.472
20	0.579	0.492	0.547	0.441	0.597	0.520	0.545	0.438
25	0.655	0.473	0.635	0.441	0.667	0.491	0.629	0.434
30	0.719	0.457	0.707	0.437	0.723	0.464	0.699	0.427
35	0.777	0.450	0.768	0.436	0.777	0.451	0.758	0.420
40	0.820	0.433	0.815	0.428	0.824	0.440	0.810	0.420
45	0.858	0.418	0.853	0.415	0.861	0.422	0.843	0.396
50	0.888	0.397	0.885	0.403	0.887	0.395	0.873	0.376
55	0.916	0.382	0.914	0.395	0.910	0.366	0.912	0.387
60	0.935	0.351	0.938	0.380	0.934	0.348	0.937	0.378
65	0.957	0.337	0.959	0.374	0.955	0.330	0.960	0.379

Sources: calculated from 1982 MDS and 1984 FFS.
Notes: See Table 3.8A above.

Fig 3.8a Estimated Birth Rates for
Malawi (1966 - 1984): Male

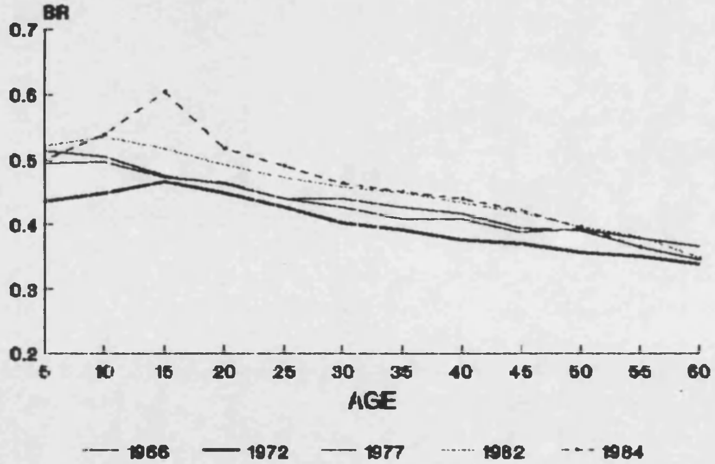
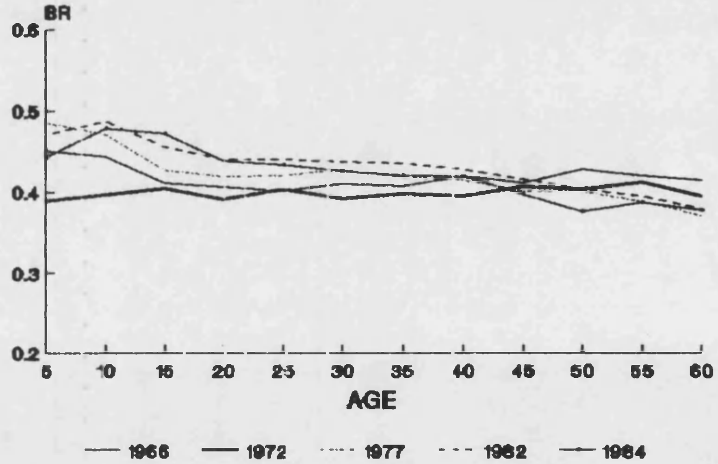


Fig. 3.8b Estimated Birth Rates for
Malawi (1966 - 1984): Female



Both Tables 3.8A-C and Figures 3.6A-B show that the estimated birth rates based on the female population are more inconsistent than those based on the male population (as measured by the degree of fluctuations). On the one hand, this could be attributed to good knowledge and statement of one's age by the male respondents - as noted in the analysis of single year age statistics. On the other hand, the estimated birth rates based on the male population reveal a rather suspicious pattern. They indicate a higher concentration at childhood ages followed by a progressive decline (punctuated by some rise and fall) thereafter implying age over-estimation.

Several factors could be suggested to account for this pattern. Firstly, the stable population model used to estimate the birth rates may not be appropriate for the population under study. However, in view of inherent problems in the reported age statistics, the determination of a stable population model that best fits the data may not be an easy exercise; in the absence of detailed mortality statistics any vigorous attempt to provide such a model is likely to be an unprofitable venture[16]. Secondly, male labour migration discussed earlier in the chapter, may not only destabilize the population, thereby giving rise to implausible results but may also, because of its age selectivity, produce such a pattern as a genuine reflection of age reporting in Malawi (for the non-migrant male population).

The "spurious" rise in estimated birth rate for the age group 15-19 in the case of males in the 1984 FFS,

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16 This aspect will be examined in depth in the next chapter.

suggest a possible over-enumeration at this age group. No other evidence is available to substantiate this finding. But, if it is indeed true, it is consistent with the finding in section 3.3.2.1 of a high sex ratio for the age group 15-19.

A detailed examination of the female birth rates show a slightly higher concentration at childhood ages, followed by a deficiency at adolescent age, a slight concentration at the childbearing ages and some ups and downs at older ages. This type of age mis-reporting is common in many other African and South East Asian countries and resembles the "Afro-Asian" pattern of age mis-reporting which was identified and described by United Nations(1967,19) as characterized by "a surplus at 5-9, and a deficit in the adolescent age intervals (10-14, 15-19) followed by a surplus in the central ages of childbearing 25-34". The possible explanation for such a pattern of age mis-reporting, as United Nations(1967,p.19) rightly puts it, lies in the fact that "the entered age on the interview schedule was (is) often an estimate made by the interviewer" and is probably influenced by (i) a tendency to over-estimate the age of young children in the age group 0-4 (ii) a tendency to exaggerate the ages of the 10-14 if they have passed puberty, particularly when they are also married and to underestimate the ages of those who have not reached puberty; and (iii) a tendency to over-estimate the ages of women (15-34), probably to coincide with people's expectations and perceptions as regards to age at marriage and motherhood (United Nations,1967).

The above analysis also demonstrate that for both males and females, and for the various censuses and surveys, the estimated birth rates show similar patterns of distortions suggesting not only the absence of major improvements in the quality of age statistics but also a possibility that the same source of biases were operating in all the sources of data examined.

3.6 Graduated Age Distributions

3.6.1 Selection of Stable Population Model

The analysis in the preceding section has shown that a substantial proportion of ages are wrongly reported for both males and females and that males report their ages relatively better than females. However, female age distribution is found to be a better source for smoothing out age distributions and selecting a stable population model since it is less affected by migration and its age misreporting follows the typical pattern found in Sub-Saharan Africa.

To select the stable population model that best fits the recorded population, the cumulated proportion by age, C(X), were compared with the equivalent stable population value, Cs(X) for various models. The mean of the squared deviation of the stable, from the reported age for each of the models, was then calculated and the model which gave the least mean squared deviation was selected. The calculations were restricted to ages up to age 50 since the analysis in section 3.3 above have shown excessive distortions at the advanced age groups. The results of this exercise are presented in Table 3.9 below.

Table 3.9

The values of the Mean Squared Deviation of the stable population from the reported population for various stable population models and data sources

stable population model		level	Year of census/survey 1966	1970	1977	1982	1984
Coale and Demeny		9	1.04	1.17	0.88	0.86	1.36
		10	1.20	0.93	0.82	0.98	1.43
	West	11	1.39	0.75	0.82	1.13	1.54
		12	1.61	0.63	0.84	1.33	1.69
		13	1.86	0.53	0.91	1.54	1.86
		9	0.81	1.37	0.75	0.70	1.30
		10	0.97	1.07	0.68	0.80	1.34
	North	11	1.16	0.85	0.66	0.95	1.44
		12	1.38	0.69	0.69	1.44	1.57
		13	1.63	0.58	0.71	1.35	1.73
		9	1.02	1.03	0.68	0.89	1.46
		10	1.23	0.82	0.67	1.05	1.56
	South	11	1.49	0.66	0.72	1.25	1.70
		12	1.76	0.57	0.89	1.49	1.89
		13	2.05	0.52	0.99	1.74	2.10
		9	0.99	0.52	0.80	0.89	1.59
		10	1.02	0.50	0.74	1.05	1.66
	East	11	1.05	0.49	0.70	1.25	1.76
		12	1.92	0.53	0.89	1.49	1.95
		13	2.17	0.49	0.99	1.74	2.13
Brass (2 parameter)			1.22	0.86	0.78	1.03	1.51
SELECTED MODEL			North 9	East 11	North 11	North 9	North 9

Notes: (1) The underlined values represents the least square deviation in each set of stable population model.

(2) Brass stable population refers to population models published by Carrier and Hobcraft(1971) using Brass model life tables and the African standard. Attempts to use three parameter model were rather frustrating since no model was found which fitted the characteristics of the population of Malawi. In such situations Carrier and Hobcraft(1971) recommends the use of one parameter model.

(3) The 1970-72 MPCS is the only source which suggest that the east family of the Princeton MLT may be relevant for Malawi. This deviation could be attributed to the somewhat "odd" age distribution recorded in

the 1970-72 MPCS.

(4) The implied stable population models for 1966 (level 9) and 1977 (level 11) may be suggestive of the relevance of the UN model of mortality decline: a change from one level to another every five years. The fact that level 9 is again implied by 1982 and 1984 age distribution may further imply the worsening of mortality after the mid seventies. However, one has to be careful with sampling variations and age errors. This pattern of mortality decline will be explained in greater detail in the next chapter.

As seen in Table 3.9 above the differences between the various stable population models are so small that the interpretation of the results becomes trivial. The selected model also varies from one data source to another. This phenomenon has been observed in other African countries (Ekanem and Som, 1984) and can be attributed to the varied distortions in the reported age statistics which counteract with the different assumptions upon which the stable population models are based. However, using this procedure, the north family of Coale and Demeny set of stable population models appears to fit the reported age distribution better than any of the models considered. This stems from the fact that in all cases but one, the north family gives the least mean squared deviation. In addition, within this family, level 9 gave the least squared deviation in three of the four cases (1966 MPC, 1982 MDS and 1984 FFS). Therefore, this level was chosen as a base of smoothing and adjusting the study population. Other researchers have also observed the relevance of level 9 (Ramachandran,1979). Table 3.10 below presents the selected and implied standards for the female and male population respectively, together with the calculated standard set of ASSRs.

Table 3.10

Standard Percentage Distribution of "Selected" Female and "Estimated" Male Populations and ASSR

Age Group	Male	Female	M/F*
	(1)	(2)	(3)
0 - 4	17.83	17.91	96.68
5 - 9	14.18	14.33	96.09
10 - 14	12.16	12.29	96.07
15 - 19	10.41	10.52	96.03
20 - 24	8.76	8.91	95.45
25 - 29	7.30	7.50	94.56
30 - 39	6.07	6.27	94.02
35 - 39	5.03	5.21	93.68
40 - 44	4.11	4.29	93.02
45 - 49	3.33	3.53	91.55
50 - 54	2.61	2.84	89.34
55 - 59	2.00	2.24	86.73
60 - 64	1.44	1.67	83.92
65+	0.92	1.17	76.44

Notes: (1) = (2) x (3) x 1.03
(2) = obtained from Coale and Demeny stable population model level 9.
(3) = calculated from Coale and Demeny stable population model, north family, level 9.

A comparison of the reported population with the selected standard confirms certain observations made earlier in the chapter (see Table 3.11). Firstly, the ratios are close to one indicating the closeness of the reported distribution to the standard. Secondly, the values of the ratio for age group 0-4 suggest that either a greater number of female infants are under-enumerated or are reported in the next higher age group 5-9. After a drop in the ratio noticeable in age group 10-14 or 15-19 they show a slight increase reaching a local maxima in the age group 25-29 or 30-34. This may be taken as confirmation that females are pushed towards the centre of the childbearing period. The ratios for the age groups above 50 years (inclusive) are usually greater than one indicating the tendency for age exaggeration in older age groups.

Table 3.11

A Comparison of the Reported and Standard Age Distributions

	1966		1970/72		1977	
	M	F	M	F	M	F
0-4	1.10	1.07	0.95	0.88	1.01	0.99
5-9	0.98	1.01	0.93	0.96	0.97	1.15
10-14	0.95	0.78	0.96	1.00	0.98	1.00
15-19	0.95	0.93	0.99	0.87	0.99	0.77
20-24	0.96	0.99	1.02	1.10	0.95	0.95
25-25	0.98	1.08	1.06	0.88	1.03	0.93
30-34	1.01	0.89	1.09	1.11	1.05	0.94
35-39	1.04	0.97	1.11	1.01	1.08	1.02
40-44	1.07	0.88	1.16	1.26	1.10	0.75
45-49	1.11	1.12	1.18	1.06	1.13	0.84
50-54	1.15	0.99	1.22	1.24	1.15	1.39
55-59	1.21	1.04	1.25	0.93	1.18	1.12
60-64	1.30	1.14	1.28	1.09	1.22	1.39
65+	3.01	3.75	2.89	3.26	2.74	3.26

	1982		1984	
	M	F	M	F
0-4	1.11	1.04	1.16	0.99
5-9	0.99	1.11	0.98	1.15
10-14	0.95	0.87	0.95	1.00
15-19	0.94	0.90	0.94	0.77
20-24	0.95	0.99	0.95	0.95
25-25	0.96	0.96	0.99	0.93
30-34	0.98	0.98	0.98	0.94
35-39	1.01	0.90	1.01	1.02
40-44	1.04	0.87	1.04	0.75
45-49	1.01	0.92	1.08	0.84
50-54	1.12	1.04	1.12	1.39
55-59	1.17	1.04	1.17	1.12
60-64	1.24	1.29	1.24	1.39
65+	2.98	3.34	2.98	3.26

3.6.2 Graduation of the Reported Age Distribution

Brass' "logit difference" was used to graduate the female age distribution. The procedure involves calculating the logits of the proportions under ages 5, 10, ..., 65, for both the reported and standard populations denoted as Y(X)17 and Ys(X), respectively, and then plotting Y(X) against Ys(X). A straight line of the form

$$Y(X) = \underline{a} + \underline{b}.Ys(X) \quad \ldots\ldots \quad (i)$$

where a and b are coefficients; Y(X) and Ys(X) are as defined above is then fitted to the points. The coefficients of the line were calculated using "group average" and least squares methods. The results of this exercise are presented in Table 3.12 below.

Table 3.12

The Values of a and b using "group average" and least squares for Malawi (1966 - 1984)

	"group average"		least squares	
	a	b	a	b
1966	0.0200	0.9222	0.02	0.9132
1970	0.0780	0.9655	0.08	0.9732
1977	0.0432	0.9622	0.04	0.9567
1982	-0.0021	0.9132	-0.00	0.9225
1984	0.0100	0.8971	0.01	0.9046

In both cases, the values of a and b are very close to 0 and 1 respectively indicating that the population was already close to the standard. The two methods of calculating a and b give very similar results and there is no way one can prefer one method relative to the

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17 $Y(X) = 0.5 \ln \left(\frac{1-C(X)}{C(X)} \right)$

where C(X) is the cumulated proportion of population under age X.

other. In this study however we have used the values obtained from the "group average" method.

Substituting the estimated values of a and b and the standard logits into equation (i), the graduated logits, were obtained from which the graduated female age distribution was derived (first, the cumulated proportions were obtained by making them the subject of the formulae in the definition of the logit and then the proportions for each age were obtained by subtracting successive cumulated proportions; these were then multiplied with the enumerated female population to get the graduated age distribution for the females). The graduated male age distribution was obtained from the graduated females, by applying a set of standard sex ratios obtained from the Coale and Demeny North family at level 9 combined with a sex ratio at birth of 103 male births per 100 females (see Table 3.8). The results of this exercise for the country as a whole and for male and female respectively are given in columns (2) and (4) of Table 3.13.

Table 3.13α

A Comparison of the Reported and Adjusted Age Distributions for Malawi: 1966

	Reported		Adjusted	Graduated	
	Male	Female	Male	Male	Female
	(a)	(b)	(c)	(d)	(e)
0-4	366,133	382,092	404,211	404,211	405,915
5-9	295,618	301,988	284,889	284,889	287,846
10-14	217,541	211,394	226,687	238,494	241,020
15-19	191,727	209,870	180,353	204,040	206,287
20-24	135,958	178,485	137,546	173,940	176,923
25-29	127,786	174,242	119,370	148,025	151,981
30-34	100,849	131,735	106,875	126,214	130,332
35-39	106,501	133,554	99,509	107,587	111,500
40-44	69,716	85,317	83,649	90,827	94,799
45-49	83,329	98,061	69,468	76,160	80,766
50-54	55,219	57,777	58,768	62,099	67,484
55-59	47,722	49,106	47,943	49,565	55,484
60-64	33,228	33,155	36,828	37,447	43,322
65+	81,935	79,545	57,167	57,167	72,608
	1,913,262	2,126,321	1,913,262	2,060,665	2,126,267

Table 3.13b

A Comparison of the Reported and Adjusted Age Distributions for Malawi: 1970-72

	Reported		Adjusted	Graduated	
	Male	Female	Male	Male	Female
	(a)	(b)	(c)	(d)	(e)
0-4	331,353	342,180	356,419	356,419	357,921
5-9	288,349	298,040	280,580	280,580	283,492
10-14	263,359	266,591	233,149	246,451	249,061
15-19	181,257	198,498	190,642	217,330	219,723
20-24	143,224	213,841	147,877	188,881	192,121
25-29	112,694	143,714	130,299	162,583	166,929
30-34	113,626	151,889	117,576	139,365	143,912
35-39	92,214	114,971	109,738	118,838	123,161
40-44	90,530	117,517	91,853	99,941	104,311
45-49	71,743	81,747	75,622	83,162	88,192
50-54	67,599	76,375	63,288	67,041	72,855
55-59	54,178	45,547	50,870	52,697	58,990
60++	126,049	119,047	38,341	39,039	45,164
	6,240	7,180	56,160	56,160	71,330
	1,942,415	2,177,137	1,942,415	2,108,489	2,177,162

Table 3.13c

A Comparison of the Reported and Adjusted Age Distributions for Malawi: 1977

	Reported		Adjusted	Graduated	
	Male	Female	Male	Male	Female
	(a)	(b)	(c)	(d)	(e)
0-4	528,550	551,566	500,531	500,531	502,640
5-9	408,644	416,669	383,690	383,690	387,672
10-14	293,848	276,800	321,713	330,753	334,256
15-19	260,816	280,018	269,047	287,183	290,345
20-24	194,803	254,149	218,506	246,370	250,596
25-29	203,824	233,239	187,843	209,782	215,389
30-34	145,086	161,081	163,408	178,214	184,029
35-39	131,581	144,989	144,667	150,851	156,338
40-44	94,683	109,000	120,617	126,113	131,627
45-49	105,322	113,341	99,328	104,452	110,769
50-54	65,768	81,076	81,359	83,910	91,186
55-59	64,704	66,808	64,556	65,797	73,655
60-64	48,820	54,771	48,205	48,679	56,317
65+	122,239	126,150	70,119	70,119	89,059
	4,901	4,214			
	2,673,589	2,786,443	2,873,878	2,673,589	2,873,871

Table 3.13d

A Comparison of the Reported and Adjusted Age Distributions for Malawi: 1982

	Reported		Adjusted	Graduated	
	Male	Female	Male	Male	Female
	(a)	(b)	(c)	(d)	(e)
0-4	585,960	596,873	636,832	636,832	639,516
5-9	484,893	509,682	435,313	435,313	439,831
10-14	356,335	340,280	346,043	359,038	362,840
15-19	266,171	301,261	277,963	304,033	307,380
20-24	221,187	281,598	217,228	257,282	261,695
25-29	188,622	230,226	186,272	217,809	223,631
30-34	170,907	196,480	163,772	185,056	191,094
35-39	124,752	150,480	148,508	157,398	163,123
40-44	109,541	119,291	124,842	132,742	138,546
45-49	88,403	103,335	103,942	111,307	118,039
50-54	82,807	94,049	87,183	90,849	98,728
55-59	56,627	74,583	70,875	72,659	81,336
60-64	61,939	68,925	54,388	55,069	63,710
65+	140,059	130,516	85,043	85,043	108,015
	2,938,203	3,197,579	2,938,203	3,100,431	3,197,484

Table 3.13e

A Comparison of the Reported and Adjusted Age Distributions for Malawi: 1984

	Reported		Adjusted	Graduated	
	Male	Female	Male	Male	Female
	(a)	(b)	(c)	(d)	(e)
0-4	562,693	565,568	642,647	642,647	645,355
5-9	511,543	527,000	430,920	430,920	435,393
10-14	395,232	391,812	344,422	359,440	363,247
15-19	272,633	259,667	274,243	304,374	307,725
20-24	203,048	270,331	211,277	257,570	261,989
25-29	163,915	222,326	181,604	218,053	223,881
30-34	158,034	188,074	160,664	185,264	191,308
35-39	137,301	169,722	147,300	157,574	163,306
40-44	106,263	103,275	123,760	132,891	138,702
45-49	76,430	95,305	102,919	111,431	118,171
50-54	67,189	126,141	86,714	90,951	98,838
55-59	70,694	80,311	70,678	72,741	81,428
60-64	61,526	74,278	54,343	55,131	63,781
65+	130,128	127,346	85,139	85,139	108,136
	2,916,629	3,201,164	2,916,629	3,104,127	3,201,259

* The small difference observed between the reported and adjusted female populations, may be attributed to rounding.

The male population graduated in this way exceeds the reported population by 7.7 percent in 1966; 8.5 percent in 1970-72; 4.2 percent in 1977; 5.5 percent in 1982; and 6.4 percent in 1984. It is tempting to look at the graduated male population as representing the population that would be expected in absence of labour emigration. Hence the difference can be assumed to portray the number of labour migrants. This is especially true for the census data. The demographic surveys appear to give larger and implausible estimates of migrants in view of the trend outlined in the preceding paragraphs which imply a decline in labour migration. It seems likely that for the demographic surveys the estimates are affected by sampling variations.

Due to lack of necessary data, it is difficult to examine the credibility of these estimates. The only (migrant) labour statistics available are for the South African mines since South Africa was the only country having some agreements with Malawi in so far as the recruitment of migrant labour was concerned[18]. However, in 1966, in conjunction with the census, an endeavour to compile a register for Malawians outside the country was made. Each adult male and head of household was asked whether or not he or she has relatives outside Malawi and for each "independent" relative "reported" some information related to his/her personal characteristics was requested. Altogether, 266,000 persons (244,000 males and 22,000 females) were reported as resident abroad, of which about 10 percent were permanently settled while 67 percent were not. As for the remaining 23 percent, respondents were not sure whether they were permanently settled or not. Of these, however, 11 percent were reported to have maintained close contacts with relatives at home. If we treat all those whose residential status is not known as a "loss", in so far as the population of Malawi is concerned and hence include them in the permanent settled category, then we end up with 178,000 absentees of which 163,000 were males and 15,000 were females. The estimate 163,000

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18 This is certainly true for the period under review (1964 to 1984). But as we have seen the agreement was temporarily withdrawn between 1974 and 1977. In addition, after 1977 it is possible to claim that the government was no longer enthusiastic to send its people to the mines (see appendix III which reveals low levels of attestment after the 1974 accident).

is compatible with the 147,000 absentees estimated from the 1966 census, particularly if it can further be argued that the 1966 register was likely to over-state the actual level of "absenteeism". This could have happened as a result of the loose nature of defining relatives abroad vis-a-vis the social kinship structure based on the extended family system and more than half a century of mass emigration of "able bodied men", a good number of whom never returned. For example, even up to now, it is not surprising to find that President Kaunda of Zambia and Zimbabwe's Finance Minister Dr Chidzero, whose fathers originated from Malawi[19], still have some relatives in the country. Indeed in the case of the former, it is significant to note that the Life President of Malawi had this to say:

> You take President Kaunda, for example. If by any chance he lost his job there, I would say: come back to Nkhata Bay. ... He, so far as I am concerned belongs here[20].

It is worth noting that Mlia and Srivastava(1990), using an entirely different approach and logic, came to the same conclusion that the reported figure of 266,000 absentees was an over-estimate. In its place they have suggested that 150,422 males and 12,034 females were absent from Malawi in 1966. Similar values for 1977 are 123,630 and 12,034 respectively.

Although our estimate for 1977 is less than the estimate presented by Mlia and Srivastava(1990), the

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19 See for details Kaunda K.K.(1962) and Mitchell, D.(1980). (These two have been chosen for illustrative purposes only).

20 Press Conference at Chileka Airport by the President (now Life President) of Malawi made on his return from a Commonwealth Prime Minister's Conference on January 14, 1969 (see page 14).

difference is so small that the figure cannot be looked at as improbable.

Hill(1986) used stable population analysis generated from "the best available estimates of fertility and mortality" and various values of sex ratio at birth to estimate "the national number of missing males (presumed to be mainly migrants abroad)". She found that the number of missing males in 1966 could be about 234,000; 213,000; 171,000 if the sex ratio at birth was 101, 100 and 98. Similar values for 1977 were 229,000; 200,000 and 143,000 respectively.

Two points emerge from Hill's estimates. Firstly, it is interesting to note that her estimates based on the sex ratio at birth of 98 males per 100 females appears to give estimates which are closer to those presented in this study and are thus deemed plausible.

Secondly, Hill's estimates are higher than those presented in this study and those advanced by Mlia and Srivastava(1990). Although Hills estimates are feasible, they are based on the assumption that the 1966 census data on "Malawians abroad" reasonably represents the number of labour migrants: "the general reasonableness of the 1966 data on relatives working abroad seems well supported" (Hill,1986). This is contrary to the view introduced in this study which has argued that the number of labour migrants were over-reported.

Another important point to note is that whereas the 1966 register of Malawians abroad inflated the number of migrant workers, a position held by this author and Mlia and Srivastava(1990), the number of "permanent emigrants" were most likely underestimated. In the literature this claim is usually based on an examination of the number of Malawians reported as residing in neighbouring countries. A number of researchers have carried out this sort of analysis, thus there is no need to repeat it here (Coleman,1979; Hill,1986; Srivastava and Mlia,1990). However, since in the literature such terms as "migrant workers", "labour migrants" and "Malawians Abroad" are used interchangeably, in carrying out this sort of analysis, little care has been taken to distinguish children and spouses.

In addition, some commentators have noted that because of the good reputation Malawian migrants have acquired for themselves, especially in the eyes of the employer, some nationalities were reporting themselves as Malawians although in the truth they were not (NG,1926; Coleman,1974a). This bias is likely to exaggerate the number of Malawians reported as residing in neighbouring countries.

The excess male population (assumed to represent the absentee population) was subtracted from the "graduated" male population to obtain the "adjusted" male population. In order to carry out this exercise it was necessary to know the age distribution of the absentee population. Two models were used for this: model I and II (see Table 3.14 below). Model I was based on the age distribution of the Puerto Rican migrants. This was obtained from Shyrock and Siegel(1976) and was also used by NSO(1984a) in estimating the age structure of the male population. Model II was calculated from replies to the question whether or not one has worked abroad, which was asked in the 1977 MPC.

Table 3.14

Percentage Distribution of the models used to estimate the age distribution of the assumed absentee population

	MODEL I	MODEL II
10-14	8.01	-
15-19	16.07	0.53
20-24	24.69	5.30
25-29	19.44	15.20
30-34	13.12	12.64
35-39	5.48	12.82
40-44	4.87	9.95
45-49	4.54	11.77
50-54	2.26	7.26
55-59	1.10	24.54
60-64	0.42	-
	100.0	100.0

There are certain problems with both models. For instance the migratory pattern in model I starts at an early age (age group 10-14) and continues to very advanced age groups (age groups above 50 years). From the little information we have on the age pattern of labour migrants from Malawi, this may not be the case. Model II is obviously affected by age mis-reporting. Moreover being based on those migrants who have returned back home, the model may reflect an older structure than expected. Although attempts were made to correct these distorting elements there was no apparent improvement in the overall results. The estimated population derived from the two models is given in Table 3.15 below. The values presented in Table 3.15 were then subtracted from the "graduated" male population (column d of Table 3.13) to obtain the "adjusted" male population (column c of Table 3.13). The total male population obtained by using model I were close enough to the reported total male population. Therefore this model was used to obtain the "adjusted" male population.

Table 3.15

Estimated Age Distribution of the Absentee Population Using Models I and II

	1966		1970-72		1977	
	I	II	I	II	I	II
10-14	11,807	-	13,303	-	9,040	-
15-19	23,688	781	26,688	880	18,136	598
20-24	36,394	7,812	41,004	8,802	27,864	5,981
25-29	28,655	22,405	32,285	25,243	21,939	17,154
30-34	19,339	18,632	21,789	20,992	14,806	14,265
35-39	8,078	18,897	9,101	21,291	6,184	14,468
40-44	7,179	14,667	8,088	16,524	5,496	11,239
45-49	6,692	17,349	7,540	19,547	5,124	13,283
50-54	3,331	10,701	3,753	12,057	2,551	8,193
55-59	1,621	36,173	1,827	40,755	1,241	27,694
60-64	619	-	698		474	
	147,403	147,418	166,074	166,091	112,854	112,865

	1977		1982	
	I	II	I	II
10-14	12,994	-	15,019	-
15-19	26,070	860	30,131	994
20-24	40,054	8,598	46,293	9,937
25-29	31,537	24,659	36,450	28,500
30-34	21,284	20,506	24,600	23,700
35-39	8,890	20,798	10,275	24,037
40-44	7,901	16,142	9,131	18,656
45-49	7,365	19,094	8,512	22,069
50-54	3,666	11,778	4,237	13,612
55-59	1,785	39,811	2,062	46,012
60-64	681		787	
	162,228	162,244	187,498	187,517

As a result of the above complications the results of the graduation procedure should be treated with caution. Although there are reasons to believe that the graduated age distribution may represent the "true" age distribution more closely than the reported distribution, a number of potential sources of error still remain unresolved. The graduation procedure may have, other things being equal, smoothed out genuine irregularities.

There are reasons to believe that the procedure does not perform well at both extremes (infant and childhood on the one hand and adulthood on the other hand). In addition the choice of the graduation technique was arbitrary and as we have seen in section 3.6.1 the selection of the standard population was not without difficulties. Other methods which would have yielded different but equally plausible results might have been used. In this study our choice was influenced by the observation that Brass′ method is simple and have yielded plausible results elsewhere in Sub Saharan Africa.

Accepting that the "adjusted" distribution truly represents the structure of the population in Malawi and, on the assumption that the difference between the "adjusted" and reported distributions are exclusively due to age mis-reporting and can be explained in terms of the transfer of the respondents from one age group to another in either direction (backward or forward), some suggestive information about the nature and extent of age mis-reporting in the country can be made. The results of this exercise are presented in Tables 3.16A-K. The diagonal shows the respondents whose ages were reported correctly whereas those (above) below the diagonal indicate a shift from (a higher age to a lower age: understatement of age) a lower age to a higher age: over-statement of age.

It is clear from the tables that the pattern of age shifting is different between males and females, and varies from one survey or census to another. Generally speaking males show a tendency towards over-stating their age after reaching a certain age: 20 in 1966, 30 in 1977, 35 in 1977, 40 in the 1982 and 1984. Below these ages there appears to be understatement of age, except age group 0-4 in 1982 and 1984 surveys which show some over-statement of age.

However in the case of females it is difficult to generalize. The 1966 census suggest over-statement of age up to age 35 and understatement of age thereafter whereas the 1977 census show a general understatement of age. The 1970/72 age distribution suggest that age was transferred in both directions. There was a tendency to understate one's age in age groups 25-39 and 10-44 in 1982 and 1984, respectively. After age 45 there is a clear suggestion that age was over-stated in 1982 while in 1984, age seem to be shifted in both directions even though, to a larger extent, age was understated.

Apart from these differences there appears to be a general tendency to exaggerate one's age for females in their teens and early twenties and understatement of age for females in their late twenties, thirties and forties. This pattern of age mis-reporting results in the preponderance of female in the age group 20-34 as observed earlier in the chapter.

Table 3.16a

A Comparison of the Reported (R) and Expected (E) Population: Male 1966

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	(R)
1	193														193
2	18	138													156
3		11	104												115
4			14	87											101
5				7	65										72
6					7	60									67
7						2	51								53
8							5	51							56
9								1	36						37
10									8	36					44
11											29				29
12											2	23			25
13												2	19	7	28
14														23	43
(E)	211	149	118	94	72	62	56	52	44	36	31	25	19	30	

Table 3.16b

A Comparison of the Reported (R) and Expected (E) Population: Female 1966

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	(R)
1	180														180
2	11	131													142
3		4	95												99
4			18	81											99
5				16	68										84
6					15	67									82
7						4	58								62
8							3	52	8						63
9									37	3					40
10										35	11				46
11											21	6			27
12												20	3		23
13													16	0	16
14													1	34	35
(E)	191	135	113	97	83	71	61	52	45	38	32	26	20	34	

Notes:

(i) (R) stands for Reported Population

(ii) (E) stands for Expected Population: Adjusted Population

(iii) the values underlined represents the diagonal

(iv) the numbers 1, 2, 3, ..., 13, 14 represents age groups 0-4, 5-9, 10-14, ..., 60-64, 65 and over. In the case of 1970-72 MPCS the last age group is 60 years and over.

(v) the values for the last age group may not add up due to rounding errors in the graduation procedures.

(vi) to avoid working with large numbers the population figures in Table 3.16 are expressed in terms of "rates per 1000".

Table 3.16c

A Comparison of the Reported (R) and Expected (E) Population: Male 1970-72

	1	2	3	4	5	6	7	8	9	10	11	12	13	(R)
1	109	2												121
2		131	17											148
3			100	36										136
4				67	26									93
5					64	10								74
6						58								58
7						9	49							58
8							17	30						47
9								26	21					47
10									26	13				37
11										24	11			35
12											21	7		28
13												18	47	65
(E)	183	144	120	98	76	67	61	56	47	39	33	26	65	

Table 3.16d

A Comparison of the Reported (R) and Expected (E) Population: Female 1970-72

	1	2	3	4	5	6	7	8	9	10	11	12	13	(R)
1	157													157
2	7	130												137
3			114	8										122
4				91										91
5				2	88	8								98
6						66								66
7						3	66	1						70
8								53						53
9								3	48	3				54
10										38				38
11											33	2		35
12												21		21
13												4	54	55
(E)	164	130	114	101	88	77	66	57	48	41	33	27	54	

Table 3.16e

A Comparison of the Reported (R) and Expected (E) Population: Male 1977

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	(R)
1	187	11													198
2		133	20												153
3			100	10											110
4				91	7										98
5					73										73
6					2	70	4								76
7							54								54
8							3	46							49
9								8	27						35
10									18	21					39
11										16	9				25
12											21	3			24
13												18			18
14												3	18	23	46
(E)	187	144	120	101	82	70	61	54	45	37	30	24	18	23	

Table 3.16f

A Comparison of the Reported (R) and Expected (E) Population: Female 1977

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	(R)
1	175	17													192
2		118	27												145
3			90	7											97
4				93	3										96
5					84	4									88
6						71	10								81
7							54	18							56
8								36	14						50
9									32	6					38
10										33	6				39
11											26	2			28
12												24	1		23
13													19	0	19
14														*	44
(E)	175	135	116	101	87	75	64	54	46	39	32	26	20	31	

Table 3.16g

A Comparison of the Reported (R) and Expected (E) Population: Male 1982

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	(R)
1	200														200
2	17	140	8												165
3			110	12											122
4				83	8										91
5					66	9									75
6						54	10								64
7							46	12							58
8								39	4						43
9									37						37
10									1	29					30
11										6	22				28
12											8	11			19
13												13	8		21
14													11	29	43
(E)	217	148	118	95	74	63	56	51	42	35	30	24	19	29	

Table 3.16h

A Comparison of the Reported (R) and Expected Population: Female 1982

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	(R)
1	186														186
2	14	138	7												159
3			106												106
4				94											94
5				2	82	4									88
6						66	6								72
7							54	7							61
8								44	3						47
9									37						37
10									3	29					32
11										8	21				29
12											10	13			23
13												12	10		22
14													10	30	40
(E)	200	138	113	96	82	70	60	51	43	37	31	25	20	34	

Table 3.16j

A Comparison of the Reported (R) and Expected Population: Male 1984

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	(R)
1	193														193
2	27	148													175
3			118	18											136
4				76	17										93
5					55	15									70
6						47	9								56
7							46	8							54
8								43	4						47
9									36						36
10									2	24					26
11										11	12				23
12											18	6			24
13												18	3		21
14													16	29	45
(E)	220	148	118	94	72	62	55	51	42	35	30	24	19	29	

Table 3.16k

A Comparison of the Reported (R) and Expected (E) Population: Female 1984

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	(R)
1	177														177
2	25	136	4												165
3			109	13											122
4				73	8										81
5					74	10									84
6						59	11								69
7							47	12							59
8								39	14						53
9									29	3					32
10										30					30
11										4	31	4			39
12												21	4		25
13													15		23
14													1	39	40
(E)	202	136	113	96	82	70	60	51	43	37	31	25	20	34	

3.7 Summary

This chapter has explored the accuracy of the reported age statistics for Malawi. This accuracy was determined by calculating various measures of age distortions: Myers and Whipple's indices of digit preference, UN Joint Age and Sex Score and by employing stable population model. The analysis was carried out for the total population, the three regions and twenty-four districts while in each case male and female were treated separately. This approach enabled us to relate the observed differences in the reported age statistics to the social and economic indicators which characterize the different sub- divisions of the population of Malawi.

The results do confirm that the reported age statistics are highly distorted and that the nature and pattern of age mis-reporting are similar to those found in other developing countries. The regional differentials appear to suggest that the higher the level of social and economic indicators, especially education, the greater the accuracy of the reported age distributions. This may serve to suggest that the quality of the reported age statistics is expected to improve as the general level of literacy in Malawi improves.

The reported age structure closely resembles what is expected in a developing country. The reported age distribution reveal a young age structure and further indicate that the population of Malawi is getting younger and younger with the passage of time. The elderly population show a modest increase overtime. On the other hand, the economically active population appears to be declining.

As several other studies have demonstrated the consequences of the above-described structure on the social and economic development of Malawi are gloomy. At a family or household level the age structure suggests that the head of the family or household has the enormous responsibility to see to it that there is enough food, clothing and shelter for everyone. At the national level the high and increasing dependency burden implies a lot of pressure on the government to make available such social services as schools and health facilities and create employment for the young population. All this indicates at both levels, more effort will be on consumption rather than on investment.

Lastly, the examination of the reported age distribution further revealed the preponderance of females in the population. This was reflected by the low overall and ASSRs, and raises the question "where do our men go?". A number of factors were suggested to account for this anomaly and these included such variables as sex differentials in enumeration, labour migration and high male mortality.

CHAPTER IV

MORTALITY ESTIMATION

The Sick gets cured
Because his time has not yet come
But when the day has dawned
For the journey to pagak
No one can stop you
Okot P'Bitek, Ugandan Poet.
Song of Lowino,p. 172.

4.1 Introduction

The size and structure of any population at any given moment is determined by the interaction of mortality, fertility and migration. The analysis in the preceding chapter however, appears to have, rightly or wrongly, given the impression that migration has been the major determinant of population change in Malawi. All the same, the role played by both mortality and fertility, though difficult to quantify in the absence of requisite data, cannot be underestimated.

The basic source of fertility and mortality data is the vital registration system which, as noted in chapter I, does not exist for the African population in Malawi. As a result of this deficiency, heavy reliance will be on indirect estimation. This chapter attempts to examine the levels, patterns, trends and differentials in mortality in Malawi. A similar study for fertility is presented in the next chapter.

This chapter begins by analyzing direct estimates of mortality as obtained in two demographic surveys and one national census (see Appendix I). It then proceeds to examine mortality measures derived from indirect procedures. In both cases model life tables (MLT) were used to analyze the data. In the former this involved comparing life table functions with corresponding values from MLTs whereas the use of "indirect techniques" required the specification of appropriate MLT for Malawi.

Some researchers are dissatisfied with the observation that most census and survey reports (from developing countries) publish, without any reservation, life tables calculated from reported data (Blacker,1977a)1. As a result of this objection, most recent reports tend to publish life tables derived from indirect procedures. In the opinion of this author the most ideal situation is to calculate both, study any differences that may arise and then accept which of the two seem to represent the situation better.

Unfortunately, in either case, it is difficult to "accept" the derived age pattern of mortality. This stems from the fact that for various reasons, some of which will be discussed later, the reported death statistics from developing countries are often scanty and inaccurate while the estimated mortality level and pattern calculated using indirect procedures rely on the MLT used in the method. Most MLTs used in the indirect estimation are based on western age patterns of mortality. Although, some MLTs have been derived using data from developing countries, the countries used tend to be, on relative terms "statistically" developed. Example of such countries include Latin America, Asia and North Africa. Moreover, the estimates of mortality based

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1 See for example NSO(1973), pp. 38-41.

on these "new" MLT are in most cases similar to those calculated from the original models (Palloni and Heligman, 1986). This observation raises the additional question of the relevance of indirect estimation: a subject which goes beyond the domain of this study.

It should be noted from the outset that most measures of mortality are not very much affected by the choice of a standard set of MLT for the estimation procedure, although precision is increased when the selection of the standard is based on some existing information such as the age pattern of childhood mortality or the nature and pattern of diseases in the country. However, as we shall see later on, the most "referenced" measures of mortality namely IMR or e(0) are sensitive to the choice of the model life table. As a result of the above described dilemma, the selection of the family of MLT for Malawi, may seem to have dominated the discussion on the mortality situation in Malawi.

4.2 Sources of Mortality Data

There are four questions that have been asked in Malawi that enable the study of mortality, namely: (i) deaths in the household in the last twelve months; (ii) the number of children ever born; (iii) the number of children surviving and (iv) the survival status of (one's) parents (see Appendix I). Replies to question (i) allow one to study mortality using traditional means. Questions (ii) and (iii) permits the study of infant and child mortality whereas question (iv) gives mortality estimates for the adult population using indirect procedures.

4.3 Mortality Estimates From Reported Statistics

There are three sources which asked and published the replies to the question of deaths in the household in the last twelve months. These are (i) the 1970/72 MPCS; (ii) the 1977 MPC; and (iii) the 1984 FFS (although this question was asked in 1982 MDS the results were not published). The reported distributions of deaths by age and sex obtained from these sources are presented in Table 4.1 below.

Table 4.1

Reported Deaths in the Household in the last Twelve Months for Malawi (1972 - 1984

Age	1972		1977		1984	
Group	Male	Female	Male	Female	Male	Female
0	16,688	12,888	18,291	16,517	29,477	22,334
1-4	22,706	17,656	39,809	36,948	23,466	21,609
5-9	3,925	5,475	6,266	5,568	5,866	3,615
10-14	70	1,875	1,486	1,399	586	1,303
15-19	1,000	3,277	773	865	850	677
20-24	495	990	592	698	914	817
25-29	955	920	454	504	854	1,163
30-34	530	1,185	387	379	761	1,456
35-39	725	967	333	283	607	558
40-44	1,162	1,610	381	299	1,481	661
45-49	725	990	420	263	794	966
50-54	955	1,185	454	311	1,442	971
55-59	690	460	414	204	1,098	636
60-64	5,162	3,957	545	285	1,793	1,448
65+	(a)	(a)	1,931	1,031	7,162	4,982

Source: NSO(1973, 1982a, 1987)

Note: (a) The 1972 data were tabulated up to 60 years and over. Thus for the 1972 age group 60-64 is actually age group 60 years and over.

Death statistics collected in this way are distorted by a number of factors. Firstly, the reported death statistics from developing countries usually suffer from omission. This might happen in various ways. To begin with, for various reasons, including cultural, people are in general reluctant to talk about dead relatives. This may be particularly serious for young infants who died before they were even given a name, and naturally people think there is nothing worth saying about them. Omission may also occur among young adults and the elderly population who live in single-person households. Omission may also take place as a result of the wrongful exclusion of deaths which took place within the twelve month limit imposed by the question. This may be deliberate as in the case when the respondent doesn't want (for reasons best known to himself) to talk about the event but is simply forced by the inquisitive interviewer or unconsciously due to faulty memory in so far as the time period when the death took place is concerned.

Secondly, age at death may be wrongly reported. This may stem from the fact that the required information is supplied by another person. The analysis in the previous chapter has indicated that most people in Malawi do not state their age correctly. Therefore it can further be argued that an even greater proportion cannot correctly state the age at death of their relatives.

The reported death statistics for Malawi reveal the above described deficiencies (Table 4.1 above) . It can be observed from this table that the figures for age groups above 5 years appear to be too low. This could be attributed to omission. The fluctuations in the percentage distribution for some age groups can be explained in terms of age mis-reporting and small numbers involved in the case of the sample surveys.

Despite these weaknesses, the reported distributions of deaths by age seem to reveal some characteristic features about the age pattern of mortality in Malawi. Firstly, Table 4.1 indicates that at least two-thirds of all deaths in Malawi occur to children below the age of five. In the 1972 MPCS 71 percent and 57 percent of all male and female deaths, respectively, occurred to children under the age of 5. Similar percentages for the 1977 MPC and the 1984 FFS were 80 percent and 81 percent and 69 percent and 71 percent, respectively. The increased proportion of child deaths in 1977 may be indicative of (i) better reporting of infant and childhood deaths in the census than in the sample surveys; (ii) an increased share of deaths for these age groups.

Secondly, the reported number of deaths by age is generally higher for males than females with the exception of some age groups (age groups 5-9, 10-14, 20-24, 30-59 in 1970-72 the MPCS; age group 15-29 in the 1977 MPC and age groups 10-14 and 25-34 in the 1984 FFS). It should be noted that most of these age groups belong to the childbearing age groups (assumed to be age group 15-49). Consequently this may be partly caused by the incidence of high "maternal mortality" associated with teen-age pregnancies and short birth intervals.

Table 4.1b

Percentage Distribution of the Reported Deaths for broad age groups for Malawi 1972, 1977 and 1984

	1972		1977		1984	
	Male	Female	Male	Female	Male	Female
0	29.9	24.1	25.2	25.2	38.2	35.3
1-4	40.7	33.0	54.9	56.4	30.4	34.2
5-29	11.6	23.5	13.2	13.8	11.8	12.0
30-49	5.6	8.9	2.1	1.9	4.7	5.8
50-59	2.9	3.1	1.2	0.8	3.3	2.5
60+	9.3	7.4	3.4	2.0	11.6	10.2
	100.0	100.0	100.0	100.0	100.0	100.0

Using data in Table 4.1 and the reported age distributions (see chapter III), Crude Death Rates (CDR) and Age Specific Death Rates (ASDR) were calculated. The calculated ASDR are given in Table 4.2 and illustrated in Figure 4.1. The reported CDR was 29, 25 and 27 deaths per 1,000 population for the 1970/72 MPCS for males, females and both sexes. Similar values for the 1977 MPC and the 1984 FFS were 27, 23 and 25, and 27, 20 and 23, respectively.

Fig 4.1 Reported ASDR for Malawi
(1972 - 1984): Male

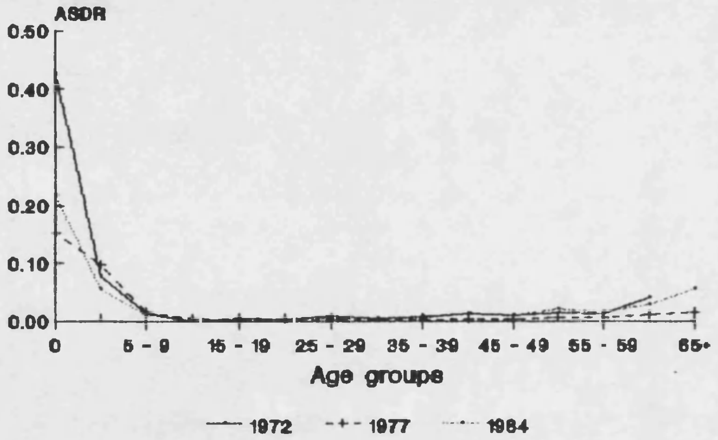

Fig 4.1b Reported ASDR for Malawi
(1972 - 1984): Female

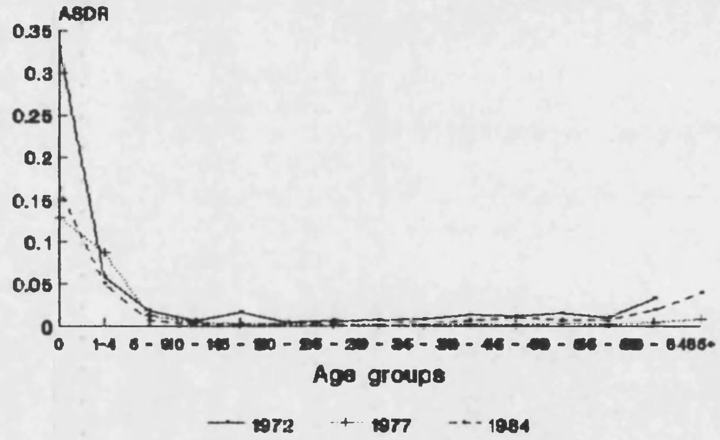

Table 4.2

Reported ASDR for Malawi: 1972, 1977 and 1984

	Male			Female		
	1972	1977	1984	1972	1977	1984
0	425.3	151.3	216.2	329.6	129.0	162.7
1-4	77.7	97.7	55.0	58.3	87.2	50.5
5 - 9	13.6	15.3	11.5	18.4	13.4	6.9
10 - 14	0.3	5.1	1.5	7.0	5.1	3.3
15 - 19	5.5	3.0	3.1	16.5	3.1	2.6
20 - 24	3.5	3.0	4.5	4.6	2.7	3.0
25 - 29	8.5	2.2	5.2	6.4	2.2	5.2
30 - 34	4.7	2.7	4.8	7.8	2.4	7.7
35 - 39	7.9	2.5	4.4	8.4	2.0	3.3
40 - 44	12.8	4.0	13.9	13.7	2.7	6.4
45 - 49	10.1	4.0	10.4	12.1	2.3	10.1
50 - 54	14.1	6.9	21.5	15.5	3.8	7.7
55 - 59	12.7	6.4	15.5	10.1	3.1	7.9
60 - 64	41.0	11.2	29.1	33.2	5.2	19.5
65+	*	15.8	55.0	*	8.2	39.1

Note: * see note in Table 4.1.

The general shape of the mortality schedule (see Table 4.2 and Figure 4.1) reveal that the high mortality found in infant and childhood age groups (say age group 0-4) decline to a local minimum experienced in the teens (age group 10-14). After age group 10-14, the ASDR remain more or less constant at a very low level until somewhere around the age group 35-39 where there is a "very slight" tendency to increase. The rising trend at older age groups is more noticeable in the 1984 FFS and the 1972 MPCS than in the 1977 MPC. The slight fluctuations in the reported ASDR particularly after the age group 15-19 reveal the existence of errors attributable to omission and age mis-statements. The data are also affected by small numbers. This could again be attributed to omission which has already been noted above, or in the case of the sample surveys to sampling variations.

Table 4.1 and Figure 4.1 further suggest that the effect of these distorting influences are more prominent in the 1977 MPC than in the 1984 FFS and the 1970-72 MPCS. Unfortunately no reason can be suggested to account for this anomaly. Probably, this may be a reflection of good reporting in the sample surveys attributable to good training on the part of the enumerators and good supervision.

The age pattern of mortality in Malawi, as depicted in figure 4.1 and described in the preceding paragraphs, slightly resembles the U-shaped pattern expected in developing countries with one major exception: the left-arm of the curve is higher than the right-arm. Therefore the mortality schedule for Malawi can be appropriately described as L-shaped. This is a reflection that the level of infant and child mortality compared with adult mortality is very high. Considering that the mortality curve for a developed country is said to be J-shaped, it looks probable to suggest that a similar curve for a developing country experiencing high mortality is L-shaped. Looked at in this way the U-shaped mortality curve usually associated with developing countries can be said to characterize these countries during the course of mortality transition2.

This pattern suggests that either the infant and childhood mortality were grossly overstated, or that the

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2 It is being suggested here that countries move from L-shaped to U-shaped to J-shaped mortality curves.

adulthood statistics were enormously under-reported. The former contradicts the usual assertion that the reported statistics for the infant and childhood age groups are in most cases under-reported. This observation may serve to indicate that the likelihood of the latter could have occurred as a result of omission*. It is difficult to speculate how this might have arisen. The fact that both the male and female distributions show a similar pattern of distortions (and of course age pattern of mortality) combined with the fact that the migrant labour system is predominantly male may suggest that migration is not responsible for this.

Female ASDR for certain age groups - all belonging to the reproductive age groups - are slightly higher than corresponding male ASDR. This can be attributed to the higher risk of exposure to maternal mortality in the reproductive period.

The reported age pattern of mortality is the same in all the three sources of data available in Malawi. This implies that either similar distorting forces are operating in all sources or the reported age pattern of mortality is indeed real and indicative of the prevailing mortality situation in the country3. The latter is obviously too good to be true and hard to believe in the absence of any supportive evidence. The former is plausible and further suggests that some sort of cultural or behavioral variables could be sought to explain the

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3 A similar observation was found in the analysis of the reported age statistics. See section chapter III section 3.4.

inconsistency in the data.

A convenient, but complex, way of describing mortality is to employ the life table approach. Consequently, from the reported ASDR, life tables were calculated using the "traditional" means of calculating a life table and these are given in Tables S4.3.

For a detailed discussion about the various relationships between the different columns of the life table reference can be made to any basic demographic textbook such as Newell(1988). But suffice it here to note that there are slight differences in the computational procedures among the three "sets" of life tables presented. One worth noting is that the q(0) values for the 1970/72 life tables are based on the reported IMR whereas for both the 1977 and 1984 life tables, the q(0) values were derived from the reported ASDR. This stems from the fact that when the reported ASDR were used for the 1972 data it produced results which were improbable. The q(0) estimates ranged from 328 and 267 infant deaths per 1,000 live births, and the derived expectation of life at birth was 27 and 29 years for males and females, respectively. These estimates imply not only a higher mortality conditions for Malawi than one would imagine given the prevailing level of social and economic development in the country at the time but also are out of line with other mortality estimates provided by other agencies and institutions (consider for example UN estimates presented in Table S4.2).

Another difference, however minor, is that both the 1977 and 1984 data were tabulated up to the age group 65 years and over; whereas the 1972 data terminate at the age group 60 years and over.

Commenting on the published 1970/72 life table, John Blacker observed that:

> the figures of expectation of life given by the current deaths ... appear scarcely plausible. If they are correct, adult mortality in Malawi would be lower than in any other country in the world, and the female expectation of life at age 60 would be nearly nine years in excess of the corresponding figure for Sweden, which has the lowest mortality of any country shown in the United Nations Demographic Yearbook for 1974.
> Blacker(1977b)

From the title and tenor of his article, it is clear that Blacker attributed the observed discrepancies to the quality of data. He argued that the quality of the reported statistics did not improve, despite the claim by the proponents of the "Dual Record Method" that this approach of data collection was likely to lead to improve the quality of the reported statistics. Whereas no claim is being made that the 1970-72 data were of a better quality, the re-examination of the reported mortality statistics as carried out in this study indicate that most if not all of the observed irregularities especially in so far as the calculated expectation of life is concerned can be attributed to the assumption made in the calculation of the L(x) and T(x) values for the open-ended age group. In the published report (NSO:1973,38-41), L(60+) was calculated as:

$$L(w) = d(w)/m(w) \quad \ldots\ldots\ldots\ldots \quad (i)$$

where w refers to the last open ended age group and L(w), d(w) and m(w) are life table functions for this age group (in case of 1970-72 w = 60+).

In this study we experimented with different ways of calculating L(w) such as a procedure recommended by United Nations(1956):

$$L(w) = l(w) \times \log[l(w)] \quad \ldots\ldots\ldots\ldots \quad (ii)$$

where w, L(w) and l(w) are as defined above.

The results of our investigation indicate that calculating L(x) values for the last age group using formulae (i) leads to estimates of expectation of life which are implausibly high and the use of formula (ii) is therefore recommended. Kdpedeko(1976) made a similar observation for other African countries. Consequently, unless otherwise stated, all the life tables calculated and presented in this study employ this formula. The other life table functions were calculated using the following formulae:

$$L(0) = 0.3l(0) + 0.7l(1)$$

$$L(1) = 1.3l(1) + 1.7l(5)$$

According to the life tables presented in Table S4.2 to S4.10, in 1970/72 e(0) was 33.7, 34.6 and 34.2 years for males, females and both sexes respectively. These rose to 36.1, 39.1 and 37.6 years by 1977 and similar values for 1984 were 37.3, 42.3 and 40 years.

Several things can be said about these estimates. Firstly, the improvement in mortality conditions as measured by changes in e(0) is clearly indicated. Secondly, the life tables do suggest a very fast decline in mortality for the period 1970 to 1977. Moreover there appears to be a reduction in the rate of decline during the period 1977 to 1984. This claim is made on the basis that in the former period respective e(0) for males, females and both sexes increased by 2.4, 4.4 and 3.4 years. Similar values for the latter period are 1.8, 3.2 and 2.4 years respectively.

On the one hand this could indeed be true, as the available evidence suggests that during the early and mid 1970s, there were noticeable improvement in the country's social and economic conditions. The social and economic growth was however hampered in the late 1970s and early 1980s largely as a result of the world-wide economic recession combined with poor climatic conditions. Unfortunately, due to insufficient data, this analysis relies on two sample surveys and one census. Therefore, any conclusive examination of this hypothesis should await a detailed analysis of social and economic development that have taken place in Malawi since independence.

On the other hand this feature could be attributed to the distortions and errors in the existing statistics. Although this aspect cannot be denied and is difficult to quantify due to meagre data, there seem to be some suggestive evidence that the 1970/72 data overstated the true level of mortality. There are no clear-cut explanations to ruminate how this could have happened. There are no grounds to suggest that the period surrounding the survey were particularly bad years in terms of climatic, social and even economic conditions.

No major epidemics were reported during this period. Such incidents as the "Chilobwe affair" which, in certain circles, is believed to have led to deaths of hundreds of civilians is not supported by any statistical data. Furthermore, it was limited to one urban area (Blantyre city: Chilobwe "township") and could not be expected to affect the national estimates to such an extent as the 1970-72 data seem to imply[4]. Moreover the claim is wholly political in nature and thus falls outside the scope of this study.

With the hope of smoothing out some of the irregularities found in the reported death statistics and thereby obtaining better estimates of mortality for Malawi than those presented in the preceding paragraphs MLT were fitted to the data.

Since the life tables presented in Table S4.3 are for different time periods, it was further anticipated that the MLTs could help in generating life tables for the intervening period and thus map out the possible trend in mortality as reflected in the "reported" life table. Therefore the fitting of MLTs to the Malawian data was considered necessary as it was going to allow us to utilize each and every piece of information on mortality in our effort to study this aspect of the demography of Malawi.

In addition, for a statistically underdeveloped

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4 A brief account about this subject can be found in the speech by the President of Malawi (now Life President) at the closing session of the Malawi Congress Party (MCP) Annual Convention at Kwacha National Cultural Center in Blantyre on September 7, 1969.

country like Malawi, to rely on the reported statistics as we have done so far is rather naive and awkward. Unfortunately, for such countries, the reported death statistics represent the only available source of the age pattern of mortality. Thus to discard the data at their face value and go straight to indirect estimation as is often done may not be the most rational thing to do unless it can be shown that the MLT upon which the indirect procedures are based are indeed representative of the mortality conditions in the country. This represents the dilemma in which Third World demographers have found themselves.

To fit MLTs, the q(x) values from the "reported" life tables for each sex were compared with the q(x) values from various MLTs with the same e(0) as the life table. The selected MLT are given in Table 4.3 below. The deviations from the MLTs were plotted on a graph (see Figures 4.2 to 4.4) and their mean deviations were also calculated and are given in Table 4.4 below.

Table 4.3

Model Life Tables Whose e(0) Corresponds to e(0) derived from Reported Life Tables

MLT	Mortality Level: Male 1970	Male 1977	Male 1984	Female 1970	Female 1977	Female 1984
West	7	9	9	7	9	10
North	8	9	9	7	9	10
East	8	9	9	7	9	10
South	7	8	9	7	8	10
Brass	25	30	35	30	35	45
UN(1)	30	35	40	30	35	40

Fig 4.2a A Comparison of the Reported and Modelled ASDR Malawi 1972: Male

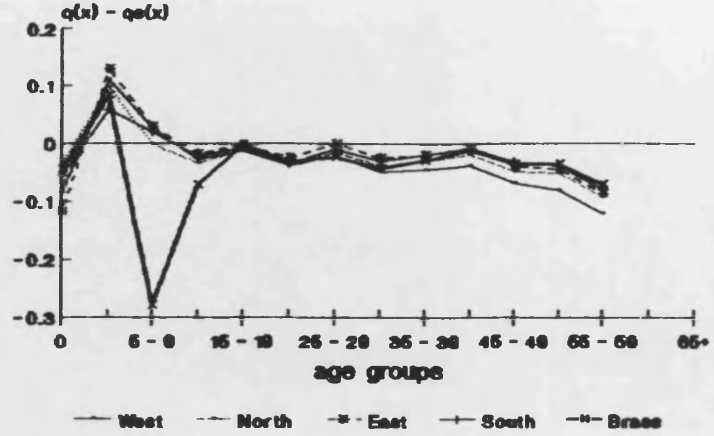


Fig 4.2b A Comparison of Reported and Modelled ASDR for Malawi 1972: Male

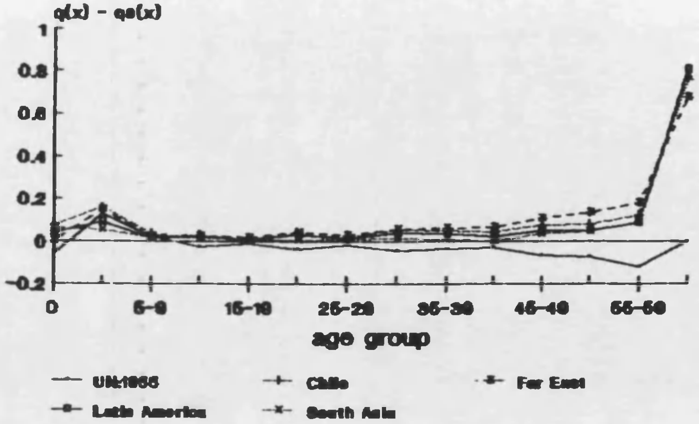


Fig 4.2c A Comparion of Reported and Modelled ASDR for Malawi 1972: Female

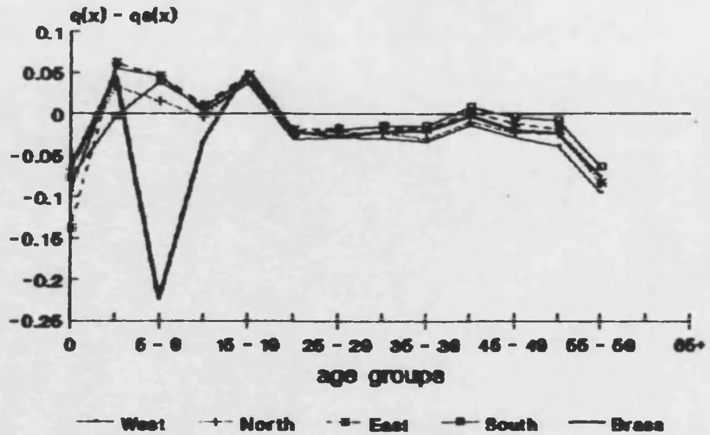


Fig 4.2d A Comparison of Reported and Modelled ASDR for Malawi 1972: Female

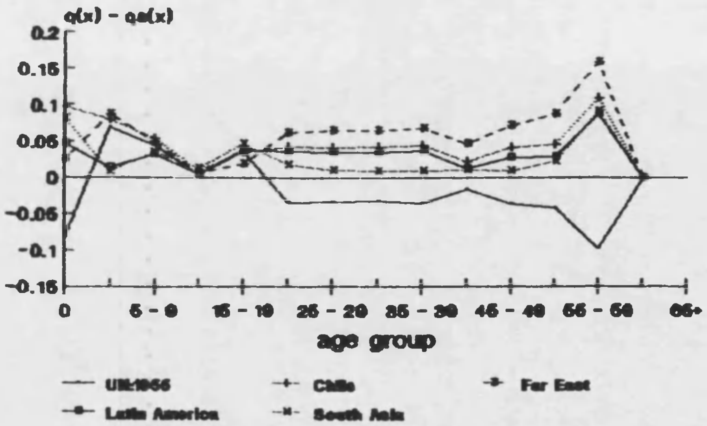


Fig 4.3a A Comparison of Reported and Modelled ASDR for Malawi 1977: Male

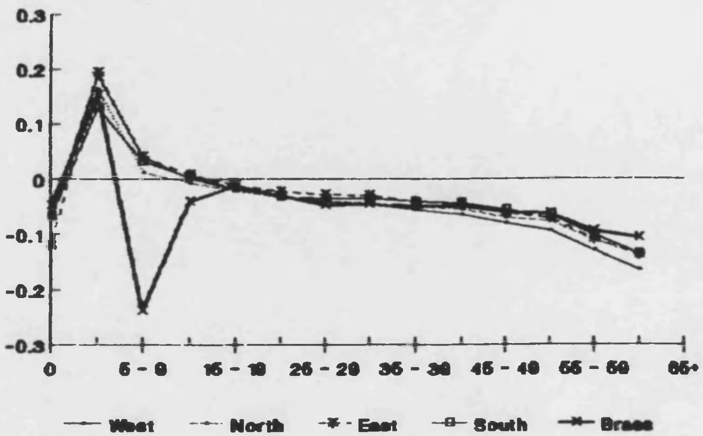


Fig 4.3b A Comparison of Reported and Modelled ASDR for Malawi 1977: Male

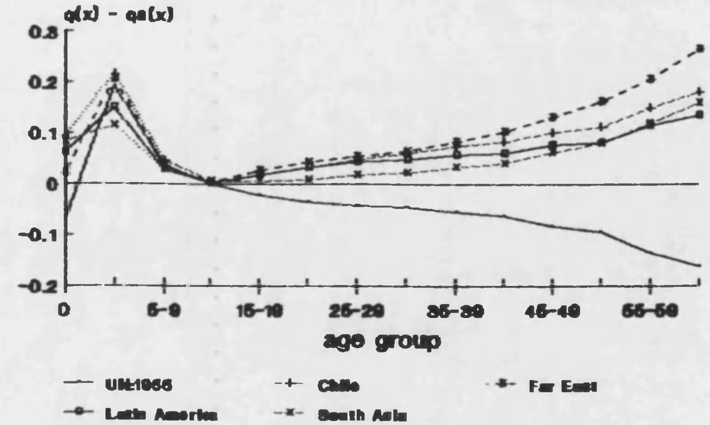


Fig 4.3c A Comparison of Reported and Modelled ASDR for Malawi 1977: Female

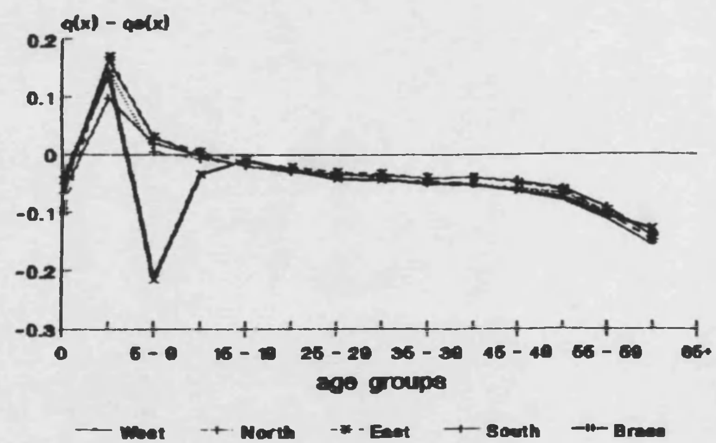


Fig 4.3d A Comparison of Reported and Modelled ASDR for Malawi 1977: Female

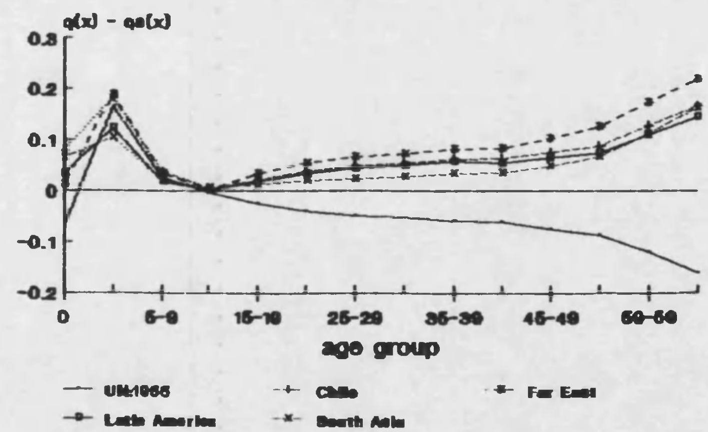


Fig 4.4a A Comparison of the Reported an Modelled ASDR for Malawi 1984: Male

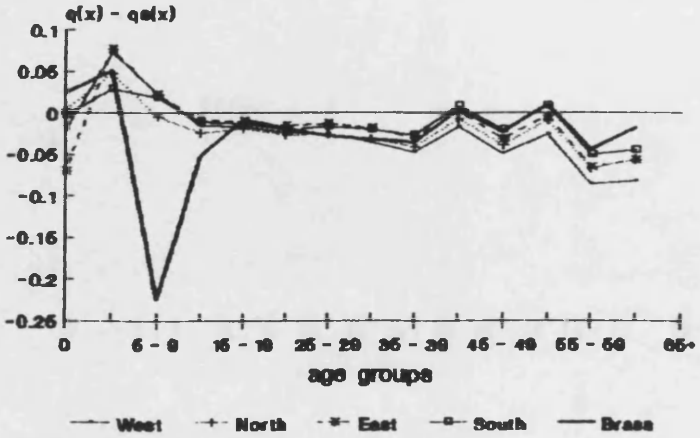


Fig 4.4b A Comparison of Reported and Modelled ASDR for Malawi 1984: Males

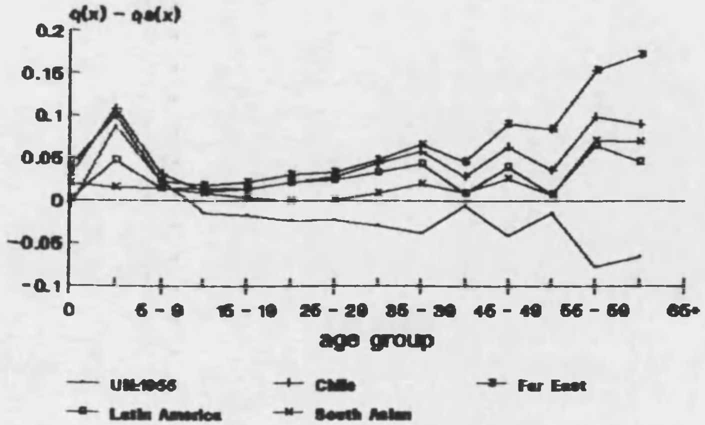


Fig 4.4c A Comparison of Reported and Modelled ASDR for Malawi 1984: Female

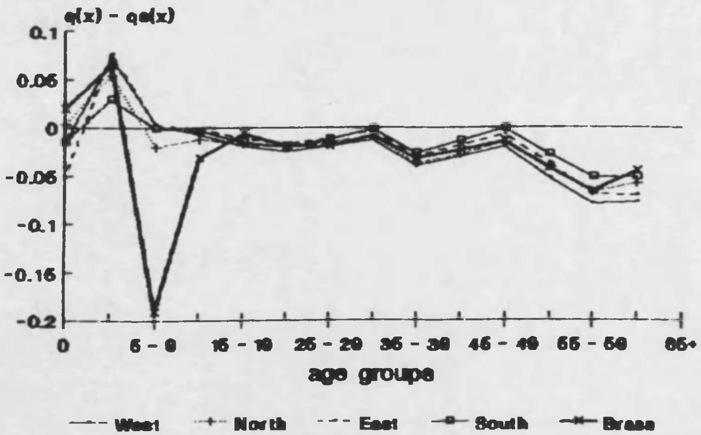
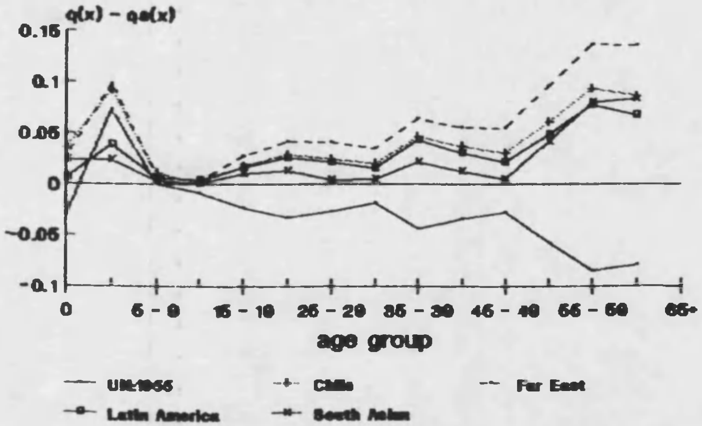


Fig 4.4d A Comparison of Reported and Modelled ASDR for Malawi 1984: Female



It can be deduced from Table 4.3 that the levels of mortality given in this table are slightly lower than those implied by the reported age distribution (see Table 3.7 in chapter III). The only exception to this are the 1984 levels which indicate the opposite. This may be attributed to omission of death statistics as noted above.

Furthermore, just like Table 3.7 in Chapter III, Table 4.4 and Figures 4.2 to 4.4 indicate that the difference between the various MLTs are small. As suggested in chapter III this could be attributed to the various biases and irregularities found in the data which interact with the different assumptions underlying each MLT. But unlike Table 3.7, Table 4.4 portrays a consistent picture in that all the three sources examined indicate that the South family has the smallest mean deviation. This is followed by the South Asian pattern of the new UN MLT. Brass MLT and Far Eastern pattern of the new UN MLT invariably indicate the poorest fit. This finding is true for both males and females as seen in Table 4.4.

Table 4.4

Mean Square of the Difference Between the Reported and Standard q(x) values for each sex for Malawi: 1972, 1977 and 1984

		MALE		
MLT	Family	1972	1977	1984
Princeton	West	0.054	0.087	0.022
	North	0.029	0.063	0.013
	East	0.044	0.081	0.018
	South	0.018	0.047	0.006
Brass	-	0.103	0.111	0.063
UN (1955)	-	0.050	0.090	0.020
UN (1982)	Chile	0.070	0.124	0.037
	Far East	0.101	0.159	0.063
	Latin America	0.028	0.066	0.013
	South Asia	0.020	0.050	0.007

		FEMALE		
		1972	1977	1984
Princeton	West	0.031	0.064	0.019
	North	0.018	0.049	0.013
	East	0.036	0.062	0.017
	South	0.015	0.035	0.006
Brass	-	0.069	0.099	0.051
UN (1955)	-	0.033	0.075	0.023
UN (1982)	Chile	0.043	0.086	0.029
	Far East	0.067	0.121	0.054
	Latin America	0.019	0.051	0.015
	South Asia	0.020	0.039	0.010

Table 4.4 also suggest that the MLTs considered in this study could be ranked in the following manner, ranging from the MLT that fits the data well to the least: Princeton, United Nations(1982), United Nations(1955) and Brass MLTs. Within the first two MLT system one would similarly rank the different families as follows: South, North, East and West in the first set and

South Asian, Latin American, Chilean and Far Eastern in the second set5. It is interesting, though not surprising, to note that in the case of United Nations(1982) MLT the families which seem to match the Malawian data all come from other developing countries.

A closer examination of Figures 4.2 to 4.5 reveals the following three points which are essential in not only understanding the age pattern of mortality in Malawi but also in estimating the level of mortality:

(i) the pattern of fluctuations in the difference between the reported and modelled q(x) values is somewhat similar for both males and females for the three sources of data herein examined;

(ii) the age pattern of the differences in Brass, Coale-Demeny and "original" UN systems can be contrasted with that obtained from the new UN MLT. This is partly due to the fact that the former are based on historical data obtained from European countries whereas the data-set for latter comes from the developing countries;

(iii) the age pattern of the difference can be distinguished into three groups: (a) infant and childhood, (b) prime and adult, and (c) the older age groups.

Before this exercise was conducted it was presumed

5 This ranking would not necessarily be correct. In the 1970-72 MPCS for instance Latin American pattern and South Asian pattern are at par.

that the age pattern of mortality for the female population would provide a better fit than the age pattern of mortality for the male population. The latter was deemed to be distorted by labour migration. Unfortunately, it was difficult to establish the superiority of the former over the latter, as in both cases the difference between the observed and modelled q(x) values were generally small and of the same magnitude. As a result of this resemblance one may cast doubts about the reliability of the female distribution although at the same time this might suggest that the male distribution is better reported than it was previously thought.

Figures 4.2 to 4.4 further indicate that the deviations from the model values are greater for the infant and childhood population than the adult age range. On the one hand, this feature may be taken to imply that a model life table that conforms closely to the former age group would, within limits, provide acceptable estimates for the adult population. Therefore in an exercise to establish which model life table is appropriate for the country one may restrict oneself to determining which model life table is suitable for the childhood population. On the other hand, the fact that the above analysis did not reveal the model life table that "best" describes the age pattern of mortality in Malawi, suggests that a further test is necessary.

It must be emphasized that, so far, the analyses presented in the preceding paragraphs and Chapter III, seem to indicate that there is no evidence to suggest that any of the existing model life tables conforms better than any other to mortality conditions existing in Malawi. Studies conducted in other developing countries, some of which are from Africa, reveal that the age pattern of mortality in these countries is different from those incorporated in the existing model life tables (Blacker and Timaeus,1985; Gerenne,1982; Adlakha,1972). This may further suggest that any of the existing models can be utilized when studying mortality situation in Malawi.

Although in Chapter III, the North family of Coale-Demeny model life tables, was accepted and used to adjust the Malawian age distribution, it was pointed out, from the outset, that the relevance of this family is not without question. However the search into the mortality pattern of the country is hindered by the absence of requisite data and more studies of this nature should continue as data of better quality become available.

The absence of any apparent superiority of one set of model life tables relative to another set partly explains why different researchers have in the past employed different model life tables. Blacker(1977a) used the West family of Coale-Demeny set. NSO(1984), Mbale(1984), Palamuleni(1987) and Ndawala(1989) used the North family and Hill(1986) used the South family of the same set. Table 4.4 illustrate this point by showing a small difference between one MLT and another. It is however surprising that no previous investigator ventured to employ the East family of the Princeton despite the fact that tests employed in this study indicate that the model may still be suitable for Malawi.

At this stage in this study, there is no need to continue considering all the four model life tables in the analysis. We have, however, selected the African standard proposed by Brass(1968, 1971). The reason for this choice will be presented later in the chapter. Evidence presented in this study indicate that this may not necessarily be the "best" MLT for Malawi. At the same time there exists insufficient evidence to suggest that the age pattern of mortality in the country is significantly different from that found in other African countries.

Using Brass African standard the reported life tables for 1972, 1977 and 1984 (for males and females separately) were subjected to further tests. The observed logits denoted as Y(x) were plotted against the standard values denoted Ys(x)[6]. These graphs are presented in Figures 4.5 below. The overall pattern indicate that the points can be considered to lie on a straight line with the exception of age groups 0 and 1-4. rest. The slope of the line further suggest that relative to the standard, childhood mortality is higher than adult mortality (see Table 4.5). Figures 4.5 further shows that the graphs for 1977 has a more gentle slope than the

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6 The logit of x, denoted Y(x) are defined as $0.5\log\left[\frac{1-l(x)}{l(x)}\right]$ where l(x) is the survivorship function of x.

rest. This is further indicated by very low estimates of <u>B</u> and may be due to omission and age misreporting as noted earlier.

<u>Table 4.5</u>

<u>Estimates of A and B Calculated from Reported Death Statistics for Malawi 1972 - 1984</u>

		1972	1977	1984
Male	a	0.115	0.042	0.039
	b	0.553	0.273	0.566
Female	a	0.150	-0.051	-0.104
	b	0.778	0.239	0.509
Both sexes	a	0.134	-0.005	-0.034
	b	0.666	0.255	0.531

There are three elements that seem to characterize the pattern of mortality in Malawi, namely (1) the overall mortality is high by world standards; (2) infant and childhood mortality are both very high and the latter appears to be higher than the former; (3) adulthood mortality is moderate.

Fig 4.5a A Comparison of the Observed and Standard Logits: Male 1972

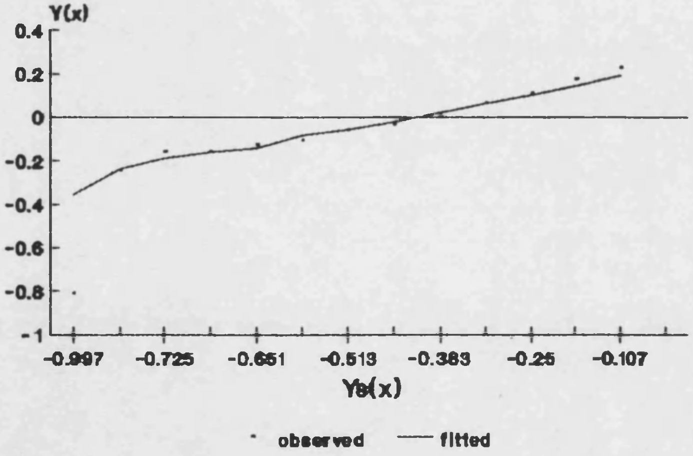


Fig 4.5b A Comaparison of the Observed and Standard Logits: Female 1972

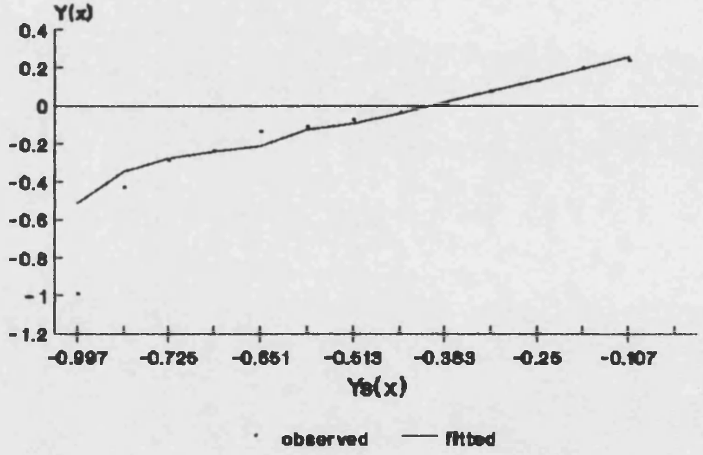


Fig 4.6a A Comparison of the Observed and Standard Logits: Male 1977

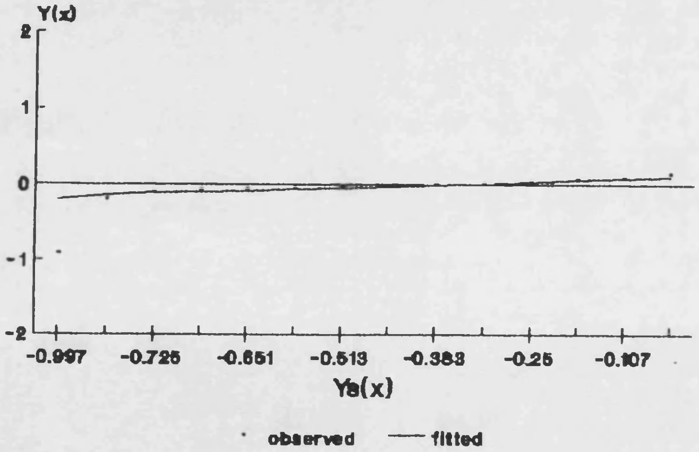


Fig 4.6b A Comparison of the Observed and Standard Logits: Females 1977

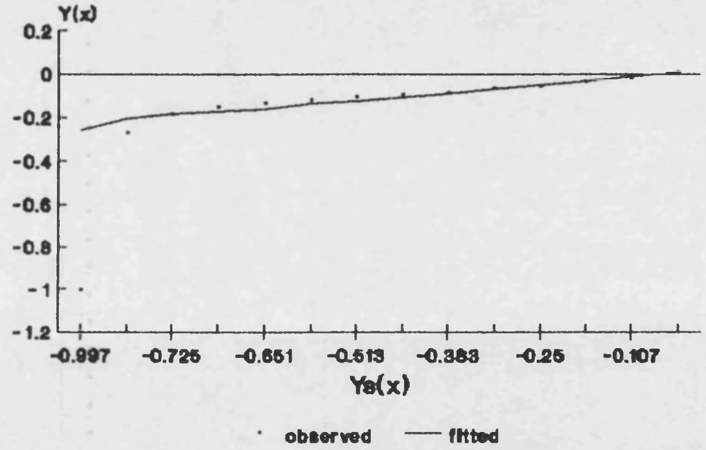


Fig 4.7a A Comparison of the Observed and Standard Logits: Male 1984

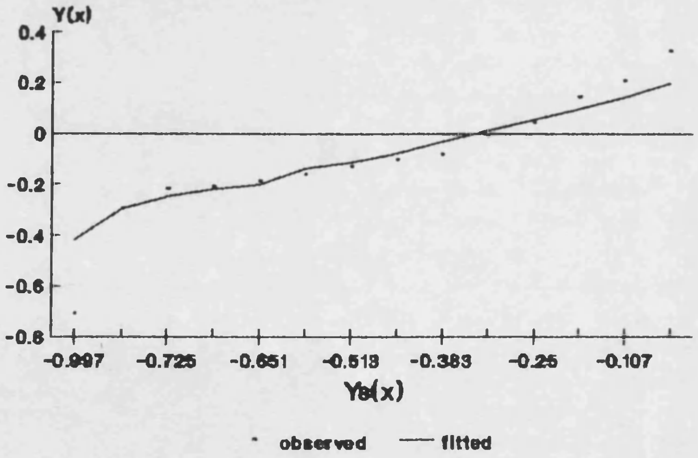
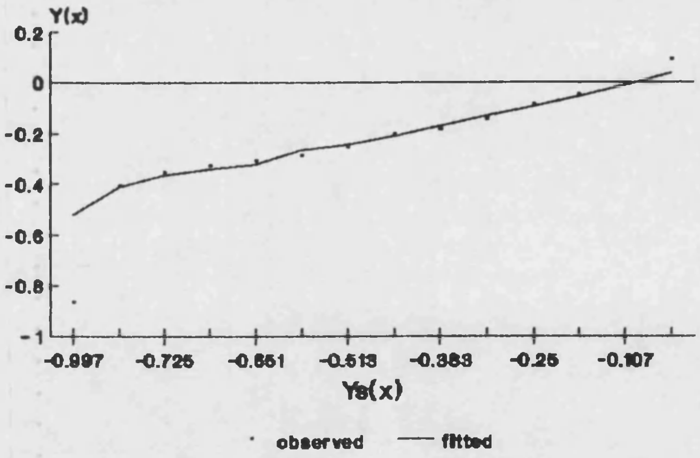


Fig 4.7b A Comparison of the Observed and Standard Logits: Female 1984



These aspects of mortality are relevant for both estimation and planning processes. For instance, the above stated observations imply that further studies should concentrate on establishing the correlates of mortality in general and infant and childhood mortality in particular. Points (1) and (2) are relevant in selecting which model life table to use. Apparently, none of the MLTs examined in this thesis display the above named aspects at the same time with the possible exception of the more mathematical systems like the logit and the new UN systems which permit one to include any "special" features of the "study" population. The North family for instance is characterized by a "low infant and old age mortality, but a high adult mortality" due to high incidence of Tuberculosis. In the case of Malawi the existence of a "high adult mortality" obviously contradicts the earlier assertion that adult mortality in the country is "moderate". It is however probable that the claimed "moderate" mortality is by the standards of the MLTs "high". The relevance of this model in the African setting appear to have been overshadowed by the finding that in certain African countries, mostly from West and Central Africa, childhood mortality is higher that infant mortality. Moreover this family is based on the smallest number of life tables and it is a little bit strange that very few have taken this as the source of trouble. The use of the north family was first suggested by Clarin in 1969 (Clarin,1969). Thus it is encouraging to note that in the same paper he showed that the south family may also be relevant.

The south family have a feature which may be attractive in the case of Malawi: a high childhood mortality and a low adult mortality. The east family seem to have received outright rejection probably because it includes a feature which is believed, through experience from other African countries, particularly from West Africa, to be missing in Africa: high infant mortality and low childhood mortality.

One of the features of "African" age pattern of mortality that encouraged researchers to recommend the use of North family of Princeton MLT is that in most African countries the proportion of children dying in age group 1-4, denoted as q(5), is higher than the proportion of children dying in infancy, denoted as q(1). This relationship was further examined in Table 4.6 below.

Table 4.6 depicts the difference in the age pattern of mortality in Malawi and in the various MLTs. The MLTs used in this exercise were those which have the same e(0) as the life tables calculated from the reported ASDR. In all the model life tables the q(1) is greater than q(5) while in Malawi the opposite is true. This feature has been found in other African countries (Cantrelle and Leridon,1971; Cantrelle,1974; Page,1974; Rimmimgton,1982). The explanation for this distinctive age pattern of mortality lies in the fact that in most of these countries there is a predominance of infectious and parasitic diseases and malnutrition. The situation is made worse because it is difficult if not impossible to isolate the effect of each variable. The relationship between malnutrition and infectious and parasitic diseases is such that each interacts with and exacerbates the effects of the other. On the one hand a malnourished child is more susceptible to infectious diseases and is less able to successfully combat the infection. On the other hand a child suffering from infection often becomes malnourished as a result of increased nutritional requirements to fight the infection and the loss of appetite. The existence of prolonged breast-feeding and abrupt weaning that usually leads to the development of malnutrition is also important.

Table 4.6

Ratio of the Proportion of Children Dying in Age Groups 0 and 1 - 4*

	Male 1972	Male 1977	Male 1984	Female 1972	Female 1977	Female 1984
Coale and Demeny MLT						
West	1.70	1.75	1.75	1.47	1.51	1.53
North	1.26	1.28	1.28	1.12	1.14	1.15
East	2.20	2.24	2.24	1.86	1.91	1.95
South	1.10	1.13	1.17	0.97	1.00	1.08
UN(1982) MLT						
Chile	2.43	2.49	2.62	1.79	1.98	2.12
Far East	1.51	1.54	1.62	1.27	1.39	1.49
Latin America	1.23	1.25	1.30	0.89	0.95	1.01
South Asia	1.12	1.14	1.18	0.97	1.04	1.10
Brass MLT	1.21	1.19	1.17	1.19	1.17	1.13
UN(1955) MLT	1.72	1.80	1.88	1.54	1.61	1.68
Reported Life Table	0.64	0.44	0.98	0.60	0.42	0.82

* q(1)/q(5)

Another aspect to be noted from Table 4.6 is that different MLTs display different age patterns of mortality. It is sometimes argued in the literature that the suitability of the north family of the Coale and Demeny set of MLT to Sub Saharan Africa lie in the fact that in relative terms childhood mortality is higher than infant mortality in this family than in the other families. Table 4.6 however fail to support this claim and further suggest that this superiority is lost in favour of the south family.

From the analyses in the preceding paragraphs it is clear that the existing MLTs fail to depict fully the reported age pattern of mortality in Malawi. This is the case with both male and female ASDR. There is no doubt that this is caused by the deficiency in the existing statistics. Age mis-reporting and omission of deaths due to cultural reasons may be the major source of this discrepancy. This said, it should be noted that relative to the MLTs utilised in this study, the reported age pattern of mortality in Malawi reveal a high infant, childhood and old age mortality and a rather moderate adult mortality. These features are absent in the MLT examined in this study (see Table 4.7 below). This observation leads one to suggest that a slightly better pattern of mortality for the country can be obtained by (i) accepting such models as the south family of Coale and Demeny set or South Asian pattern of the new UN MLTs, which seem to bear some features of the "Malawian" pattern; and (ii) employing the "mathematical" MLT systems which allows one to calculate separate MLT for a given country (or area). This is the approach we have adopted in this study. But before we present the fitted MLTs we examine first the results from indirect estimation for (i) infant and childhood mortality and (ii) adult mortality.

Table 4.7

Model Patterns: Deviations from the "general" Pattern

Model	Infancy	(A) Relative Shapes childhood	Adult	Old age
South Asian	-	High	-	High
Chilean	High	-	-	-
Far Eastern	-	-	-	High
Latin American	High	High	High	Low
East	High	-	-	Very High
North	Low	High	-	Low
South	High	-	Low	High
IDEAL**	High	High	Medium	High

Source: Anson(1991)
Note: ** ideal for Malawi

4.4 Mortality Estimates From Indirect Estimation

4.4.1 Infant and Child Mortality

Brass(1968) was the first to develop a method of estimating infant and childhood mortality based on the information on children ever born (CEB) and children dead (CD). He presented a table of multipliers for converting the proportion dead among the CEB reported by women in age group i, denoted as D(i), where i represents maternal age groups 15-19, 20-24, ..., 45-49, into probability of dying between birth and exact age x, denoted as q(x), where x = 1, 2, 3, 5, 10, 15, 20.

The method is based on the finding that D(i) depends on both the level of mortality and the age distribution of CEB for women in the age group i. It can be noted that the former is the variable we would like to estimate and the latter is a function of age specific fertility schedule experienced by women throughout their reproductive period up to age i. Thus if both the distribution of women by age and age specific fertility schedule are available, then mortality estimates can be obtained from the proportion dead children among CEB.

Using the logit system of model life tables and a three degree polynomial fertility distribution schedule, Brass presented a set of multipliers for converting D(i) into equivalent life table values q(x). He further showed that in order to determine appropriate set of multipliers the following pair of indicators of fertility location should be used: the mean of age specific fertility schedule (m), the ratio of P(1) and P(2), and the ratio of P(2) and P(3). The ratio P(1)/P(2) is used to determine the factors for the first three age groups and m for the remaining age groups. Subsequent analysis revealed that the single parameter P(2)/P(3) gives plausible multipliers for the estimates of q(2), q(3) and q(5) which are the most plausible estimates derived from this procedure (Brass,1976).

Sullivan(1972) suggested another set of multipliers based on the observed fertility schedules and Coale-Demeny set of MLTs. He also discovered that the multiplying factor is a linear function of the measure indicating the beginning of childbearing, P(2)/P(3) and presented different coefficients for different families of the MLTs.

Trussell(1977) presented yet another set of multipliers based on the Coale and Trussell(1974) fertility schedules and Coale and Demeny(1966) model life tables. He presented a set of regression coefficients for each family of the model life tables. Recent versions of Trussell's regression equations are presented in UN Manual X (United Nations,1983).

The original Brass procedure (Brass,1968) and the earlier variants (Sullivan,1972; Trussel,1977) assumes that mortality has remained constant in the recent past. Experience, however, seems to indicate otherwise, and a number of studies have demonstrated that developing countries have witnessed mortality decline since the end of second world war. As the data in the previous section has demonstrated there is some evidence to suggest that Malawi is no exception and that mortality has improved in the last two decades or so.

Feeny(1980) was the first to present an estimation procedure that assumes a constant change of mortality. As with the original Brass method, Feeney's method has been so extensively promoted that almost all the earlier techniques have been re-formulated to include - and the most recent versions of the procedure include - this novel idea of establishing the time period to which each of the mortality estimates refers.

To use the above-described procedures children ever born and children dead (or children surviving) statistics, denoted as CEB and CD (or CS) respectively, should be tabulated by the age group of the mother. CD data are presented in Table 4.8 (column 3) below and illustrated in Figures 4.8a-b. Since CEB statistics are also used in estimating the level of fertility these data are presented in Table 5.2 in Chapter V. However, the ratios P(1)/P(2) and P(2)/P(3) calculated from these data are given in Table 4.6 whereas the values of the mean age of childbearing, m, calculated from births in the last 12 months are presented in Table S5.2. Also presented in Table 4.8 are the multipliers obtained using the ratio P(2)/P(2). The ratio P(1)/P(2) and m produced somewhat similar multipliers that the resulting mortality estimates were almost identical.

Table 4.8

Estimated and Smoothed Infant Mortality
Using Brass Procedure (1972 - 1984)

1970-72 MPCS

Age of the Mother	CD	K(x)	Q(x)	Smoothed Q(x) Standard African	General	Date of Estimate
(1)	(2)	(3)	(4)	(5)	(6)	(7)
15-19	0.356	0.985	0.351	0.231	0.253	1970.4
20-24	0.327	1.014	0.332	0.306	0.314	1968.9
25-29	0.343	0.996	0.342	0.341	0.341	1967.0
30-34	0.345	1.004	0.346	0.375	0.365	1964.7
35-39	0.385	1.013	0.390	0.423	0.389	1962.3
40-44	0.403	0.990	0.399	0.441	0.407	1959.6
45-49	0.429	0.988	0.424	0.470	0.435	1956.3

P1/P2 = 0.171 P2/P3 = 0.484

1977 MPC

Age of the Mother	CD	K(x)	Q(x)	Smoothed Q(x) Standard African	General	Date of Estimate
(1)	(2)	(3)	(4)	(5)	(6)	(7)
15-19	0.248	0.905	0.225	0.199	0.219	1976.2
20-24	0.274	0.969	0.265	0.267	0.275	1974.4
25-29	0.310	0.969	0.300	0.299	0.299	1972.5
30-34	0.339	0.980	0.332	0.331	0.322	1970.2
35-39	0.362	0.988	0.358	0.378	0.345	1967.7
40-44	0.384	0.962	0.369	0.395	0.362	1964.8
45-49	0.408	0.960	0.391	0.423	0.389	1961.4

P1/P2 = 0.249 P2/P3 = 0.560

1982 MDS

Age of the Mother	CD	K(x)	Q(x)	Smoothed Q(x) Standard African	General	Date of Estimate
(1)	(2)	(3)	(4)	(5)	(6)	(7)
15-19	0.205	0.933	0.191	0.170	0.188	1981.5
20-24	0.228	0.986	0.225	0.231	0.238	1979.8
25-29	0.265	0.980	0.260	0.261	0.261	1977.9
30-34	0.302	0.990	0.299	0.290	0.282	1975.6
35-39	0.334	0.998	0.333	0.334	0.303	1973.2
40-44	0.364	0.973	0.354	0.350	0.319	1970.4
45-49	0.393	0.971	0.382	0.377	0.345	1967.0

P1/P2 = 0.223 P2/P3 = 0.530

1984 FFS

Age of the Mother	CD	K(x)	Q(x)	Smoothed Q(x) Standard African	General	Date of Estimate
(1)	(2)	(3)	(4)	(5)	(6)	(7)
15-19	0.153	0.949	0.145	0.149	0.165	1983.1
20-24	0.220	0.994	0.219	0.205	0.211	1981.5
25-29	0.234	0.985	0.230	0.232	0.232	1979.6
30-34	0.247	0.994	0.245	0.259	0.252	1977.3
35-39	0.280	1.002	0.281	0.300	0.272	1974.9
40-44	0.300	0.978	0.293	0.316	0.287	1972.1
45-49	0.338	0.976	0.330	0.342	0.311	1968.7

P1/P2 = 0.217 P2/P3 = 0.516

Fig 4.8a Time Trending Infant Mortality

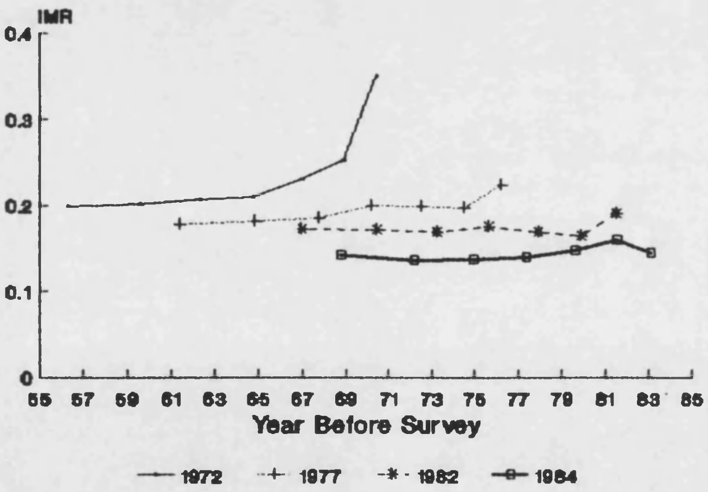
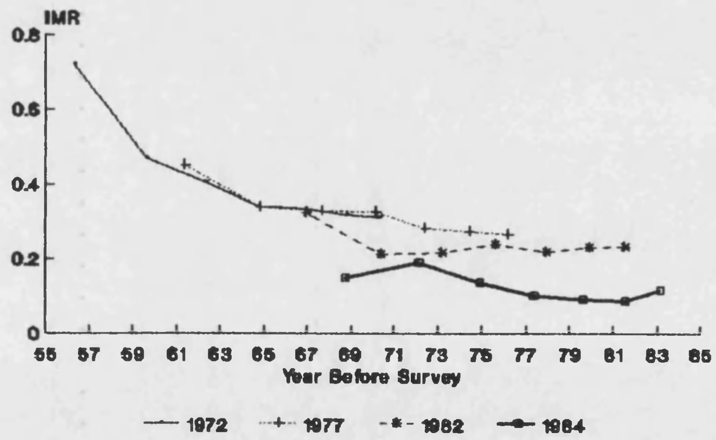


Fig 4.8b Time Trending Infant Mortality



This graph is based on IMR estimates calculated from CEB derived from ASFR using Brass polynomial function.

The proportion of children dead for age group 15-19 are usually unreliable. Data in Table 4.8 vindicates this finding. The value for the 1970-72 MPCS is implausibly high whereas the values for the 1977 MPC, the 1982 MDS and the 1984 FFS are too low. This is attributable to age reporting of young and teenaged mothers at the beginning of childbearing and sampling variations originating from the small number of births to women aged 15-19 years. Furthermore, a high proportion of children born to women aged 15-19 are first order births and are consequently subject to high mortality levels (Mahadevan,1984; Palloni,1981).

The CD values are expected to increase with the age of the mother since the older the age group the longer the CEB were exposed to the risk of dying and the higher the mortality. The data in Table 4.8 appear to pass this test with the exception of the 1972 data whose CD values decline between the age groups 15-19 and 20-24 and remain more or less constant for the age groups 25-29 and 30-34. The small increase observed at the older age groups can be associated with omission of children: a phenomenon which is common at these age groups.

Three tentative conclusions can be deduced from the CD data. Firstly, the level of mortality in Malawi is very high. Secondly, the decline in mortality as postulated above is also indicated. This is deduced from the fact that at each age group the proportion of dead children is highest in 1972 and lowest in 1984. Thirdly, with the exception of age group 20-24 in 1970-72 and in absence of omission, the increase in the proportion dead increases with the age group of the mother. This partly suggests that the omission of dead children is not a function of the age group of the mother and in the absence of omission it suggests that mortality has declined in the recent past.

Another way of evaluating the data is to examine the reported sex ratios of CEB and CD. Such information is only available from the 1982 and 1984 surveys (see Table 4.9 below).

Table 4.9

Sex Ratio for Children Ever Born and Children Dead: Malawi (1982, 1984)

Age Group	1982 CEB	1982 CD	1984 CEB	1984 CD
15-19	103	119	114	174
20-24	102	106	100	97
25-29	99	106	98	105
30-34	99	101	101	97
35-39	98	101	108	113
40-44	97	94	97	101
45-49	99	102	101	106
15-49	99	101	101	105

The observed pattern seem to be reasonable and comparable with the results obtained from other African countries (GOZ,1982; ROZ,nd). The reported values are close enough to 100 implying no apparent differences in the reporting of male and female children. The "slightly" high ratios reported by young mothers could be due to small number of births occurring to women in their teens and early twenties. The somewhat low ratios in the older age groups may be indicative of a slight tendency to omit male children. This may arise from the fact that male children are more likely to move away as labour migrants. In matrilineal societies (with matrilocal residence) male children (of older women) are also likely to be away from their kinsmen (village) as a result of the customary practice which requires them to reside at their wives place. Although most ethnic groups in Malawi are matrilineal the above remark is just a mere conjecture. The probable effect of this phenomenon however requires that CEB and CD data are available by ethnic groups which can then be differentiated into matrilineal and patrilineal societies.

The above described procedures were applied to the Malawian data set and the results proved very trivial, though expected. Firstly, the differences between the various estimates derived from the different variants were relatively small and it was impossible to establish the advantages of using one method over the other. Thus, using any of them would give satisfactory results. Secondly, the question of which set of estimates to accept as representing the pattern of infant and childhood mortality in Malawi, given the various model pattern of mortality, re-surfaced.

As a result of the above dilemma the estimates were subjected to a further consistency check. This involved comparing the "observed" logits (calculated from the q(x) estimates) with the "standard" logits (calculated from the q(x) values of various model life tables). When comparing the observed and standard logits it was assumed that a linear relationship would emerge if the two set of logits come from the same model life table (Brass et.al.,1968). In each case the average level of mortality implied by childhood estimates for each family was "accepted" as the standard. The plots of the standard and observed logits are presented in Figure 4.4. As before no one set of model life table can be regarded outright as representative of the mortality situation in the country.

It was stated in the introduction of this chapter that the importance of selecting an appropriate MLT when estimating the level of mortality will be illustrated. This is done in Table 4.10 below. Two things can be deduced from this table. Firstly, the implied e(0) varies from one set of model life tables to another set. In general terms, the e(0) estimates derived from the New UN model life tables are lower than those obtained from the Princeton set of model life tables. Brass estimates seem to lie in between the two.

Secondly, within each set, the implied level of mortality varies from one family to another. For instance the e(0) estimates based on Princeton model life tables indicate that the south family gives a highest estimate of e(0), followed by the east family, then the north family and the west family gives the least estimate. In addition mortality estimates for the last two families tend to be close to each other. Similarly, ranking the families of UN MLTs from the one that produces the highest to lowest estimates, the following picture is obtained: South Asian pattern, Latin American pattern, Chilean pattern, Far Eastern pattern and General pattern. It should further be added that the degree of variation between different families of the same system of MLT is greater in the UN MLTs than in Coale and Demeny MLTs.

Although the difference between the e(0) estimates based on the various families are mathematically small and appear negligible to a layman's eye, it should be noted that extensive research by the UN has shown that in developing countries a change in e(0) of two years can take place over a period of about five years (United Nations,1956, 1982a).

Table 4.10

e(0) Estimates Implied by q(x) using Brass General Standard, Princeton and New UN Model Life Tables (1972 to 1984)

		1972			1977		
		Q(2)	Q(3)	Q(5)	Q(2)	Q(3)	Q(5)
Brass MLT		25.9	28.8	32.9	32.2	32.5	33.7
	West	28.8	31.3	33.4	35.6	35.0	34.3
Princeton	North	27.5	31.0	33.5	34.9	35.0	34.6
MLT	South	32.8	34.7	36.7	39.3	38.3	37.7
	East	29.1	32.7	35.9	37.3	36.9	36.8
	Latin America	25.0	28.3	31.7	32.8	32.3	32.9
New UN	Chile	26.4	28.5	30.6	33.5	32.4	31.5
MLT	South Asia	29.8	33.3	34.0	37.7	37.4	36.8
	Far East	25.0	25.0	25.2	25.8	26.0	26.1
	General	25.0	27.0	29.8	30.7	31.0	30.9

		1982			1984		
		Q(2)	Q(3)	Q(5)	Q(2)	Q(3)	Q(5)
Brass MLT		37.1	36.8	37.1	38.0	40.2	42.6
	West	40.0	39.1	37.4	40.7	42.1	42.6
Princeton	North	39.2	39.1	37.7	39.9	42.1	43.0
MLT	South	43.6	42.3	40.4	44.4	45.5	45.4
	East	42.3	41.4	40.2	43.2	44.9	45.8
	Latin America	38.3	37.2	36.5	39.2	40.9	42.4
New UN	Chile	39.0	37.3	35.1	40.0	40.9	41.1
MLT	South Asia	42.9	42.1	40.4	43.8	45.5	46.0
	Far East	30.8	30.2	29.2	31.7	33.5	34.6
	General	36.1	35.7	34.3	37.1	39.2	40.2

In such circumstances the mean of the various estimates would normally be accepted as representing the level of childhood mortality in Malawi. But nonetheless, as it was argued in the preceding section, the measures derived from the original Brass technique were accepted as representative of the mortality situation in Malawi. This may look naive since most of the procedures exploited above reveal that Brass MLT replicates the Malawian data rather poorly. The measures obtained from indirect estimation method are supposed to give the minimum values below which no reliable estimates of mortality can be expected to lie. This is what Brass estimates appear to indicate. Therefore, although according to the results of the analysis carried in the preceding section, measures calculated using the South family of the Princeton would be expected to produce acceptable estimates, Brass′ estimates would be used in this study.

The choice of Brass MLT may further be justified on the grounds that in view of the fact that very little is known about the nature and pattern of mortality in Malawi, there exists enormous pressure on Malawian demographers to experiment with as many systems as possible with the hope that, in the final analysis, a "true" picture of the mortality situation in the country will be known.

Before leaving this section, it must be noted that other researchers have conducted studies to evaluate the performance of this estimation procedure. Evidence seem to indicate that the method has performed better in West Africa than elsewhere on the continent (Blacker,1979). Some studies have also revealed that if the aim of the estimation procedure is to obtain estimates of e(0) other procedures like the Ladderman formulae tends to give acceptable results and is therefore recommended (Garenne,1982). This formulae was applied to the Malawian data set and the results will be examined later in the chapter.

4.4.2 Adult Mortality

4.4.2.1 Extension of Childhood to Adulthood Estimates

In situations such as those existing in Malawi, where vital statistics are lacking, estimates of adult mortality may also be obtained from the reported proportion of children ever born and children surviving. In the original Brass procedure (Brass, 1968) mortality estimates could be derived up to age 35 while the most recent versions (United Nations,1983) of the method allow one to estimate mortality up to age 20. In theory this means that some estimates of adult mortality could be obtained using this method. In practice however, some problems still remain unsolved. Firstly, one often need to have mortality estimates beyond these age groups (say age groups above 20 years and 35 years). Secondly, as we have already pointed out, older women from which the information on children ever born and children surviving is obtained tend to omit children especially those children who are dead and consequently one is always suspicious about the estimates obtained from these age groups.

The analyses conducted in section 4.3 above revealed that the differences between the observed and modelled q(x) values (for various MLTs) for the adult population are negligible. Apart from the usual problems associated with the quality of data, this may be taken as suggestive evidence that mortality estimates for the adult population derived from any of the existing MLTs may be representative of the mortality conditions existing in Malawi. Therefore, given any MLT, the childhood estimates obtained in the preceding section can be extrapolated to adulthood. There are several approaches how this can be done. Essentially, all methods are based on fixing the level of childhood mortality as implied by CEB/CS data and then deducing adult mortality by using MLT. In this study, for reasons discussed earlier, the logit system and Brass African standard were employed.

Brass MLT is a two parameter system which can be expressed as follows:

$$Y(x) = \underline{A} + \underline{B}Ys(x) \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (ii)$$

where $\underline{A}$ refers to the level of mortality and $\underline{B}$ represents the relationship between child and adult mortality, and Y(x) and Ys(x) are the logits of the study and standard population, respectively.

By setting $\underline{B}$ equal to its central value of one, equation (ii) becomes a single parameter system:

$$Y(x) = \underline{A} + Ys(x) \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (iii)$$

Given the above formulation, the method adopted involved the following two steps. Firstly, the graduated l(x) values were used to calculated A values corresponding to given B values. Since the plausible range for B is 0.6 to 1.4 (Newell,1988; Carrier and Hobcraft,1971), B values lying between 0.5 and 1.3 at 0.1 interval were considered. The A values obtained in this way are given in Table 4.11 below. Secondly, using the estimated A and given B values, a series of life tables were calculated. The whole problem then reduces to selecting which of these tables are representative of the mortality situation in Malawi?

The e(0) estimates calculated from the above exercise and for selected B values are given in Table 4.12 below. Also presented in this table are e(0) estimates obtained from the reported statistics, Ladderman and Myburgh formulae7.

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7 Garrane argued that if the purpose of using Brass CEB and CS procedure is to obtain e(0) estimates then Ladderman formulae gives better results than Brass technique. Ladderman formulae is as follows:

85.386 - 2.6244*SQRT(1000*D2) ....

where SQRT(X) refers to the square root (positive) of the product in the brackets; and
D2 is the proportion dead of children ever born to women in the age group 20-24.

Table 4.11

Alpha Values for given Beta Values for Malawi

Both Sexes

Given Beta	Graduated l(x) values 1972 0.691	1977 0.730	1982 0.766	1984 0.793
0.5	-0.039	-0.133	-0.230	-0.307
0.6	0.034	-0.060	-0.157	-0.234
0.7	0.107	0.013	-0.084	-0.161
0.8	0.179	0.086	-0.011	-0.088
0.9	0.252	0.158	0.061	-0.016
1.0	0.325	0.231	0.134	0.057
1.1	0.398	0.304	0.207	0.130
1.2	0.470	0.376	0.280	0.202

Male

Given Beta	Graduated l(x) values 1972 0.676	1977 0.715	1982 0.751	1984 0.778
0.5	-0.004	-0.095	-0.189	-0.262
0.6	0.069	-0.023	-0.116	-0.189
0.7	0.141	0.050	-0.043	-0.117
0.8	0.214	0.123	0.030	-0.044
0.9	0.287	0.196	0.102	0.029
1.0	0.360	0.268	0.175	0.101
1.1	0.432	0.341	0.248	0.174
1.2	0.505	0.414	0.321	0.247

Female

Given Beta	Graduated l(x) values 1972 0.706	1977 0.745	1982 0.781	1984 0.808
0.5	-0.074	-0.171	-0.272	-0.354
0.6	-0.002	-0.099	-0.200	-0.281
0.7	0.071	-0.026	-0.127	-0.208
0.8	0.144	0.047	-0.054	-0.135
0.9	0.217	0.120	0.019	-0.063
1.0	0.289	0.192	0.091	0.010
1.1	0.362	0.265	0.164	0.083
1.2	0.435	0.338	0.237	0.156

Table 4.12

Mortality Estimates by various methods
and researchers: Malawi 1972 - 1984

Method/Researcher	1972	1977	1982	1984
Graduated l(x)+				
and B = 0.5	45.5	49.6	53.5	56.6
= 0.6	42.3	46.0	49.9	52.9
= 0.7	39.4	43.0	46.7	49.6
= 0.8	36.9	40.3	43.9	46.7
= 0.9	34.7	38.0	41.4	44.1
= 1.0	32.7	35.9	39.2	41.8
= 1.1	30.9	34.0	37.1	39.7
= 1.2	29.3	32.2	35.2	37.7
= 1.3	27.3	30.0	33.6	36.0
Implied by q(3)	29.0	33.0	37.0	40.0
Ladderman formulae	36.6	37.1	39.8	44.1
Myburgh formulae	36.2	39.3	40.4	40.1
Reported	34.2	37.6	-	40.0
NSO(1984)		39.3		
UN				
Blacker*	37.2	-	-	-

Notes: (i) + corresponding A values are given in Table 4.12b above.
(ii) * estimate calculated by this author using A and B values suggested by Blacker(1977a).

Since the CEB and CS data for the 1970-72 MPCS and the 1977 MPC are tabulated for both sexes the estimated proportion surviving for both sexes, denoted l(x,b), had to be split into two to obtain proportion surviving for males, l(x,m) and females, l(x,f), respectively. Through his experience in working with data from developing countries, Blacker(1977a) has found out that in most cases l(x,f) is 10 to 15 points higher than l(x,b) and l(x,m) is 10 to 15 points lower than l(x,b). This method was employed using the four sets of data. The data from 1982 MDS and 1984 FFS were used to test the validity of this "rough" procedure and the results indicate that the routine is plausible.

It can be noted from Table 4.12 that the estimates obtained from B values greater than 1.0 appear to be implausibly low whereas if B is less than 0.7 the estimates are unbelievably high. Evidence presented in section 4.3 above suggests that in Malawi infant and childhood mortality is very high relative to adult mortality as compared to the standard population. Consequently, a value of B less than one seems appropriate for Malawi. Accordingly the "acceptable" range of B seems to be 0.7 and 0.9 and at this stage of the analysis 0.8 seems an appropriate choice. This implies that e(0) was 37 years in the early seventies rising to 40 years in the mid seventies and reaching an estimate of 44 years in the early eighties. The estimates derived from Ladderman and Myburgh formulae closely resembles those implied by B = 0.8 with minor variations. Although IMR estimates derived from q(3) gives a consistent picture, the e(0) estimates obtained from them indicate a slightly higher mortality and cannot be relied upon.

The characteristic of Brass system exemplified in the preceding paragraph further illustrates the attractiveness of this system, in particular its simplicity to use. Furthermore, in view of the available data, this is the only model life table system which allows one to incorporate the two features that characterize the population of Malawi: very high childhood mortality and low (to moderate) adult mortality. Although other MLTs such as the north and south families of the Princeton set include this feature, attempts to fit them to the Malawian situation have been disappointing. The analyses carried out by NSO(1984) and Hill(1986) revealed that the age pattern of mortality in Malawi could not be represented by a single family of the Princeton model life tables. A similar problem has been found in other developing countries (Timaeus 1990).

Consequently, on the basis of childhood estimates derived from Trussell variant using the north family, NSO(1984) suggested that level 7.6 was representative of mortality pattern up to age group 5-9 for both sexes. Furthermore, using various indirect procedures based on the reported age-sex composition, level 10.6 was found to be representative of adult mortality after the age group 20-24 for males and 25-29 for females. In between these age groups both levels were believed to apply in varying proportions. Similarly Hill(1986) suggested that levels 8.3, 14 and 13 of south family were appropriate for respective age groups (i) below 15 years for males and below 10 years for females, (ii) above 20 years for males and (iii) above 25 years for females (see Table 4.13 below). In both cases it was assumed that the transition from the heavier childhood to lighter adulthood mortality is slower in the case of females than males. This could be justified on the basis of high maternal mortality in childbearing age groups.

Table 4.13

Blending Child and Adult Mortality Patterns

NSO

Age Groups	Male	Female
0-9	C	C
10-14	0.8C + 0.2A	0.75C + 0.25A
15-19	0.4C + 0.6A	0.50C + 0.50A
20-24	A	0.25C + 0.75A
25+	A	A

Source: NSO(1984b)

HILL

Age Groups	Male	Female
0-9	C	C
10-14	C	0.9C + 0.1A
15-19	0.5C + 0.5A	0.4C + 0.6A
20-24	A	0.1C + 0.9A
25+	A	A

Source: Hill(1986)

Note: A = Adulthood; C = Childhood

4.4.2.2 Orphanhood Estimates

Brass also developed a method of estimating adult mortality from the information supplied by children about the survival status of their parents (Brass and Hill,1973). Respondents in a survey or a census are asked whether or not their mother or father is alive. From the replies to this question, proportions with surviving mothers and fathers are calculated. Just like with the proportion of children dead in the childhood method, the proportion with surviving mother or father depends on the prevailing mortality conditions and the length of exposure to the risk of mortality. The former represents the variable of interest. The latter can be approximated by the difference between the age of the respondent (who is in fact the child) and the age of the parent (mother or father) at the time when the respondent was born (or conceived in the case of the father).

In Malawi three demographic inquiries have collected information on orphanhood: the 1977 MPCS, the 1970-72 MPCS and the 1982 MDS. It should be noted from the outset that each set of data has got its own problems. Firstly, the 1970-72 MPCS did not publish orphanhood statistics. This was probably due to the emphasis on providing an estimate of population growth rather than studying the determinants of such a growth. Secondly, the 1977 MPC did not tabulate the orphanhood data in the conventional manner which requires that the data should be classified by (a) survival status of parents (that is survival status of the father and mother, separately) and by age and sex of the respondents. Thirdly, for reasons which will become clear later in the section, the 1982 MDS only collected information on maternal orphanhood. Therefore no estimates of adult male mortality can be obtained from this source.

Like the childhood method this procedure has been modified and different variants of the method are currently available. The method has also benefited from some of the discoveries in childhood estimation, especially the "time-trending" exercise. United Nations(1983) has presented regression coefficients generated for each family of Coale and Demeny MLT, and Palloni and Heligman(1986) have presented similar values for the "new" UN general MLT. Timæus(1990) has recently re-evaluated the performance of procedures designed to estimate adulthood mortality and published new coefficients based on Brass general standard and Gompertz relational model using Booth's (1984) standard for females and Paget's(1988) standard for males8.

There are a number of problems associated with orphanhood data. Firstly, there is the usual problem of proxy reporting arising from the fact that the required information pertaining to an individual was supplied by another person: in this case the information about the survival status of the parents is provided by children. Secondly, the data may again be affected by age misreporting. Thirdly, proportions with surviving mother or father for the younger age groups are usually over-represented. This arises from the tendency of reporting "foster parents" as the "true biological parents" as a result of adoption.

Fourthly, parents with many surviving children are likely to be over-represented whereas couples with few surviving children are under-represented. In order to avoid this possible source of bias it has been recommended that the orphanhood question should be limited to the "eldest surviving child of the parent". The recommendation was considered at the planning stage of 1982 MDS, hence this is the only national survey in Malawi that has collected this information.

Fifthly, the information sought appear to be better

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8 The years in paranthesis indicate when the standards were proposed. For those interested in studying this subject further, consult Timæus(1990).

reported for the mothers than the fathers, and female respondents tend to give better statistics than male respondents. This phenomenon is quite common in African demographic data and can be attributed to migration. The available evidence indicate that more males than females tend to be away from their "usual place of residence". The effect of this is twofold. On the one hand, this means that male respondents may not be able to state whether or not their parents are alive. On the other hand, the children at home do not know for sure about the survival of their father. In both cases the occurrence of permanent migration as was claimed in the previous chapter may further exacerbate the effect of this bias. As a result of this observation, the 1982 MDS further collected information relating to maternal survival only.

It should further be noted that in certain sections the Malawian society, particularly the matrilineal groups such as the Chewa of the Central Region, maternal survival is likely to be better reported than paternal survival. This stems from the fact that in these communities the term "wamasiye" which translates to "orphan" is traditionally restricted only to those individuals whose mother have died and <u>not</u> to those whose father have died.

As a result of the above described problems the estimates of q(x) derived from the orphanhood method are usually not reliable as those derived from childhood method. Studies to evaluate the performance of orphanhood method in Malawi have given rise to contradictory results. Blacker(1977a) and Timaeus(1986) suggest that the results are plausible and expected for a developing country. In contrast the NSO's analysis of the 1977 data suggest a rather poor performance (NSO,1984b). In addition Timaeus(1983) further suggest that the 1970-72 MPCS and the 1977 MPS indicate inconsistent results. This probably explains and justifies why in a later study, Timaeus(1990) disregarded 1977 orphanhood statistics. No valid reason is yet available to explain the above noted inconsistency. Anyhow, it can be suggested that intensive training and good supervision associated with sample surveys probably contributed to the better statistics collected in the 1970-72 MPCS and the 1982 MDS. It is also possible that the "unconventional" tabulation in 1977 contributed to the above mentioned discrepancy.

The proportion with surviving mother and father obtained from the 1972 MPCS, the 1977 MPC and the 1982 MDS are presented in Table 4.14 below. The ratio of male and female respondents with surviving (i) mothers, (ii) fathers and (iii) parents (both mother and father) were calculated to capture the extent of differential reporting by the two sexes. These are given in columns (4) and (8) of Table 4.14a, columns (4) of Table 4.14b and columns (4) and (7) of Table 4.14c. The ratios are close enough to 1.00 suggesting that the reporting by the two sexes is almost the same. This is particularly true for young respondents in general and for maternal (Table 4.14a) and paternal (Table 4.14b) survival data. The high ratios found at older age groups can be attributed to exaggeration of age by males. Combined data for both sexes presents some problems (see Table 4.14c). In the case of 1970-72 statistics the ratios appear to be too low whereas similar ratios for 1977 appear to be too high. No reasons can be suggested for these discrepancies.

Table 4.14a

Proportion of Surviving Mothers

	1970-72			1982		
	Male	Female		Male	Female	
(1)	(2)	(3)	(4)	(5)	(6)	(8)
5-9	0.9766	0.9715	1.01	0.9905	0.9903	1.00
10-14	0.9511	0.9569	0.99	0.9816	0.9781	1.00
15-19	0.9263	0.9324	0.99	0.9614	0.9639	1.00
20-24	0.9108	0.8459	1.08	0.9343	0.9282	1.01
25-29	0.7839	0.7593	1.03	0.8918	0.8817	1.01
30-34	0.6849	0.7107	0.96	0.8341	0.8189	1.02
35-39	0.6009	0.5674	1.06	0.7338	0.7357	1.00
40-44	0.4519	0.4617	0.98	0.6554	0.6154	1.07
45-49	0.3915	0.3672	1.07	0.5538	0.5175	1.07
50-54	0.2917	0.2206	1.32	0.4697	0.4238	1.11

Notes: [i] (4)=(2)/(3) and [ii] (8)=(5)/(6)

Table 4.14b

Proportion of Surviving Fathers

	1970-72 Male	1970-72 Female	
(1)	(2)	(3)	(4)=(2)/(3)
5-9	0.9350	0.9483	0.99
10-14	0.9279	0.9185	1.01
15-19	0.8728	0.8618	1.01
20-24	0.7931	0.7647	1.04
25-29	0.6959	0.6528	1.07
30-34	0.5345	0.5311	1.01
35-39	0.4266	0.4278	1.00
40-44	0.2974	0.2938	1.01
45-49	0.2757	0.1787	1.54
50-54	0.1730	0.1039	1.66

Table 4.14c

Proportion with Surviving Parents (both Sexes)

	1970-72 Male	1970-72 Female		1977 Male	1977 Female		1982 Female
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
5-9	0.9418	0.9740	0.97	0.9772	0.9612	1.02	0.9904
10-14	0.9232	0.9540	0.97	0.9568	0.9301	1.03	0.9798
15-19	0.8669	0.9296	0.93	0.9190	0.8706	1.06	0.9626
20-24	0.7758	0.8712	0.89	0.8653	0.7851	1.10	0.9311
25-29	0.6708	0.7696	0.87	0.7968	0.6812	1.17	0.8862
30-34	0.5325	0.7000	0.76	0.7053	0.5584	1.26	0.8258
35-39	0.4273	0.5821	0.73	0.6196	0.4572	1.36	0.7348
40-44	0.2954	0.4574	0.65	0.5199	0.3535	1.47	0.6335
45-49	0.2244	0.3787	0.59	0.4296	0.2680	1.60	0.5348
50-54	0.1358	0.2531	0.54	0.3107	0.1753	1.77	0.4449

Notes: (4) = Ratio of (2) and (3)
(6) = Ratio of (5) and (6)

Another test of consistency in orphanhood data is based on Preston's (quoting United Nations,1983; Brass,1985) finding that in a closed population the number of living children reported by mothers should equal the number of mothers reported still alive unless mothers are counted more than once. This relationship forms a useful check in measuring the degree of "adoption bias". The Malawian data were assessed using this procedure and the results were amazingly encouraging (see Table 4.15). Nonetheless, due to the scant nature of data we are dealing with, this close agreement may well be attributable to not only chance but also the offsetting effects of (i) emigration which usually result in larger numbers of living children than surviving mothers and (ii) adoption which conversely affects the two sets of data.

Table 4.15

Comparison of Numbers of persons who reported mothers alive with number of living children by mothers (Malawi 1972 - 1982)

	Mother Alive	Children Living	Percentage Difference
1972	3,115,464	3,130,707	-0.49
1977	4,302,289	4,319,173	-0.39
1982	4,925,100	4,972,931	-0.97

From the reported births in the household in the last twelve months, the mean age of the mothers at the birth of their children (M) was calculated. The value was found to be 28.08 years for the 1970-72 MPCS, 27.44 for the 1977 MPC and 27.11 for the MDS. Although the 1984 FFS did not ask the "orphanhood" question the value of M was however calculated and it turned out to be 27.30 years.

Except for the 1970-72 MPCS the values of M are more or less similar and look plausible for a developing country like Malawi. They are also comparable to values of M calculated for other developing countries and are close enough to the "minimum" value of 27 years which Brass recommended for use in countries where no independent estimates of M can be made.

The value of M for the 1970-72 MPCS appears to have been exaggerated. This could have happened as a result of age mis-reporting errors. As outlined in Chapter III above, in comparison with other sources, 1970-72 age distribution reflect a distinct pattern of distortions. The overall effect of this is to underestimate the level of mortality.

Using the calculated value of M the multiplying factors were obtained for each central age and from these the corresponding mortality measures were derived. These are give in Table 4.16 below. On assumption that the changes in adult mortality are linear over time, and that the pattern of adult mortality in the population resembles that described by the Brass standard life table the "time location estimates" (denoted as t(n)) were calculated. A and t(n) values were estimated using the formulae:

$$\underline{A} = -0.5 \, \mathrm{LOG} \left\{ 1 + \left[\frac{P(N,B)}{ls(B+N)} - \frac{1}{ls(B)} \right] / \left[1 - P(N,B) \right] \right\}$$

$$t(n) = N/2 \left\{ 1 - 1/3 \ln \left[\frac{P(N,B)\ (80-M)}{80 - (M+N)} \right] \right.$$

where P(N,B) is the probability of surviving from age B to B+N

N is the central age of the respondent,

M is the mean age of mothers at birth,
B is the age at the time of birth (of the respondent) in this case assumed to be 25 years,
ls(x) is the survivors to age x taken from the standard population, and
ln stands for natural logarithm.

Mortality measures presented in Table 4.16 give the conditional mortality level as they are based on the observation that the mothers survive to age group M. It is therefore necessary to obtain unconditional measures of mortality.

Table 4.16

Estimates of Adult Mortality derived From Maternal Orphanhood Method

1970-72 MPCS

Age of Respondent*	N	W(N)	l(25+N) / l(25)	A	t(n)	Date of Estimate
15-19	20	0.928	0.955	-0.959	8.5	1963.1
20-24	25	1.024	0.934	-0.942	10.0	1961.6
25-29	30	1.090	0.854	-0.656	11.5	1960.1
30-34	35	1.139	0.766	-0.549	12.5	1959.1
35-39	40	1.124	0.728	-0.688	12.3	1959.3
40-44	45	1.078	0.576	-0.589	11.5	1960.1
45-49	50	0.906	0.453	-0.665	4.1	1967.5

* female only

1970-72 MPCS

Age of Respondent*	N	W(N)	l(25+N) / l(25)	A	t(n)	Date of Estimate
15-19	20	0.928	0.952	-0.924	8.5	1963.1
20-24	25	1.024	0.931	-0.912	10.1	1961.5
25-29	30	1.090	0.880	-0.785	11.3	1960.3
30-34	35	1.139	0.779	-0.592	12.4	1959.2
35-39	40	1.124	0.715	-0.650	12.4	1959.2
40-44	45	1.078	0.592	-0.627	11.3	1960.3
45-49	50	0.906	0.450	-0.659	4.2	1967.4

* both sexes combined.

1977 MPC

Female

Age of Respondent*	N	W(N)	1(25+N) / 1(25)	A	t(n)	Date of Estimate
15-19	20	0.875	0.923	-0.642	8.7	1969.0
20-24	25	0.958	0.867	-0.506	10.4	1967.3
25-29	30	1.011	0.786	-0.387	12.0	1965.7
30-34	35	1.049	0.687	-0.310	13.3	1964.4
35-39	40	1.021	0.561	-0.247	14.3	1963.4
40-44	45	0.963	0.453	-0.295	13.9	1963.8
45-49	50	0.783	0.335	-0.375	8.9	1968.7

* both sexes combined

1982 MDS

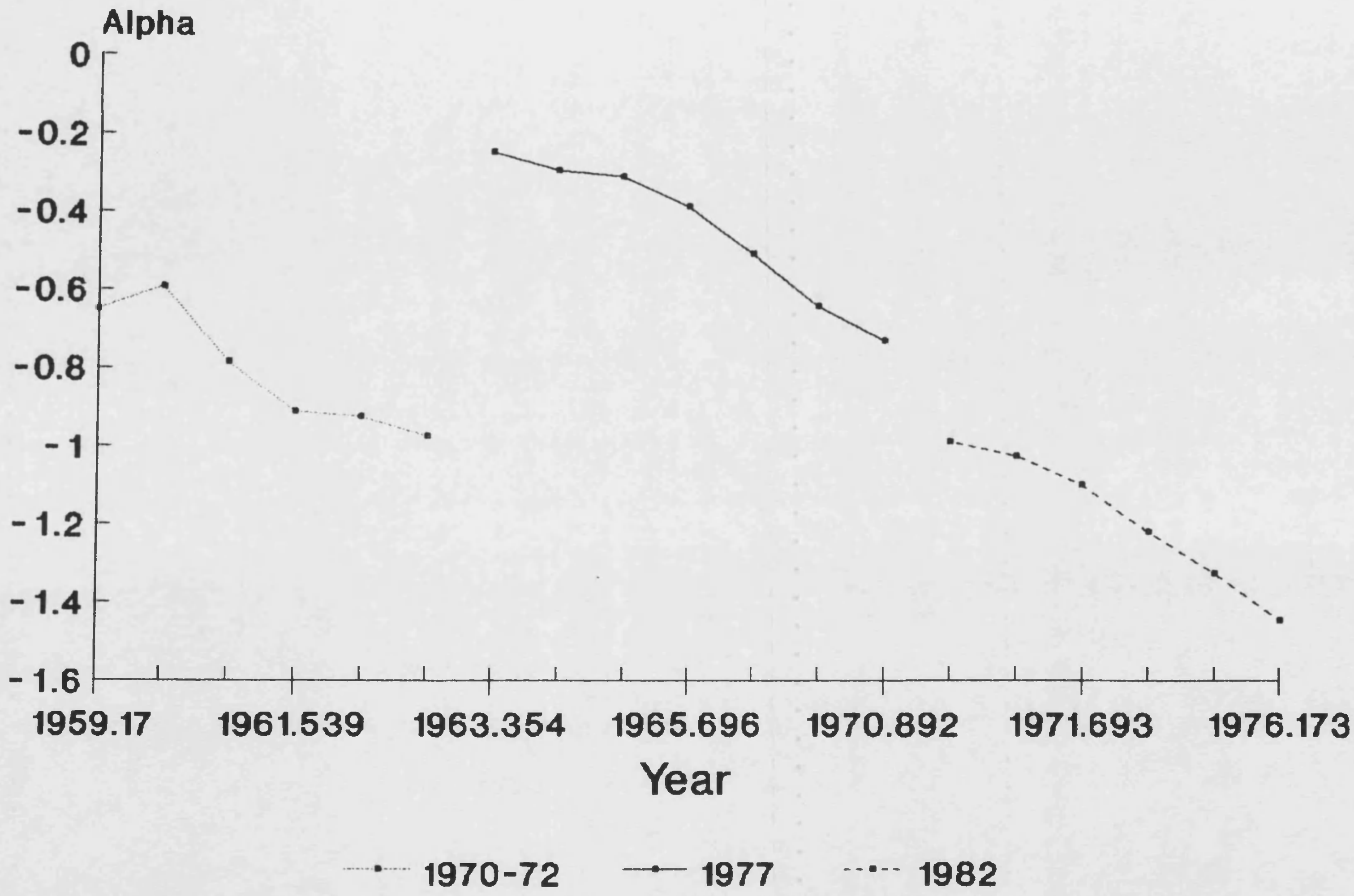
Age of Respondent*	N	W(N)	1(25+N) / 1(25)	A	t(n)	Date of Estimate
15-19	20	0.847	0.976	-1.297	8.5	1974.4
20-24	25	0.924	0.961	-1.232	10.0	1972.9
25-29	30	0.970	0.927	-1.076	11.2	1971.7
30-34	35	1.001	0.882	-1.002	11.9	1971.0
35-39	40	0.967	0.816	-0.963	11.9	1970.9
40-44	45	0.903	0.724	-0.952	10.7	1972.2
45-49	50	0.719	0.588	-0.962	5.2	1977.7

* female

1982 MDS

Age of Respondent	N	W(N)	1(25+N) / 1(25)	A	t(n)	Date of Estimate
15-19	20	0.847	0.977	-0.340	8.9	1974.0
20-24	25	0.924	0.960	-0.472	10.5	1972.4
25-29	30	0.970	0.930	-0.553	11.7	1971.1
30-34	35	1.001	0.886	-0.615	12.6	1970.3
35-39	40	0.967	0.823	-0.673	12.8	1970.1
40-44	45	0.903	0.725	-0.705	11.8	1971.1
45-49	50	0.719	0.606	-0.783	6.5	1976.4

Fig 4.9 Time Trending Adult Mortality



4.4.3 Linking Childhood and Adult Mortality

Having established both child and adult mortality the next step is to combine them to derive "single" life table measures such as e(0) for the entire population. There are a number of ways of combining childhood and adulthood mortality estimates (Blacker,1971, 1977a; NSO,1984b; Hill,1986). The one followed here is based on the procedure advocated by Brass (Brass and Hill,1973) and involves obtaining A and B values by "iterative" method. The steps followed were:

1. the estimated q(x) (where x = 2, 3, 5) were accepted as representing the level of childhood mortality. These were then averaged and the logit of the average calculated. Similarly, the corresponding logits for the standard are averaged. Substituting the two "average" logit values into equation (i) gives:

   $$Y(C) = \underline{A} + \underline{B}\ Ys(C) \quad \ldots\ldots\ldots\ldots \quad (iv)$$

   where A and B are as defined above;
   Y(C) refers to the logit of the average of q(x) estimates representing the level of childhood mortality for the observed population and Ys(C) are the corresponding values for the standard population.

2. the adulthood mortality estimates calculated in section 4.4.3 above were then
   (i) multiplied by ls(25), the proportion surviving to age 25, obtained from Brass model life table;
   (ii) the logits of l(25+N), where N = 20, 25, 30, 35 were calculated and averaged. These measures

represent adulthood mortality which need to be "linked" to childhood estimates defined in step 1.

(iii) the average of the logits calculated in (ii) together with corresponding logits obtained from the standard life table were used to obtain another equation of the form:

$$Y(A) = \underline{A} + \underline{B}\ Ys(A) \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (v)$$

where $\underline{A}$ and $\underline{B}$ are as defined above, Y(A) refers to the average logits for the adult population, and Ys(A) refer to corresponding standard logits.

3. putting together equations (iv) and (v) we obtain a pair of equations for which the values of the "unknown" parameters $\underline{A}$ and $\underline{B}$ could be simultaneously determined;

4. using the estimated $\underline{A}$ and $\underline{B}$ values obtained in step (3), a new value of l(25), denoted as l*(25) is calculated as follows:

$$Y^*(25) = \underline{A} + \underline{B}\ Ys(25) \quad \ldots\ldots\ldots\ldots \quad (vi)$$

$$l^*(25) = \frac{1}{1 + EXP(\ 2Y^*(25)\ )} \quad \ldots\ldots\ldots \quad (vii)$$

where $\underline{A}$ and $\underline{B}$ are the estimates derived in step (3) and Ys(25) is obtained from standard life table;

5. steps 2 to 4 were repeated [each time using l*(25) calculated in step (4)] until the estimated values were approximately constant which in practice meant until the first two decimal places of the estimates

no longer changed with continued application of the method);

6. once the final estimates of A and B (denoted A* and B* respectively) were calculated, the estimated l(x) values of the fitted LT were obtained using equation:

$$Y^*(x) = A^* + B^*\, Ys(x) \quad .... \text{(viii)}$$

$$l^*(x) = \frac{1}{1 + EXP(\ 2Y^*(x)\ )} \qquad \text{(ix)}$$

where x, A*, B* and Ys(x) are defined as above, Y*(x) denote the estimated logit of x and l*(x) refers to the estimated survivorship to age x.

The following are the final estimates of A and B obtained from using maternal orphanhood data for both sexes:

	A	B
1972	-0.0916	0.330
1977	-0.0409	0.530
1982	-0.2672	0.353

The estimated A values indicate that the level of mortality in Malawi is slightly higher than that of the standard population: that is 43 years. For 1982 this is plausible but for 1970 and 1977 this looks impossible. The estimated B values are implausibly low and lie outside the accepted limits of 0.6 and 1.3. The values however compare favourably with those obtained from the reported death statistics. Furthermore, the fitted B values imply an extremely higher child mortality, a feature which is supported by the reported death statistics.

It should be noted that Carrier and Hobcraft (1971), in their analysis of the effect of mortality decline on B values concluded that "the estimate of B [was] always too low and more so, the faster the mortality decline." They proceeded to comment that "This suggests that one symptom of [mortality] transition may be an abnormally low estimate of B.9 This observation may indeed be valid in the case of Malawi as the B estimates calculated from both reported statistics (section 4.3 above) and those obtained by Brass procedure are "abnormally low".

Table 4.17

Selected Life Table values for Malawi (both sexes)

	1972		1977		1982	
	l(x)	e(x)	l(x)	e(x)	l(x)	e(x)
0	100000	46.4	100000	47.3	100000	52.6
1-4	69875	65.3	75728	61.4	77372	66.9
5 - 9	67144	63.9	71801	60.7	74912	65.1
10 - 14	65969	60.0	70054	57.1	73836	61.0
15 - 19	65324	55.5	69084	52.9	73241	56.5
20 - 24	64865	50.9	68387	48.4	72816	51.8
25 - 29	63322	47.1	66017	45.1	71373	47.8
30 - 34	62758	42.5	65139	40.6	70840	43.1
35 - 39	61859	38.1	63732	36.5	69987	38.6
40 - 44	60728	33.7	61947	32.5	68906	34.2
45 - 49	59655	29.3	60238	28.3	67870	29.6
50 - 54	58612	24.8	58568	24.0	66855	25.1
55 - 59	57521	20.2	56813	19.7	65784	20.4
60 - 64	56317	15.6	54870	15.3	64592	15.8
65+	54914	10.9	52604	10.9	63190	11.1

The life tables calculated using the estimated values of A and B give values of e(0) which are exceedingly high (see Table 4.17 above). For instance, according to this procedure, e(0) for females was

9 The underlining and the words in brackets are by this writer.

estimated to be 46 years in 1970-72 slightly rising to 47 years in 1977 and attaining a value of 52 years by 1982. These estimates are outside the upper limit of all estimates of mortality currently available for Malawi with one exception: the MOH estimate (see Table S4.1c .

Using birth history data collected in the 1984 FFS, MOH has estimated that IMR was 189 infant deaths per 1,000 live births in the late 1960s declining to 144 in mid 1970s and to 105 deaths per 1,000 in early 1980s. These estimates compare favourably with the e(0) presented in Table 4.17 above. However given that very little examination was carried out in terms of the quality of data and the relevance of the procedure followed, one is sceptical about MOH estimates. Moreover the various aspects examined in this study reveal some unexplained distortions in the 1984 data-set. Thus until some of these problems are settled much trust will not be placed on these estimates.

In absence of any plausible explanation for the irregularity in estimated B values, it can be suggested that the results are affected by distortions in the reported age statistics. This feature has been noticed in the analyses of data from other African countries and John Blacker has been active in this area (Blacker,1971; GOB,1971)).

As a result of this anomaly John Blacker has suggested another method of calculating B. This method involves calculating a series of MLTs based on (i) the accepted childhood estimates and (ii) the "possible" range of B values (Blacker,1977a). The problem is then reduced to determining which of these models is appropriate for the population under study. This can be done through trial and error as was the case in section 4.4.2.1 above. The availability of mortality estimates in adulthood ages however speeds up this process.

The procedure involves constructing a life table with the radix at age 25 from the estimated adulthood measures, l(25+N)/l(25). Using the e(x) measures calculated from these life tables and presented in Table S4.11 estimates of B values are obtained by interpolating between appropriate MLTs based on accepted childhood estimates. The results of this exercise are given in Table 4.18 below.

Examining the different estimates of B presented in Table 4.18 reveal that the B values for respondentS in the younger age groups are on the lower side than those based on the middle aged women. Similarly the B values are slightly higher. This implies that B values in the age range 15-35 seem acceptable. Consequently, the B values in this range were then averaged and accepted as representing the relationship between child and adult mortality in Malawi. From the implied B values relevant A values are estimated just like in section 4.4.2.1 above. Since the A and B values estimated in this way are for the female population, similar values for the male population were derived from the former using a procedure advocated by John Blacker and presented in section 4.4.2.1 above. The estimates of B values obtained using

Blacker's approach are presented in Table 4.18 below.

Table 4.18

Estimating B values using Blacker's Method

1972 MPCS

Respondents' Age		Female Respondents l(x)	e(x)	B*	Respondents of both sexes l(x)	e(x)	B*
5-9	10	1000	36.3	0.685	1000	36.6	0.673
10-14	15	969	32.4	0.750	970	32.7	0.738
15-19	20	955	27.8	0.792	952	28.3	0.771
20-24	25	934	23.4	0.842	931	23.9	0.816
25-29	30	854	20.4	0.828	880	20.1	0.844
30-34	35	766	17.4	0.825	779	17.4	0.825
35-39	40	728	13.2	0.918	715	13.7	0.880
40-44	45	576	11.0	0.900	592	11.0	0.900
45-49	50	453	8.3	0.975	450	8.7	0.925
50-54	55	318	5.8	-	336	5.8	-

1977 MPC

Respondents of both sexes

		l(x)	e(x)	B*
5-9	10	1000	32.1	0.877
10-14	15	954	28.5	0.960
15-19	20	923	24.4	1.000
20-24	25	867	20.8	1.027
25-29	30	786	17.7	1.029
30-34	35	687	14.9	1.025
35-39	40	561	12.7	0.983
40-44	45	453	10.1	1.011
45-49	50	335	7.8	1.057
50-54	55	225	5.4	-

1982 MDS

		Female Respondents l(x)	e(x)	B*	Respondents of both sexes l(x)	e(x)	B*
5-9	10	1000	40.9	0.629	1000	41.2	0.612
10-14	15	987	36.4	0.681	988	36.7	0.671
15-19	20	976	31.7	0.712	977	32.1	0.697
20-24	25	961	27.2	0.740	960	27.6	0.724
25-29	30	927	23.1	0.742	930	23.4	0.757
30-34	35	882	19.2	0.786	886	19.4	0.776
35-39	40	816	15.5	0.813	823	15.7	0.800
40-44	45	724	12.2	0.854	725	12.5	0.831
45-49	50	588	9.4	0.892	606	9.5	0.883
50-54	55	468	6.1	-	488	6.2	1.100

4.5 Mortality Differentials

Mortality varies from individual to individual, area to area and one group to another. Several factors are responsible for these differentials and these include the physical characteristics of an area (climate, ecology), biological attributes (race, ethnic groups, sex) and various social and economic considerations (education, income, employment and social class). The effect of such factors as fathers' income, women's education and rural-urban residence on the mortality differences between various subgroups of the population, have been subjects of great concern among demographers as well as policy and decision makers who are interested in improving the health status of the population (Ndawala,1989). Because of the availability of data, in this section, we shall concentrate on regional, rural-urban and sex differentials in mortality. The same approach like the one presented in the preceding sections for the country as a whole was followed, hence the methods of analysis will not be outlined in this section.

4.5.1 Regional Differentials

Both the reported statistics and the indirect estimates indicate regional differences in mortality. Northern Region tend to show the lowest level followed by Southern Region while Central Region has the highest level of mortality.

Studies done elsewhere in Africa have shown that mortality is negatively related to social and economic development. On the face of it, the observed regional differentials do not conform to the above stated perspective since the commonly held view is that the Southern Region is the most developed region followed by the Central Region, and the Northern Region being the least developed. As we have argued in chapter II, however, this belief is based on indicators which in general cannot be regarded as indicating the standard of living of the people. If we however restrict ourselves to such measures as educational status, which has been demonstrated to have a greater impact on the level of mortality, we see that the above assertion concerning regional differentials in mortality is in line with the observation that more people in the Northern Region are literate.

Another factor which may be relevant in explaining the regional difference in mortality is the variation in the geographical locations of the regions. Being a mountainous area, it can be argued that Northern Region provides fewer breeding grounds for parasites which transmit diseases than the other two regions. In addition the resulting sparse population density in the Northern Region implies that infectious diseases cannot be easily transmitted from one individual to another. This is in marked contrast to the low-land and over-crowded areas of Southern and Central Regions which are likely to provide good breeding grounds for parasites. The high population density in these places is also likely to foster the spread of diseases.

Furthermore, as we shall see in Chapter VI below, Northern Region appears to be well served with medical facilities - particularly at the level below district hospitals. This fact is of course open to discussion and the analysis presented so far appears to be contradictory (Msukwa,1982; Mcglashan,1968; MOH,nd). Nonetheless it suffices to say that the problem appears to arise from the fact that the Northern region is well served with mission health centres unlike the other two regions. This is further complicated by the fact that at mission hospitals patients pay a small fee whereas at government health centres medical treatment is free (however, medical services in general are highly subsidies by the government). Therefore this raises the humane question: "why should some people in the same country pay for medical services while others get it free?" (This point is illustrated in the lively debate in Malawi´s parliament involving the Member of Parliament for Nkhata Bay South and the Minister of Health. Given the source of material, the debate has been quoted at length and is presented separately in Appendix IV).

Table 4.19a

Estimated and Smoothed Infant and Childhood Mortality Using Brass Procedure

1977 MPC Northern Region

Age of the Mother	CD	K(x)	Q(x)	Smoothed Q(x) Standard African	General	Time Location
15-19	0.154	0.9263	0.142	0.126	0.140	1976.4
20-24	0.167	0.9819	0.164	0.175	0.181	1974.6
25-29	0.207	0.9773	0.202	0.199	0.199	1972.6
30-34	0.237	0.9874	0.234	0.224	0.217	1970.4
35-39	0.265	0.9954	0.264	0.261	0.235	1967.9
40-44	0.294	0.9703	0.285	0.275	0.248	1965.1
45-49	0.335	0.9683	0.325	0.299	0.271	1961.7

Table 4.19b

Estimated and Smoothed Infant and Childhood Mortality Using Brass Procedure

1977 MPC Central Region

Age of the Mother	CD	K(x)	Q(x)	Smoothed Q(x) Standard African	General	Time Location
15-19	0.287	0.9547	0.274	0.226	0.248	1976.3
20-24	0.307	0.9714	0.298	0.301	0.309	1974.5
25-29	0.346	0.9703	0.335	0.335	0.335	1972.5
30-34	0.378	0.9817	0.371	0.369	0.360	1970.2
35-39	0.402	0.9892	0.398	0.417	0.384	1967.7
40-44	0.421	0.9633	0.406	0.435	0.401	1964.9
45-49	0.444	0.9613	0.427	0.464	0.429	1961.4

Table 4.19c

Estimated and Smoothed Infant and Childhood Mortality Using Brass Procedure

1977 MPC Southern Region

Age of the Mother	CD	K(x)	Q(x)	Smoothed Q(x) Standard African	General	Time Location
15-19	0.235	0.9245	0.217	0.183	0.202	1976.1
20-24	0.256	0.9642	0.246	0.248	0.255	1974.4
25-29	0.290	0.9655	0.280	0.279	0.279	1972.4
30-34	0.317	0.9778	0.310	0.310	0.301	1970.1
35-39	0.337	0.9850	0.332	0.355	0.323	1967.6
40-44	0.363	0.9585	0.348	0.372	0.340	1964.8
45-49	0.387	0.9565	0.370	0.399	0.366	1961.3

4.5.2 **Rural - Urban Differentials**

The available information indicates that mortality is lower in urban than rural areas. Life tables based on reported death statistics indicate that the difference between e(0) in urban areas and e(0) in rural areas is about 12 years. This is as expected and is largely attributed to the presence in urban areas of good medical and public health facilities. Certain characteristics of the urban population like: better education, higher income, improved and greater awareness of social and environmental aspects of life among the urban population are also important in fostering rural-urban differentials. Studies in both developing and developed countries seem to agree with this finding although in certain instances because of overcrowding and poor hygienic and sanitary conditions existing in some large cities (or some sections therein) mortality has been found to be higher in urban that in rural areas (Harrington,1982). This finding may also be relevant in Malawi particularly in such over-crowded locations (or townships) as Kawale in the City of Lilongwe and Ndirande and Bangwe in the City of Blantyre. Thus it can be suggested that future censuses and surveys should attempt to tabulate data by townships.

Table 4.20

Estimated and Smoothed Infant and Childhood Mortality Using Brass Procedure

1970-72 MPCS (Rural)

Age of the Mother	CD	K(x)	Q(x)	Smoothed Q(x) Standard African	Smoothed Q(x) Standard General	Time Location
15-19	0.369	1.005	0.371	0.242	0.265	1970.3
20-24	0.338	1.029	0.347	0.320	0.328	1968.9
25-29	0.354	1.004	0.356	0.355	0.355	1967.0
30-34	0.356	1.010	0.360	0.390	0.380	1964.8
35-39	0.399	1.019	0.406	0.439	0.405	1962.4
40-44	0.409	0.997	0.408	0.457	0.423	1959.7
45-49	0.438	0.996	0.436	0.486	0.451	1956.5

1977 MPC (Rural)

Age of the Mother	CD	K(x)	Q(x)	Smoothed Q(x) Standard African	Smoothed Q(x) Standard General	Time Location
15-19	0.252	0.942	0.237	0.206	0.227	1976.2
20-24	0.283	0.967	0.274	0.276	0.284	1974.4
25-29	0.320	0.968	0.309	0.309	0.309	1972.4
30-34	0.349	0.980	0.342	0.342	0.333	1970.2
35-39	0.370	0.987	0.365	0.389	0.356	1967.7
40-44	0.390	0.961	0.374	0.406	0.373	1964.8
45-49	0.412	0.959	0.395	0.434	0.400	1961.3

1982 MDS (Rural)

Age of the Mother	CD	K(x)	Q(x)	Smoothed Q(x) Standard African	General	Time Location
15-19	0.209	0.963	0.201	0.178	0.197	1981.5
20-24	0.237	0.984	0.233	0.242	0.249	1979.8
25-29	0.276	0.979	0.270	0.272	0.272	1977.9
30-34	0.314	0.989	0.310	0.302	0.294	1975.6
35-39	0.344	0.997	0.342	0.347	0.316	1973.2
40-44	0.372	0.972	0.362	0.364	0.332	1970.4
45-49	0.399	0.970	0.387	0.391	0.358	1966.9

1984 FFS (Rural)

Age of the Mother	Age of CD	K(x)	Q(x)	Smoothed Q(x) Standard African	General	Time Location
15-19	0.157	0.965	0.152	0.159	0.175	1983.1
20-24	0.229	0.990	0.227	0.217	0.224	1981.5
25-29	0.249	0.982	0.245	0.245	0.245	1979.5
30-34	0.264	0.992	0.261	0.273	0.265	1977.3
35-39	0.290	1.000	0.290	0.316	0.286	1974.8
40-44	0.308	0.976	0.300	0.332	0.301	1972.0
45-49	0.345	0.973	0.336	0.358	0.326	1968.6

Table 4.21

Estimated and Smoothed Infant and Childhood Mortality Using Brass Procedure

1970-72 MPCS (Urban)

Age of the Mother	CD	K(x)	Q(x)	Smoothed Q(x) Standard African	General	Time Location
15-19	0.210	1.018	0.213	0.157	0.174	1970.3
20-24	0.244	0.979	0.239	0.215	0.222	1968.4
25-29	0.257	0.975	0.251	0.243	0.243	1966.4
30-34	0.242	0.986	0.239	0.272	0.264	1964.2
35-39	0.228	0.994	0.227	0.314	0.284	1961.7
40-44	0.311	0.968	0.301	0.330	0.299	1958.9
45-49	0.339	0.966	0.328	0.356	0.324	1955.4

1977 MPC (Urban)

Age of the Mother	CD	K(x)	Q(x)	Smoothed Q(x) Standard African	General	Time Location
15-19	0.184	0.964	0.177	0.126	0.140	1976.3
20-24	0.182	0.980	0.178	0.175	0.181	1974.6
25-29	0.204	0.976	0.199	0.199	0.199	1972.6
30-34	0.221	0.987	0.218	0.224	0.217	1970.3
35-39	0.250	0.995	0.249	0.261	0.235	1967.9
40-44	0.279	0.969	0.270	0.275	0.248	1965.1
45-49	0.315	0.967	0.305	0.299	0.271	1961.6

1982 MDS (Urban)

Age of the Mother	CD	K(x)	Q(x)	Smoothed Q(x) Standard African	Smoothed Q(x) Standard General	Time Location
15-19	0.147	0.969	0.142	0.102	0.114	1981.5
20-24	0.153	0.997	0.153	0.143	0.148	1980.0
25-29	0.157	0.986	0.155	0.164	0.164	1978.0
30-34	0.183	0.995	0.182	0.185	0.179	1975.8
35-39	0.203	1.004	0.204	0.218	0.195	1973.4
40-44	0.232	0.998	0.231	0.230	0.207	1970.6
45-49	0.264	0.978	0.258	0.252	0.226	1967.2

1984 FFS (Urban)

Age of the Mother	CD	K(x)	Q(x)	Smoothed Q(x) Standard African	Smoothed Q(x) Standard General	Time Location
15-19	0.127	0.994	0.126	0.087	0.097	1983.2
20-24	0.154	1.026	0.158	0.122	0.127	1981.8
25-29	0.141	1.003	0.141	0.140	0.140	1979.9
30-34	0.120	1.009	0.121	0.159	0.154	1977.7
35-39	0.194	1.018	0.198	0.188	0.168	1975.4
40-44	0.241	0.996	0.240	0.200	0.178	1972.7
45-49	0.246	0.994	0.244	0.219	0.196	1969.4

4.5.3 Sex Differentials in Mortality

In the analysis of the reported age distributions we have seen that the masculinity ratio in the age group 20-39 is quite low. Among the factors suggested for this was excess male mortality. It was claimed then that this came about as a result of the high risk of exposure to dangerous occupations such as mining popular among labour migrants.

This section attempts to explore the subject of excess male mortality further by utilizing the available mortality statistics. As with the other aspects considered, it must be emphasized that the data used in this analysis are far from being complete.

The reported death statistics by age (Tables 4.1 and 4.2 above) show that more males than females were reported dead at each age group. The differences however are not big enough to be held responsible for the variations in the reported sex ratio by age.

The sex ratios calculated from the reported deaths in the last 12 months are quite plausible and do not suggest excessive male mortality. In fact the life tables which were calculated from these data indicate that e(0) is higher for females at each age group (see Table S4.1 - S4.8).

Life tables based on reported statistics indicate that e(0) is higher for females than males (see Tables S4.1..). There is a suggestion of an increasing gap of sex differentials in mortality. In 1972 female e(0) exceeded male e(0) by less than one year. This difference was 3 and 5 years in 1977 MPC and 1984 FFS respectively.

Table 4.22

Sex Ratio (M/F) for the Reported Deaths in the household in the last 12 months

	1972	1977	1984
0	1.29	1.11	1.32
1-4	1.29	1.08	1.09
5 - 9	0.72	1.13	1.62
10 - 14	0.04	1.06	0.45
15 - 19	0.31	0.89	1.26
20 - 24	0.50	0.85	1.12
25 - 29	1.04	0.90	0.73
30 - 34	0.45	1.02	0.52
35 - 39	0.75	1.18	1.09
40 - 44	0.72	1.27	2.24
45 - 49	0.73	1.60	0.82
50 - 54	0.81	1.46	1.49
55 - 59	1.50	2.03	1.73
60 - 64	1.30	1.91	1.24
65+	*	1.87	1.44
	1.04	1.11	1.22

* 1970-72 MPCS are tabulated up to age group 60 years and over.

The CEB and CS data are available for each sex from two sources, namely the 1982 MDS and the 1984 FFS. These were used to calculate mortality estimates for each sex. The results again indicate that females enjoy a relatively lower mortality than males.

4.6 Trends in Mortality

In the absenceof registration statistics, thestudy of mortality trends hasto be done throughindirect procedures. It must however be mentioned from theoutset that different estimates of mortality presented in the preceding sections clearly demonstrate that mortality has declined during the period under review.

The study of changes that have occurred in mortality levels is also examined by examining the relationship between the estimated q(2), q(3) and q(5). This is done by comparing the estimated l(3) and the derived l*(3) implied by the estimated l(2) and l(5)10. The ratios of the derived l*(3) and estimated l(3) were calculated to facilitate the comparison. The results of this exercise are presented in Table 4.23 below.

Looking at the ratios calculated from the 1972 MPCS and the 1984 FFS a clear pattern of mortality decline is indicated, whilst the 1977 MPC and 1982 MDS data appear to indicate an increase in childhood mortality over the past years. Therefore it can be suggested that the available data on mortality appear to suggest that there was a constant decline in childhood mortality in the period preceding the 1970-72 MPCS. The pace of mortality decline shows some signs of stagnation with a possibility of a slight increase in childhood mortality in the seventies. Beginning in the late seventies up to early eighties, there was a continuation in the downward trend in mortality (this result should be interpreted with some caution since the l(3) and l(5) values could have been exaggerated by the omission of dead children and this problem would have been more serious with the older than younger women).

10 Although this is not the most skillful way of studying changes in mortality, the approach does portray a feasible pattern of mortality decline for Malawi.

Table 4.23

The Relationship between estimated l(3) and l*(3) implied by l(2) and l(5) derived from Brass MLT (Malawi, Rural and Urban)

		l*(3) implied by l(2)	l(3) estimate	l*(3) implied by l(5)	Ratio (1)/(2)	Ratio (2)/(3)
		(1)	(2)	(3)	(4)	(5)
	1972	0.642	0.658	0.678	0.975	0.971
Total	1977	0.711	0.700	0.691	1.015	1.013
	1982	0.754	0.741	0.723	1.018	1.024
	1984	0.760	0.769	0.774	0.988	0.994
	1972	0.625	0.644	0.664	0.970	0.970
Rural	1977	0.702	0.691	0.682	1.160	1.130
	1982	0.745	0.730	0.712	1.021	1.250
	1984	0.752	0.755	0.759	0.996	0.995
	1972	0.739	0.749	0.780	0.947	0.960
Urban	1977	0.804	0.800	0.799	1.005	1.001
	1982	0.831	0.845	0.833	1.02	1.014
	1984	0.826	0.859	0.890	1.04	0.965

The pattern is possible given the nature and pattern of social and economic changes in Malawi. The overall decline in mortality can in general be attributed to changes in the overall standard of living of the people as reflected (in this study) by increases in such variables as proportion literate and per capita income, among other things. The influence of these factors will be further illuminated in Chapter VI below.

At the same time the increase in mortality, or rather the "stagnation" in the rate of decline, may be attributed to the stagnation in Malawi's economy in the early 1970s following the world-wide oil crisis and in the late 1970s, beginning in 1979, as a result of poor climatic conditions (rainfall shortages), joined in subsequent years by the global economic recession of the 1980s. In addition, childhood mortality might have increased as a result of the outbreak of the Cholera epidemic in 1973 and the shortages of food in the early 1980s; both of these were reported in certain areas in the country. These aspects however require further clarification which is only possible by studying in detail the social and economic changes that have taken place in Malawi since independence. Unfortunately this is outside the aims of this study and thus such an account would be an interesting piece of research. It is interesting, however, to note that Chimwaza(1982) demonstrated that although the overall food consumption increased between 1964 and 1980, there is some evidence to suggest that the average in-take of food declined during the late seventies and early eighties (see Table 4.24 below).

It should further be noted that different areas appear to have been affected differently by the above-claimed adverse social and economic variables. According to Table 4.23 above, the rural areas were most affected in contrast to urban localities. This is expected in terms of the vulnerability of rural areas (poor transport, poor health facilities, poor storage facilities (food), high levels of illiteracy, low income levels, etc).

Table 4.24

Nutrient Availability per head per day in Malawi (1964 - 1980)

	Energy Kcal	Kj	Protein g	Fat g
1964	2049	8573	56.7	35.7
1966	2039	8494	56.4	35.3
1970	2113	8840	58.5	37.0
1972	2379	9954	66.6	42.1
1974	2409	10079	67.6	43.5
1976	2396	10025	67.8	45.4
1978	2265	9471	69.5	38.6
1980	2215	9268	67.2	36.0

Source: Chimwaza(1982) quoting FAO(1980) Food Balance Sheet 1980

4.7 Causes of Death in Malawi

Statistics on causes of death are deficient in Malawi. Information on deaths occurring in the government and mission hospitals is published by the MOH. These information are also available from the annual Statistical Yearbooks published by the NSO. However, the number of deaths obtained from these sources constitutes a small proportion of the total deaths occurring in the country and is at best representative of the mortality of the urban population since most of the health facilities are located in urban areas. Unfortunately, probably arising from various organizational and administrative problems, even in urban areas not all deaths are registered and reported to the central office at the MOH headquarters for compilation and publication.

An examination of the reported causes of death statistics beginning from early this century to the post-independence period suggests that the disease pattern in

Malawi has hardly changed in that infectious and parasitic diseases such as Malaria, Schistosomiasis, Measles, Pneumonia and Tuberculosis can still be regarded as the major causes of morbidity and mortality.

Apart from infectious and Parasitic diseases malnutrition is the second major cause of ill health and death in Malawi. Although malnutrition is common in both the childhood and adult population there are reasons to believe that it is a serious problem among the former group. Malnutrition may lead to high death rates in two ways. Firstly, malnutrition itself can lead to ill health and death. Secondly, malnutrition make the individual weaker and more susceptible to further attacks and complications from the other diseases.

A number of factors could be responsible for the above described disease pattern. These include, for example, bad cultural practices[11], poor and unhygienic living and sanitary conditions and, more generally, poor standards of living. There are reasons to believe that these factors are well understood by all parties concerned (researchers, planners, decision makers and the general public). The major hinderance to their total elimination however appears to be poverty and the "vicious" cycle of underdevelopment. This proposition is further illustrated by a recent publication by Lindskog

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11 Culturally, certain members of the population say children and women may be prohibited from eating certain types of food such as eggs. In some cases the "best" food is reserved for senior members of the household (family). For further information on this aspect see Chimwaza (1982), Msukwa(1982) and Chilivumbo(1974).

and Lindquid on child health in Malawi whose title is Why "Poor Children" Stay Sick12.

On the one hand, because the people are poor they cannot afford to eat all the required types of food (balanced diet) and in such situations the eating of certain food (such as beef, chicken and eggs) becomes a "luxury" and not a "necessity" as these types of food are seen as a source of revenue (income) for the family. On the other hand, because of poverty, families cannot afford to send all their children to school since they have limited financial resources to pay for such things as school fees and uniforms. In addition families cannot afford to buy such agricultural inputs as fertilizers. The latter combined with the low level of literacy implies that farm and crop management are likely to be poor resulting in poor yield and little income.

It can unfortunately be argued that one does not have to be rich to build a toilet, to protect water sources from such pollutants as domestic animals or to clean ones surrounding. But we must realize that we are trying to break practices that have existed for longer periods and people everywhere are not prepared to do that easily.

From the foregoing discussion, it can be suggested that to reduce mortality in Malawi programmes that tend to address "rural poverty" seem appropriate and should be

12 The quotations are inserted by this author to clarify the point. The title suggest, among other things, that the children discussed in the book are poor and always remain sick. One must however be careful in that this association does not necessarily imply causation.

encouraged. The emphasis the government gives to rural development is therefore commendable. There are many approaches available some of which have already been initiated (for example the NRDP: see appendix II). But whatever strategy will be followed, it appears that the overall advancement of the educational status of the population in particular maternal education13 will play a leading role in making the programmes acceptable and thus producing the required results: including mortality reduction. Maternal education has been found to be the most important factor in reducing infant and childhood mortality in most developing countries and Professor John Caldwell has been influential in establishing this relationship. He confirmed the importance of (i) paternal education using Nigerian data (Caldwell,1979) and (ii) maternal education in an analysis carried out in ten countries on four continents using WFS data (Caldwell and McDonald,1982).

There are three major reasons why education is important in bringing about mortality reduction in Malawi. Firstly, the general improvement in the people's understanding of the causes of diseases, cleanliness and where and how to get good medical and health facilities. Secondly, education is the driving force in breaking up the long-held traditions, customs, beliefs and practices which tend to encourage malnutrition, the spread of

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13 It should be noted that the saying "if you educate a man you educate an individual but if you educate a woman you educate the whole nation" is very well understood and appreciated among the general population in Malawi.

diseases and increase death rates. In addition the adoption of "new" ideas in agriculture, sanitation and health and medical values is likely to take place among those who can be said to be educated. Thirdly, the educated person is more likely to consume food (or at least be conscious of what the food contains) which contains high levels of the required nutrients (proteins, vitamins, minerals). The educated mother is likely to see to it that her children are fed properly and she is more likely to feed the child herself.

Although researchers have in the past disagreed on the factors responsible for mortality decline it has always been appreciated that a higher standard of living leads to a reduction in mortality. This suggests that in the case of Malawi sustained mortality transition can be initiated if the people attain a higher standard of living. Moreover, the widely held view about mortality decline is that once the state of relative decline in mortality is achieved from a high mortality level, any further and subsequent decline depends on social and economic development of the country. At this stage, medical interventions tend to have only limited potential.

Table 4.25a

Ten Leading Causes of Mortality and Morbidity Among the Under five population in Malawi

Rank	Mortality	Morbidity
1.	Measles	Malaria
2.	Pneumonia	Respiratory infections
3.	Nutritional deficiency	Diarrhoeal diseases
4.	Malaria	Inflammatory disease of the eye
5.	Anaemia	Skin disease
6.	Diarrhoeal diseases	Abdominal and GI symptoms
7.	Tetanus	Trauma and Accidents
8.	Disease of Nervous system	Measles
9.	Accidents and injuries	Nutritional deficiency
10.	Tuberculosis	Hookworms and other helminthiasis

Source: MOH(1987)

Table 4.25b

Ten Leading Causes of Mortality and Morbidity Among the Population aged 5 years and over

Rank	Mortality	Morbidity
1.	Pneumonia	Malaria
2.	Tuberculosis	Respiratory infections
3.	Accidents	Abdominal and GI symptoms
4.	Malaria	Traumatic conditions
5.	Anaemia	Skin disease
6.	Diseases of the Nervous system	Eye diseases
7.	Nutritional deficiency	Diarrhoeal diseases
8.	Complications of pregnancy	Venereal diseases
9.	Measles	Diseases of limbs and joint
10.	Diarrhoeal diseases	Dental diseases

Source: MOH(1987)

Table 4.25c

Ten Leading Causes of Morbidity and Mortality

	Mortality	Morbidity
1.	Malaria	Respiratory infections including Pneumonia
2.	Measles	Measles
3.	Complications of pregnancy and child birth (including abortion)	Diarrhoeal diseases
4.	Respiratory infections including Pneumonia	Malaria
5	Injuries	Anaemia
6.	Diarrhoeal diseases	Tuberculosis
7.	Anaemia	Nutritional deficiency
8.	Nutritional deficiency	Injuries
9.	Skin diseases	Cardio-vascular diseases
10.	Tuberculosis	Certain causes of pre-natal morbidity and mortality

Source: Chimwaza (1982) quoting MOH (1979) Statistical Reference Tables, Lilongwe.

Note: Tables 4.25a and 4.25b could be said to display the morbidity situation in the mid-eighties whereas Table 4.25c refers to mid-seventies.

4.8 Summary

The measures of mortality presented in this chapter indicate that the level of mortality in Malawi is very high when compared with many African countries. This is particularly true with infant and childhood mortality. Furthermore, Malawi, like many other countries, with the exception of most South East Asian countries, experience a higher male than female mortality. The estimates presented in this chapter further indicate significant mortality differentials between regions and urban and rural areas. The level of mortality is highest in the Centre followed by the South with the Northern Region indicating the lowest mortality. The evidence presented in this chapter tentatively suggests that the level of mortality in Malawi has declined somewhat since independence. There is, however, a substantial potential for further decline which is expected to continue with the government policies of providing the people a wider access to educational, medical and clean water facilities. The rate of mortality decline is however so small that the UN target of reducing child and maternal mortality by 50 percent by the year 2000 would not be realised.

The fundamental problem which arises during mortality analysis, particularly for a developing country with no reliable vital statistics, is to decide the age and sex pattern of mortality of the population. The age pattern of mortality in Malawi is however typical for a developing country. In this study, we managed to obtain some good estimates of infant and childhood mortality (q(2), q(3) and q(5)) and of adult mortality. On the one hand, had we known before hand the existing mortality pattern in Malawi and its regions during the period under review, it would have been possible to study the age pattern of mortality by generating a series of life tables compatible with the given age pattern of mortality and the level of mortality implied by the q(x) estimates. The analysis in previous sections have demonstrated the importance of choosing a mortality pattern which closely resembles the one prevailing in the country.

Since the pioneering work by the United Nations

(United Nations,1955, 1956), a number of model life table systems have been developed (Brass,1968, 1971; Coale and Demeny,1966; 1983, United Nations,1982). Although none of these MLTs include life tables from Sub-saharan Africa, as a result of the absence of requisite mortality statistics, the inventors were quick to "prescribe" and recommend which model life table should be used in this part of the world. For instance, Coale and Demeny(1983) suggested the use of the West family in a developing country where no indication of the mortality pattern could be established prior from any other source. This seem to have prejudiced mortality studies in developing countries particularly in African regions as little attention has since been devoted to the analysis of the reported death statistics by age. By using these MLT in developing countries we are implicitly accepting that the age pattern of mortality prevailing in these countries is equivalent to that experienced by the European population at the end of the last century or during the first decades of this century. The controversies caused by a similar assumption in the case of fertility are now well understood and appreciated.

CHAPTER V

FERTILITY ESTIMATION

> ... it makes sense for these educated people to have only one child. They should read their books in peace.
>
> Dede Kamkondo, A Malawian novelist, <u>For The Living</u>, 2.

5.1 <u>Introduction</u>

The analysis in the foregoing chapter has demonstrated that during the period 1964 to 1984 the rate of mortality decline in Malawi was very slow. This finding suggest that the rapid population growth the country experienced must be attributed to the other components of population growth: namely fertility and migration.

With the exception of the recent influx of Mozambican refugees, which is believed to have prejudiced the 1987 population estimate (NSO,1988), migration can be said to have been negligible. This observation imply that fertility was the major determinant of population increase in Malawi during the period under review unless it can be shown to be otherwise.

The importance of natural increase in Malawi was first suggested by H.F. Bingham, the 1945 Census Superintendent (NG,1945), and was forcefully presented by Kuczynski(1949) who further revealed that migration was the major determinant of population change in Malawi during pre-second world war period (Coleman,1978; NG,1945, Agnew,1977).

This chapter attempts to study the levels, trends and differentials in fertility in Malawi by exploiting as many indirect estimation procedures as the data may allow. The chapter begins by examining the sources of data and biases in them before presenting the different estimates of fertility. The derived measures are compared with each other for consistency and thus, in the process, the performance of each procedure employed is also evaluated. The aim is to obtain plausible estimates of fertility bearing in mind the nature and limitation of the data. The derived measures will then be used to study various aspects of fertility in Malawi.

5.2 Sources of Data

There are three sets of data from which fertility estimates can be derived. Women aged 10 years and over in the 1970/72 MPCS, the 1977 MPC, the 1982 MDS and the 1984 FFS were asked to report: (i) the number of "live" births which had occurred to them in the last twelve months; current fertility, (ii) the number of children they have ever born alive; lifetime fertility. These data are available by five year age group of the mother, and from them various measures of current and lifetime fertility can be calculated.

In addition, since it has been demonstrated that the age-sex distribution of the population is largely determined by the level of fertility (Coale,1958; United Nations,1963), in situations where the knowledge of the latter is minimal, plausible measures of fertility can be derived from the reported age statistics, unless the age-sex structure is greatly affected by migration or age mis-statements.

5.3 Sources of Errors

There are a number of problems associated with fertility measures calculated from current fertility data. Firstly, the reported number of births is affected by the erroneous inclusion (exclusion) of births which took place outside (within) the 12-month period as a result of wrong "reference period". To minimize this problem it has been suggested that instead of asking the "number of children born alive in the last 12 months" women should be asked to report "the date of birth of the most recent (last) live birth" leaving it to the census or survey officials to determine the former (Blacker,1971, 1979).

This recommendation has not been "fully" implemented in Malawi. But the slight modifications introduced in the demographic surveys (MPCS, MDS, FFS), whereby on top of the usual question on births in the last 12 months, women were asked to report the date of birth of each child born during this 12-month period, it can be suggested that the current fertility data collected in the surveys have an in-built mechanism to check on the reliability of the reported statistics.

Secondly, the lifetime fertility data are affected by omission of children particularly those who have died or moved away from the parent's home. This error is common among the elderly respondents and is attributed to the fact that the events took place in the remote past and, to make things worse, the child died whilst it was still young. As mentioned in the previous chapter, people are in general reluctant to talk about relatives who are absent or dead for cultural reasons. The error is more likely to occur among elderly women[1].

The children ever born question has been asked in two different ways. Firstly, in the 1977 MPC only the total number of children born alive and the total number of children still living were asked. Secondly, in the surveys the question was further subdivided to include the total number of children born alive, the number of children born alive but living elsewhere and the number of children born alive but had died by the time of the interview. Therefore, in the surveys, for both current and lifetime fertility, the form and sequence of the questions was designed in such a way as to obviate the usual difficulties encountered in fertility studies (particularly retrospective questioning). This feature, together with the intense training and supervision usually associated with sample surveys suggest that the surveys may have collected data of comparable quality, if not better than, those collected in the census. This said, however, it must be emphasized that so far, throughout the analysis, the 1984 FFS has produced results which differ from the "expectation" (as deduced from the other sources). Hence, whereas the above observation is in general true, the above mentioned

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1 Mitchell(1960) noted the existence of this error among the Yao of Southern Malawi.

factor should be borne in mind when analyzing the 1984 data.

The data collected is also affected by the peoples′ or individuals′ understanding of what constitutes a "live birth". The internationally accepted definition among scientists, excludes stillbirths. In a society like that of Malawi, where childlessness is a source of shame and disgrace, and children are a source of pride, happiness and respect, a childless mother who has had at least one pregnancy, which resulted into a stillbirth, may tend to report them as live births which later died, since by so doing she may gain the sympathy of the public, and regain her lost respect.

Another source of error, particularly for the sample surveys, is the sampling error which could affect the estimates because the data were collected from a sample of women and according to a sample design. For instance, because of the sampling frame used in the 1970/72 MPCS, the survey had more households belonging to the urban strata, and consequently it has been blamed of being urban biased (Blacker,1977). A closer examination of the demographic surveys so far conducted in Malawi suggest that because of the desire to come up with a nationally representative sample (for all categories and subdivisions of the population) there exists a greater likelihood of over-representing the urban population. For example, in a country with about 12 percent of its population living in urban areas in 1984, 25 percent of the total sample size belonged to urban strata.

Lastly, the measures are also affected by the distortions in the reported age distributions. The nature and pattern of age mis-reporting has already been presented in chapter III above and it suffices to say that the concentration of women in the childbearing age groups as observed in that chapter is likely to understate the level of fertility.

5.4 Estimates of Fertility

5.4.1 Current Fertility

From the number of births in the preceding year, Age Specific Fertility Rates (ASFR) and TFR were calculated (NSO,1973, 1984b, 1987a, 1987b; Momba,1984). These are given in Table 5.1 and for the purpose of illustration of the general shapes of the fertility curves the rates for Malawi as a whole, the three regions, rural and urban areas are presented in Figures 5.1 to 5.4 respectively (see also figures 5.5 to 5.8 which show relative ASFR).

The ASFR schedules exhibit the same pattern throughout Malawi. They rise from a low value for the age group 15-19 to a maxima in the age group 20-24. The rates for some districts (Rumphi, Nkhata Bay, Kasungu, Nkhota Kota, Ntchisi, Dowa, Mchinji and Dedza) however record the highest value in the age group 25-29. The same is also true for the 1970/72 MPCS (Total, Rural and Urban), the 1982 MDS Urban, and the 1984 FFS Urban. The rates for the age groups 20-24 and 25-29 are, in most cases, quite close to each other indicating that the age pattern of fertility in Malawi closely resembles the "broad type pattern" as identified and described by the

United Nations(1963). After age group 25-29 the rates decline gradually to their lowest values attained in the 45-49 age group.

There are certain differences between the various regions and districts. The fertility curve for Central Region is above those of the other two regions. Southern Region has the lowest rates until age group 35-39 when they are surpassed by the values for Northern Region. As we have explained in Appendix VI, these variations can be attributed to differences in the childbearing behaviour and practices which are further influenced by a multitude of cultural variables.

Table 5.1 and Figures 5.1 to 5.8 also display the usual problems associated with data from the developing countries. For example, the fertility curve for the 1970-72 MPCS have "slumps" at age groups 20-24, 30-34 and 40-44. This could be attributed to age mis-statements as the examination of the 1970-72 reported age distribution indicate that the population in these age groups was over-enumerated.

In addition, the ASFR for the age group 45-49 is higher than one would normally expect. This could have happened as a result of the shifting of women aged 45-49 to age groups outside this range probably arising from the tendency to concentrate women in the centre of childbearing ages as noted in chapter III. In the case of the 1970-72 MPCS the shifting of women aged 45-49 to a younger age group, say 40-44 age group, might have led to concentration of women at the latter age group and the fall in the reported ASFR for this age group.

The nature and pattern of the ASFR curve in the neighbouring countries is similar to that found in Malawi (see Table 5.1c). In addition, the distortion at age group 45-49 is also found in the other countries. On the one hand, this reinforces the idea that the factors responsible for this are the same in all populations and the tendency to shift the ages of the respondents towards the centre of the child-bearing age groups, which is common among the African women, is the prime suspect. On the other hand, resulting in part from low levels of contraceptive usage, this could be a reflection of the fact that many women in Africa experience child-bearing at extreme ends of reproductive life.

The reported number of children per woman (TFR) for Malawi was 6.7 in 1970/72, 6.6 in 1977 and 1982, and jumped to 7.7 in 1984. Comparing these estimates with similar measures from the neighbouring countries (see Table 5.1c) indicate that the level of fertility in Malawi is high although not atypical as the reported TFR for Tanzania in 1976 and Botswana in 1982 are very close to those of Malawi.

The reported TFR in some of the neighbouring countries like Zambia is so low for a developing country. This may be an indication that fertility data in these countries suffer from severe under-reporting.

Differentials by region indicate that the reported TFR is highest in the Central Region, lowest in the Southern Region and the Northern Region occupy the middle position. Within the regions, some differentials can be observed. For instance, the Central Region districts of Kasungu, Dowa and Mchinji exhibit very high fertility whereas the Southern Region districts of Mangochi, Machinga, Zomba, Blantyre and Chikwawa indicate a relatively low fertility. The rest of the districts in Malawi display a intermediary level of fertility.

Table 5.1

Reported Age Specific Fertility Rates: Malawi, Regions+, Districts+, Rural and Urban-1977

	15-19	20-24	25-29	30-34	35-39	40-44	45-49	TFR
Malawi	.132	.280	.275	.241	.196	.126	.069	6.59
Northern*	.124	.298	.296	.263	.198	.116	.047	6.70
Chitipa	.115	.294	.277	.260	.191	.111	.063	6.56
Karonga	.150	.307	.302	.246	.194	.116	.045	6.80
Rumphi	.139	.281	.282	.257	.185	.101	.037	6.41
Nkhata Bay	.106	.313	.329	.304	.235	.132	.045	7.32
Mzimba	.122	.305	.302	.269	.202	.121	.049	6.85
Central*	.133	.307	.308	.272	.222	.143	.076	7.31
Kasungu	.149	.312	.327	.284	.244	.153	.075	7.72
Nkhota Kota	.154	.304	.305	.271	.203	.136	.084	7.29
Ntchisi	.129	.287	.298	.255	.219	.122	.062	6.86
Dowa	.142	.350	.357	.317	.249	.159	.088	8.31
Salima	.140	.294	.287	.255	.199	.133	.070	6.89
Lilongwe	.139	.312	.307	.266	.216	.139	.076	7.28
Mchinji	.146	.313	.326	.300	.250	.159	.091	7.93
Dedza	.138	.296	.298	.257	.215	.145	.080	7.15
Ntcheu	.122	.300	.289	.251	.209	.122	.057	6.75
Southern*	.132	.255	.248	.211	.173	.115	.069	6.02
Mangochi	.137	.221	.215	.179	.149	.099	.062	5.31
Machinga	.145	.252	.246	.208	.173	.116	.069	6.05
Zomba	.140	.254	.235	.192	.154	.099	.055	5.65
Chiradzulu	.132	.272	.269	.221	.178	.111	.057	6.20
Blantyre	.126	.257	.252	.223	.178	.110	.064	6.05
Mwanza	.112	.293	.287	.236	.205	.127	.087	6.73
Thyolo	.143	.273	.266	.232	.191	.139	.088	6.66
Mulanje	.150	.273	.263	.229	.191	.131	.081	6.59
Chikwawa	.130	.250	.239	.210	.176	.115	.078	5.99
Nsanje	.151	.302	.285	.237	.195	.130	.070	6.85

Source: NSO(1980), Momba(1984).
Notes: (i) + 1977 Census (ii) * Regions

		15-19	20-24	25-29	30-34	35-39	40-44	45-49	TFR
	1972	.136	.259	.296	.234	.216	.109	.086	6.68
Total	1982	.136	.280	.274	.238	.183	.111	.061	6.41
	1984	.168	.338	.331	.274	.210	.131	.091	7.72
	1972	.133	.251	.291	.227	.215	.109	.086	6.56
Rural	1977	.133	.281	.275	.241	.196	.127	.069	6.61
	1982	.138	.282	.274	.238	.184	.112	.061	6.44
	1984	.177	.349	.334	.278	.207	.126	.094	7.83
	1972	.173	.322	.332	.296	.226	.110	.089	7.74
Urban	1977	.115	.272	.272	.241	.194	.113	.065	6.36
	1982	.121	.260	.275	.244	.166	.105	.049	6.10
	1984	.114	.272	.309	.242	.237	.180	.046	7.00

Source: NSO(1973, 1980, 1984, 1987a, 1987b).

Table 5.1c

Reported ASFRs and TFR for selected countries

	Botswana		Lesotho	Swaziland	
	1971	1981	1976	1966	1976
15-19	0.077	0.102	0.070	0.090	0.117
20-24	0.248	0.250	0.258	0.217	0.254
25-29	0.248	0.250	0.280	0.221	0.246
30-34	0.218	0.234	0.240	0.200	0.209
35-39	0.178	0.190	0.178	0.152	0.159
40-44	0.125	0.134	0.104	0.095	0.092
45-49	0.065	0.084	0.042	0.059	0.055
TFR =	5.795	6.220	5.860	5.170	5.660

	Tanzania	Zimbabwe		Zambia		Mozambique
	1978	1981	1982	1969	1980	1980
15-19	0.138	0.073	0.091	0.075	0.061	0.110
20-24	0.307	0.247	0.258	0.183	0.239	0.234
25-29	0.296	0.262	0.253	0.173	0.253	0.241
30-34	0.239	0.235	0.225	0.147	0.228	0.211
35-39	0.183	0.183	0.165	0.115	0.181	0.170
40-44	0.093	0.110	0.093	0.067	0.108	0.098
45-49	0.039	0.048	0.038	0.048	0.070	0.064
TFR =	6.475	5.790	5.615	4.041	5.697	5.840

Source: ROT(1980), KOL(1981), KOS(), GOZ(1985), ROZ(1974,1987)

Fig 5.1 Reported ASFR: Malawi 1972-1984

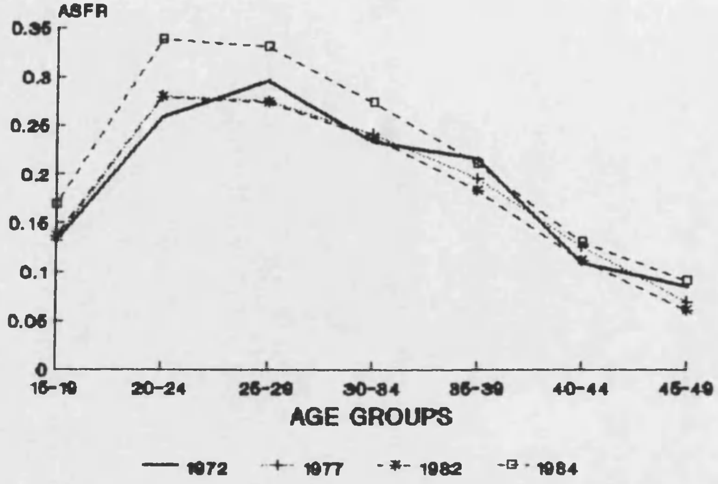


Fig 5.2 Age specific Fertility Rates:
Malawi and its Regions - 1977

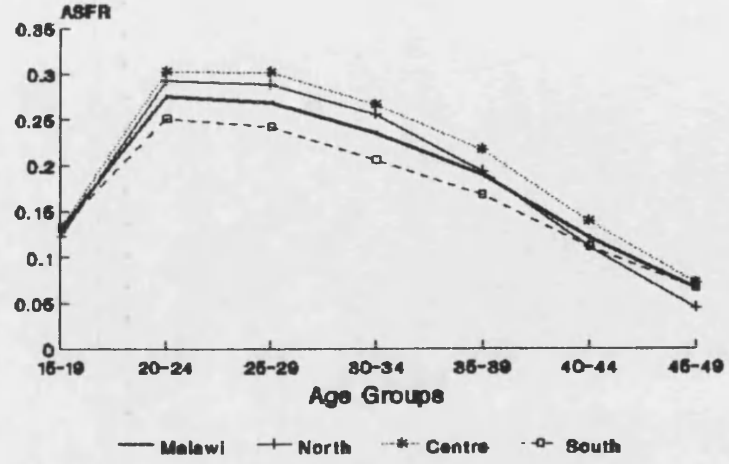


Fig 5.3 Age Specific Fertility Rates
Rural (1972 - 1984)

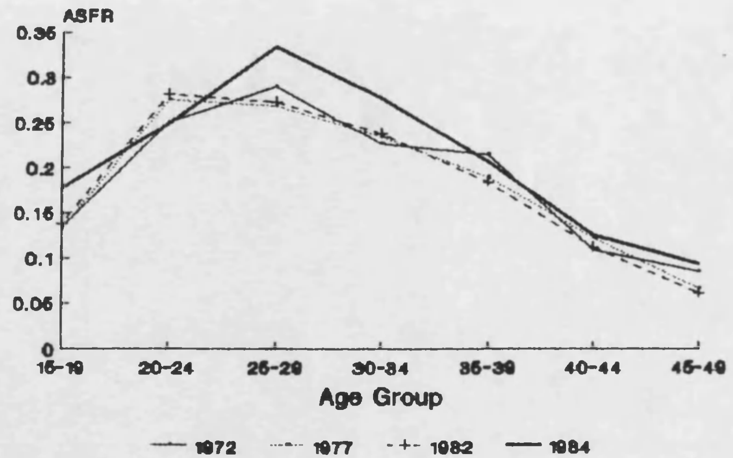


Fig 5.4 Age Specific Fertility Rates
Urban (1972 - 1984)

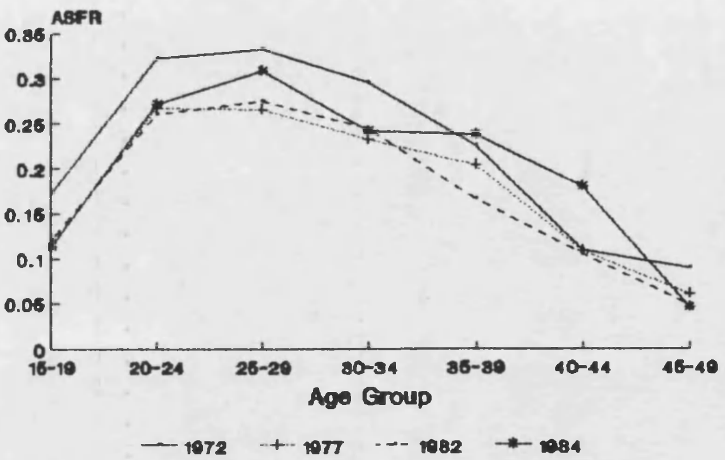


Fig 5.5 Relative Age Specific
Fertility Rates: Malawi (1972 - 1984)

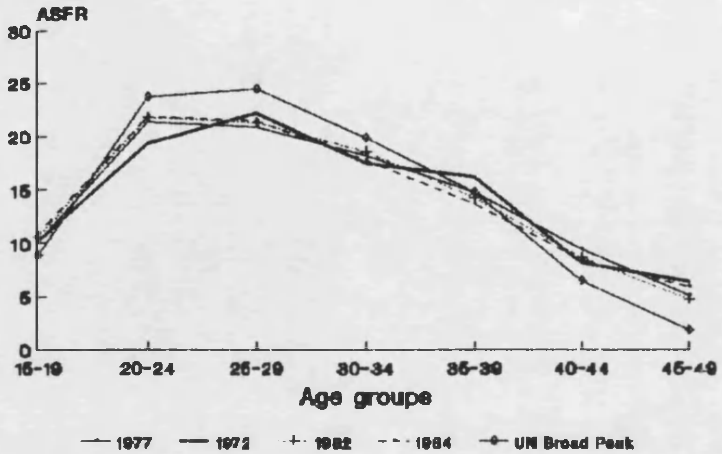


Fig 5.6 Relative ASFR: Malawi
and Regions (1977)

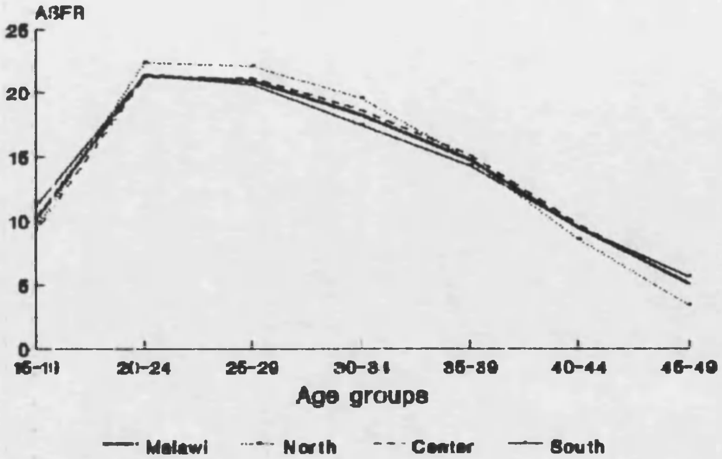


Fig 5.7 Relative ASFR: Malawi
Rural (1972 - 1984)

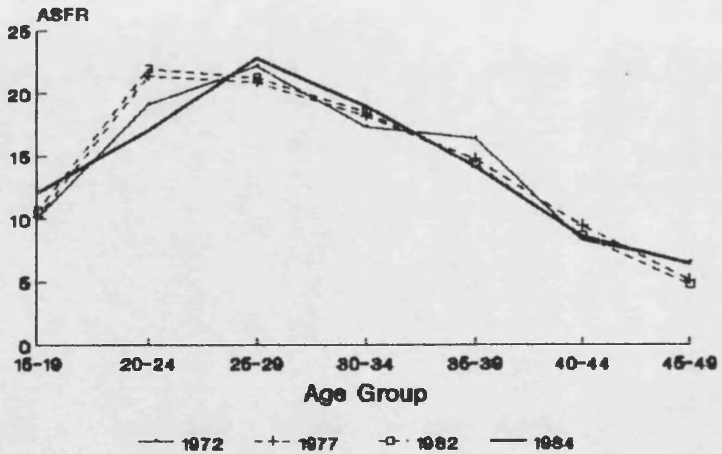
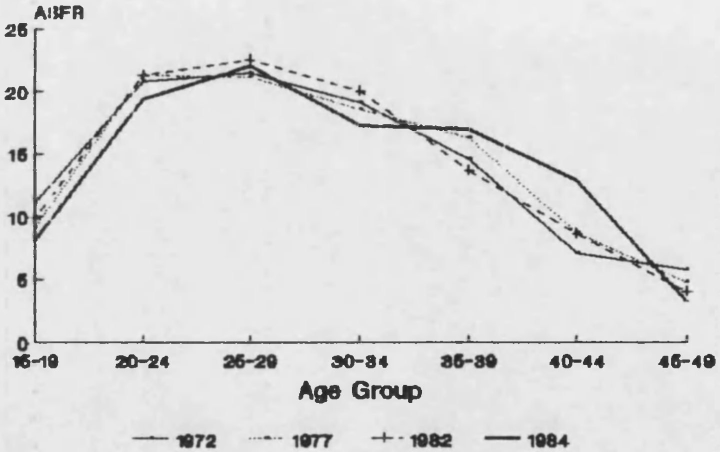


Fig 5.8 Relative ASFR: Malawi
Urban (1972 - 1984)



5.4.2 Lifetime Fertility

Table 5.2 present retrospective fertility data for Malawi and its subdivisions (regions, districts, rural and urban areas). These are illustrated in figures 5.9 to 5.12.

The reported number of children ever born shows the cumulated fertility for women up to their age at the time of the enumeration. Therefore the number of children ever born to women at the end of the reproductive period, that is age group 45-49 or 50 years and over, can be taken as a measure of completed fertility (the average size of the completed family) particularly if the sources of biases in the data (discussed above) are deemed to be minimal (in the strict sense non-existent) and fertility is believed to have remained constant in the past since the "measure" refers to "past fertility".

For Malawi as a whole, the three regions plus most districts, the mean parities show a gradual increase from age group 15-19 to age group 35-39, beyond which they start levelling off, and eventually declined in some cases (Rumphi, 1984 urban). The reduction in the rate of increase in the mean parities could be attributable to the age pattern of fecundity and more importantly, to omission of children by the older women. The fact that the mean parities declined in certain cases can indeed be taken as confirmation that the older women omitted some children.

The errors operate in such a way as to underestimate the level of fertility. Despite this error, the CEB for age groups 40-44 and 45-49, which ever is accepted as a "rough" measure of completed family produces estimates which are close enough to, but slightly higher than the reported TFR. This may be indicative that the current fertility data were grossly under-enumerated and that the retrospective fertility data gives a moderately better measure of fertility.

As a result of the above observation and persuaded by the desire to derive better estimates of fertility from the reported lifetime fertility, the mean parities for the older age groups (40-44 and 45-49) were compared with the "expected" completed family size calculated using United Nations(1967) and Brass(1980) formulae. If fertility has been constant in the recent past and the age pattern of fertility conforms to the typical pattern in population without birth control and age mis-statement are minimal, United Nations(1967) and Brass(1979) suggested that the completed family size can be approximated by the following formulae:

$$(P3)^2/P2 \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad \text{(i)} \quad \text{(UN)}$$

$$((P4)^4.P2)/(P3)^4 \quad \ldots\ldots\ldots\ldots \quad \text{(ii)} \quad \text{(Brass)}.$$

where P2, P3 and P4 are mean parities for respective age groups 20-24, 25-29 and 30-34. Brass formulae further assumes that the age pattern of fertility can be described by the Gompertz function (see section 5.4.3.3 below). The results of this exercise are presented in Table 5.2c. They confirm that the older women were undoubtedly omitting children. On average it seems that almost two children were omitted by each woman interviewed.

Also displayed in Table 5.2c are TFR estimates derived from a formulae supplied by the NSO(1984b). The NSO suggested that TFR for the different sub-divisions (rural-urban, regional and districts) in Malawi can be obtained from the estimated TFR for the whole country by adjusting the latter by the ratio of the average parities for age group 25-29 for the sub-division and the country as a whole. That is

TFR (for the sub-division) = TFR (Malawi as a whole) multiplied by the ratio P*(25-29) and P+(25-29)

where P*(25-29) and P+(25-29) represents the mean parity for the sub-division and the country as a whole, respectively.

Brass(1979) further provides a three-point procedure of evaluating the results of applying equations (i) and (ii). He suggested that if

(a) UN formulae is less than Brass′ formulae then the latter is likely to provide a better estimate;

(b) UN formulae is greater than Brass′ formulae then the estimate of TFR using the former is recommended and it is more likely that the Gompertz model doesn′t provide a good fit for the reported mean parities;

(c) the estimated TFR is less than the mean parities of the older age cohorts (40-44 and 45-49) then the underlying assumptions are not satisfied and the formulae should not be used.

The results of this exercise further demonstrate that in general terms condition (c) is satisfied, with the exception of the 1984 FFS and Ntchisi district. Condition (b) is satisfied in all cases, apart from the 1972 MPCS and the 1984 FFS. The preceding statement suggest that Gompertz function as applied in section 5.4.3.3 below may not give reliable results for the above two sources. The case of Ntchisi district requires a separate treatment and this will be given later in the chapter.

These observations imply that the level of fertility in Malawi is even higher than 6.89 children per woman implied by CEB for 45-49 age group. At this stage, therefore, the estimates obtained from using the Brass formulae can be accepted as representing the fertility situation in the country.

Fig 5.9 Children Ever Born:
Malawi 1972 - 1984

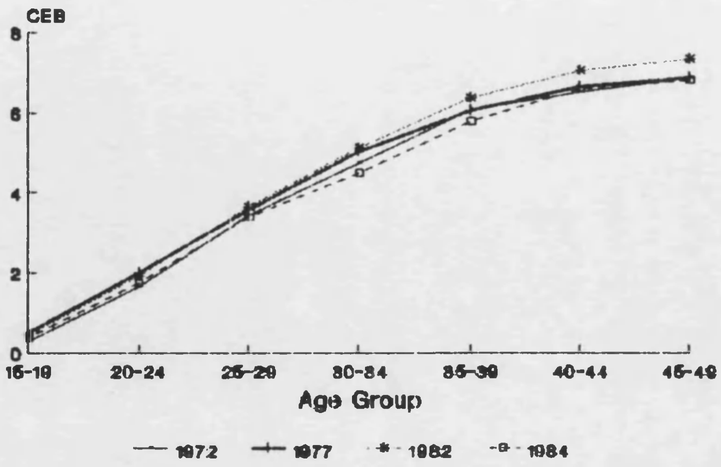


Fig 5.10 Children Ever Born by
Regions (1977)

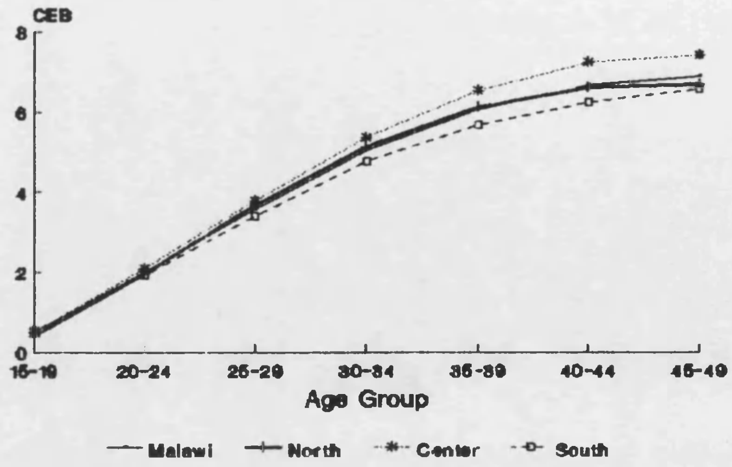


Fig 5.11 Children Ever Born: Malawi
Rural 1972 - 1984

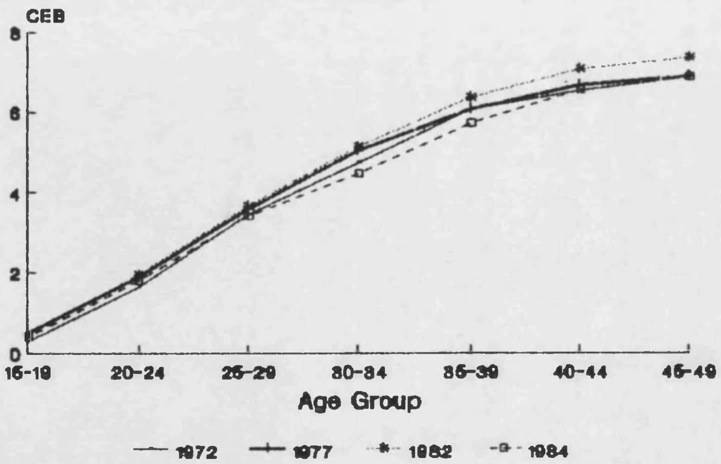


Fig 5.12 Children Ever Born
Urban 1972 - 1984

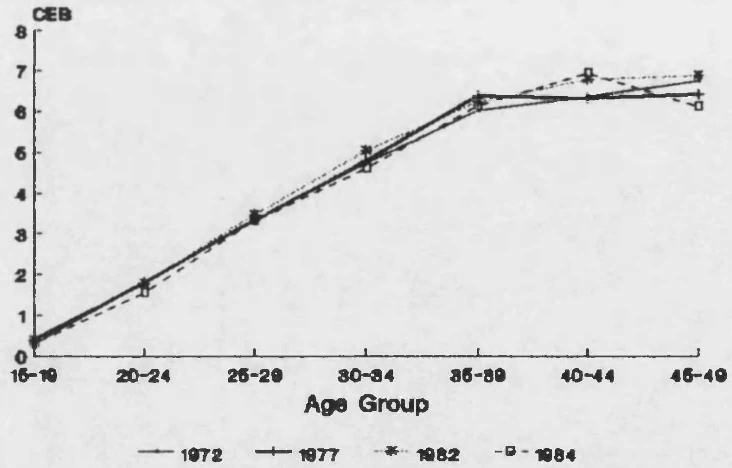


Table 5.2

Reported Children Ever Born: Malawi, Regions+, Districts+, Rural and Urban

	15-19	20-24	25-29	30-34	35-39	40-44	45-49
Malawi	.496	1.991	3.555	5.033	6.048	6.654	6.885
Northern*	.400	1.959	3.649	5.117	6.106	6.591	6.663
Chitipa	.364	1.601	2.986	4.118	4.839	5.131	5.196
Karonga	.498	2.057	3.646	5.048	5.987	6.340	6.347
Rumphi	.439	1.941	3.490	4.760	5.580	5.991	5.750
Nkhata Bay	.269	1.695	3.517	5.066	6.173	6.825	6.979
Mzimba	.388	1.976	3.684	5.196	6.168	6.684	6.850
Central*	.489	2.091	3.766	5.360	6.503	7.221	7.408
Kasungu	.484	2.148	3.872	5.538	6.749	7.493	7.673
Nkhota Kota	.614	2.157	3.750	5.126	6.020	6.469	6.413
Ntchisi	.457	1.455	2.518	3.389	4.051	4.259	8.367
Dowa	.460	2.221	4.078	5.887	7.004	7.951	8.275
Salima	.536	1.980	3.551	4.916	6.022	6.538	6.686
Lilongwe	.461	2.026	3.656	5.217	6.347	7.085	7.121
Mchinji	.526	2.160	3.929	5.465	6.723	7.593	7.851
Dedza	.540	2.007	3.522	4.981	6.073	6.804	7.026
Ntcheu	.403	1.882	3.501	5.092	6.151	6.750	6.835
Southern*	.527	1.924	3.388	4.754	5.663	6.223	6.556
Mangochi	.660	1.980	3.282	4.459	5.157	5.508	5.660
Machinga	.606	1.996	3.416	4.726	5.655	6.115	6.354
Zomba	.545	1.951	3.390	4.763	5.630	6.100	6.422
Chiradzulu	.435	1.788	3.247	4.739	5.539	6.288	6.703
Blantyre	.428	1.814	3.282	4.707	5.625	6.088	6.393
Mwanza	.393	1.849	3.532	5.049	6.106	6.745	7.149
Thyolo	.503	1.986	3.474	4.830	5.864	6.579	6.911
Mulanje	.537	1.897	3.352	4.702	5.693	6.409	6.807
Chikwawa	.510	1.997	3.625	5.111	6.049	6.714	7.037
Nsanje	.554	2.077	3.675	5.093	6.056	6.727	7.120

Source and Notes: See Table 5.1 above.

		15-19	20-24	25-29	30-34	35-39	40-44	45-49
	1972	.284	1.660	3.429	4.730	6.061	6.519	6.877
Total	1982	.430	1.929	3.638	5.130	6.351	7.049	7.344
	1984	.379	1.749	3.387	4.491	5.771	6.588	6.812
	1972	.283	1.643	3.444	4.729	6.065	6.530	6.888
Rural	1977	.505	1.882	3.578	5.054	6.066	6.674	6.908
	1982	.435	1.950	3.659	5.139	6.361	7.065	7.368
	1984	.394	1.781	3.400	4.477	5.728	6.549	6.874
	1972	.298	1.802	3.324	4.738	6.011	6.352	6.740
Urban	1977	.399	1.796	3.328	4.784	6.387	6.330	6.407
	1982	.380	1.769	3.455	5.037	6.219	6.782	6.879
	1984	.290	1.540	3.305	4.606	6.135	6.931	6.105

Source: See Table 5.1 above.

Table 5.2c

Fertility Estimates obtained by using UN, Brass and NSO Formulae: Malawi, Regions and Districts

	UN	Brass	NSO
Malawi	6.35	7.99	7.60
Northern region	6.80	7.57	7.80
Chitipa	5.57	5.79	6.38
Karonga	6.46	7.56	7.79
Rumphi	6.28	6.72	7.46
Nkhata Bay	7.30	7.30	7.52
Mzimba	6.87	7.82	7.88
Central Region	6.78	8.58	8.05
Kasungu	6.98	8.99	8.28
Nkhota Kota	6.52	7.53	8.02
Ntchisi	4.36	4.77	5.38
Dowa	7.49	9.65	8.72
Salima	6.37	7.27	7.59
Lilongwe	6.60	8.40	7.82
Mchinji	7.15	8.09	8.40
Dedza	6.18	8.03	7.53
Ntcheu	6.51	8.42	7.48
Southern Region	5.97	7.46	7.24
Mangochi	5.44	6.75	7.02
Machinga	5.85	7.31	7.30
Zomba	5.89	7.60	7.25
Chiradzulu	5.90	8.11	6.94
Blantyre	5.94	7.67	7.02
Mwanza	6.75	7.72	7.55
Thyolo	6.08	7.42	7.43
Mulanje	5.92	7.34	7.17
Chikwawa	6.58	7.89	7.75
Nsanje	6.50	7.66	7.86

		UN	Brass	NSO
	1972	7.08	6.01	7.33
Total	1977	6.35	7.99	7.60
	1982	6.86	7.62	7.78
	1984	6.56	5.41	7.24
	1972	7.22	5.85	7.36
	1977	6.80	7.49	7.65
Rural	1982	6.87	7.59	7.82
	1984	6.49	5.35	7.27
	1972	6.13	7.44	7.11
	1977	6.17	7.67	7.11
Urban	1982	6.75	7.99	7.39
	1984	7.09	5.81	7.06

5.4.3 Indirect Estimates of Fertility

The preceding subsections on current and lifetime fertility have disclosed that the two sets of data are severely distorted and that not much trust can be placed upon the measures derived from them. Fortunately enough, demographers have devised techniques to permit further investigations into the problems, and means to adjust the data so as to obtain more plausible fertility measures. Therefore the reported births in the households in the last twelve months (Table 5.1) and CEB (Table 5.2) were further examined by procedures developed by Brass(1960, 1968, 1981).

5.4.3.1 Brass Polynomial Function

The method graduates and transforms fertility distributions by fitting the polynomial function of the form

$$f(x) = x(35 - x)^2 (A + Bx^2 + Cx+ Dx^3) \quad ...... \quad (iii)$$

where x is the age of the woman from the beginning of the reproductive period (assumed to be 15 years) to the end (50 years), f(x) is the fertility rate at age x, and A, B, C, D are constants.

Three routines were conducted: (i) smoothing the ASFR; (ii) converting the ASFR into CEB equivalents; and (iii) converting the reported CEB into ASFR equivalents.

These procedures were employed for four reasons. Firstly, the reported TFR in excess of 6 children per woman (as suggested by both current and lifetime data) is clearly very high by any standard, hence it was judged that one can reasonably assume that the reported level is correct but the age pattern of fertility is distorted as a result of age mis-statements and random fluctuations in the case of the sample surveys. For this reason, a method that merely smooth out and graduates the reported ASFR was desired.

Secondly, and coming from the first, the reported ASFR (see for example Table 5.1 and Figure 5.1 above) show a rather erratic pattern suggesting that they indeed suffer from enormous errors. Therefore, it was believed that with the help of the method some of the abnormalities appearing in the data could be eliminated thereby generating a more realistic fertility curve which could not only be easily studied but also form the basis of population projections in the future.

Thirdly, since there appears to have been no major changes in fertility (exception being the 1984 FFS which suggest a rise in fertility!), and fertility can be said to have been constant in the past (particularly over the period under review), both the ASFR and CEB are just different measures of the same thing, so that by converting one into the other, one can examine the possible source of error in the data.

Lastly, most estimation procedures developed by Professor Brass, including the childhood and orphanhood methods employed in Chapter IV, assume that the age pattern of fertility can best be described by the polynomial function. Thus it was felt necessary to test the applicability and relevance of this assumption in the case of Malawi.

The method depends on three assumptions. Firstly, fertility is assumed to have remained constant in the past. This is the simplest and safest assumption one can make in view of the lack of information concerning fertility and one which seems valid and has been widely employed by "third world demographers". This assumption looks acceptable in the case of Malawi and other researchers working on the demography of the country have made a similar observation (NSO,1984). However, in the light of emerging evidence elsewhere, one should be cautious in making this assumption as recent investigations in other developing countries that have conducted intensive demographic studies, and where the assumption of constant fertility was valid a few years ago have revealed some significant trends in fertility.

Secondly, it is assumed that there is no correlation between mortality and fertility. This assumption is required: for if the two are strongly correlated then the reported ASFR and CEB may be seriously distorted. Problems may arise from the fact that some women who have given birth to a live child may not themselves be alive at the time of the interview to report the event to the enumerator.

It is however problematic to establish before hand the direction of the correlation. On the one hand, it is often argued that more frequent pregnancies and live births leads to higher mortality among both children and mothers (hence the adoption of the child spacing programme in Malawi in 1982). In this respect the high parity women and the teenaged (young) mothers may be said to be more vulnerable.

On the other hand, in societies like those found in Malawi, women who report comparatively fewer children than their age, particularly the older age groups, are likely to have been subjected to high morbidity and mortality conditions which subsequently led to spontaneous abortions or still-births. The exact nature of these relationships is unknown due to lack of relevant statistics. Therefore it looks reasonable to assume that in the real world the two associations (i.e. high fertility leading to high mortality and vice versa) negate each other thereby leading to zero correlation.

Thirdly, it is frequently assumed that the ASFR closely correspond to the polynomial function as described in equation (i) above. Although there is no reason why human behaviour (in this case fertility) should best be described and represented by a mathematical formulae, empirical evidence seems to suggest otherwise (Mtozi,1978a). Brass(1960) assessed the suitability of the formula, by using data from selected countries representing both the developed and developing nations and concluded that the function appears to fit the data well.

The result of this exercise are presented in Tables 5.3 to 5.5 and Figures 5.13 to 5.16. The smoothing of the observed ASFR gave rise to a rather implausible schedule of fertility which show a trough at age group 30-34 (see figure 5.13). This could be attributed to the distortions in the reported age statistics. Therefore ,it was concluded that the observed rates describe the age pattern of fertility better than the graduated rates.

The CEB derived from the reported ASFR showed the same pattern as the reported CEB. But at each age group the derived values were consistently lower than the reported values suggesting that the current fertility data were severely under-reported.

The ASFR derived from the reported CEB (see Table 5.5 and Figure 5.14) reveal a very plausible pattern of fertility as described in section 5.4 above. The fertility curve itself (contrast Figures 5.1 and 5.14) is moderately better than the one based on reported data and the level of fertility indicate, in most cases, a slight upward adjustment over the reported TFR.

The problem with this procedure stems from the fact that the method depends on the reported mean parity data. As noted earlier in the chapter, these data are affected by omission and under-reporting of children particularly by older women. Partly, as a result of this error, the rates for the age groups 40-44 and 45-49 for some districts (see Rumphi, Chitipa, Karonga, Nkhota Kota, Salima and Mangochi) in 1977 and the urban population in both 1982 and 1984 are less than one. This may further be a consequence of the characteristic features of the formulae itself since the polynomial function tend to force the fertility rates at both ends of child bearing period to zero.

A comparison of the TFR derived from the reported CEB (Table 5.5) and the reported ASFR (Table 5.1) reveals that although CEB statistics suffers from omission, the former is slightly higher than the latter. This may suggest that the reported fertility is under-reported. The same conclusion was also reached by examining the reported parity and those estimated from observed ASFR.

Table 5.3

Adjusted ASFR using Brass Polynomial Function:
Malawi, Regions+, Districts, Rural and Urban

	15-19	20-24	25-29	30-34	35-39	40-44	45-49	TFR
Malawi	.119	.305	.287	.203	.183	.168	.053	6.59
Northern*	.121	.331	.322	.233	.189	.138	.038	6.70
Chitipa	.107	.304	.304	.217	.178	.153	.047	6.56
Karonga	.143	.319	.307	.232	.184	.136	.038	6.80
Rumphi	.133	.290	.294	.236	.181	.119	.030	6.41
Nkhata Bay	.106	.307	.349	.290	.223	.150	.039	7.32
Mzimba	.118	.308	.320	.246	.193	.144	.041	6.85
Central*	.121	.331	.322	.233	.209	.188	.059	7.31
Kasungu	.135	.340	.332	.253	.228	.196	.059	7.72
Nkhota Kota	.134	.346	.316	.213	.196	.191	.062	7.29
Ntchisi	.119	.306	.306	.233	.199	.162	.048	6.86
Dowa	.128	.377	.375	.268	.234	.213	.067	8.31
Salima	.127	.319	.300	.213	.191	.173	.054	6.89
Lilongwe	.126	.336	.321	.226	.202	.185	.058	7.28
Mchinji	.128	.350	.338	.249	.234	.217	.068	7.93
Dedza	.123	.327	.307	.216	.202	.193	.061	7.15
Ntcheu	.117	.305	.307	.230	.191	.155	.046	6.75
Southern*	.117	.287	.255	.171	.162	.159	.052	6.02
Mango	.120	.258	.215	.142	.141	.141	.045	5.31
Machinga	.128	.289	.249	.169	.163	.160	.051	6.05
Zomba	.128	.278	.241	.162	.144	.133	.042	5.65
Chiradzulu	.121	.293	.275	.195	.167	.145	.044	6.20
Blantyre	.113	.282	.263	.185	.166	.152	.048	6.05
Mwanza	.098	.320	.303	.194	.179	.189	.064	6.73
Thyolo	.123	.316	.274	.177	.182	.195	.065	6.66
Mulanje	.131	.313	.270	.180	.180	.184	.060	6.59
Chikwawa	.113	.286	.250	.162	.162	.170	.056	5.99
Nsanje	.138	.328	.295	.202	.183	.171	.054	6.85

Notes: See Table 5.1 above.

		15-19	20-24	25-29	30-34	35-39	40-44	45-49	TFR
	1972	.114	.311	.290	.198	.185	.181	.059	6.68
Total	1982	.124	.303	.285	.203	.173	.149	.046	6.41
	1984	.147	.382	.342	.217	.194	.196	.065	7.72
	1972	.111	.303	.283	.193	.183	.180	.059	6.56
Rural	1977	.120	.306	.287	.203	.184	.169	.053	6.61
	1982	.126	.305	.286	.202	.173	.151	.046	6.44
	1984	.140	.341	.307	.213	.204	.197	.063	7.33
	1972	.148	.372	.345	.234	.203	.186	.059	7.74
Urban	1977	.105	.291	.287	.206	.178	.157	.049	6.36
	1982	.110	.282	.282	.210	.167	.131	.038	6.10
	1984	.113	.278	.295	.257	.232	.177	.048	7.00

Table 5.4

Children Ever Born derived from reported Age Specific Fertility Rates using Brass Polynomial Function: Malawi, Regions+, Districts+, Rural and Urban

	15-19	20-24	25-29	30-34	35-39	40-44	45-49
Malawi	.191	1.323	2.871	4.082	5.082	5.931	6.513
Northern*	.197	1.317	2.915	4.299	5.363	6.198	6.650
Chitipa	.165	1.252	2.849	4.149	5.113	5.962	6.487
Karonga	.246	1.485	3.107	4.454	5.482	6.300	6.746
Rumphi	.230	1.360	2.867	4.194	5.232	5.994	6.367
Nkhata Bay	.167	1.243	2.949	4.561	5.839	6.787	7.264
Mzimba	.191	1.319	2.956	4.373	5.457	6.318	6.792
Central*	.189	1.390	3.102	4.479	5.556	6.579	7.229
Kasungu	.220	1.489	3.243	4.694	5.876	6.971	7.636
Nkhota Kota	.214	1.499	3.235	4.537	5.525	6.526	7.196
Ntchisi	.193	1.323	2.918	4.260	5.322	6.248	6.792
Dowa	.193	1.528	3.506	5.103	6.323	7.475	8.213
Salima	.205	1.399	3.019	4.288	5.272	6.214	6.812
Lilongwe	.199	1.432	3.156	4.510	5.550	6.548	7.191
Mchinji	.200	1.471	3.275	4.726	5.904	7.074	7.827
Dedza	.194	1.396	3.059	4.348	5.361	6.384	7.057
Ntcheu	.188	1.309	2.907	4.245	5.278	6.164	6.684
Southern*	.190	1.278	2.698	3.744	4.457	5.381	5.942
Mangochi	.203	1.233	2.467	3.338	4.019	4.751	5.245
Machinga	.214	1.342	2.746	3.767	4.568	5.410	5.971
Zomba	.217	1.318	2.671	3.663	4.406	5.123	5.585
Chiradzulu	.200	1.311	2.795	3.960	4.841	5.641	6.136
Blantyre	.183	1.242	2.669	3.777	4.632	5.455	5.981
Mwanza	.138	1.244	2.896	4.120	5.010	5.963	6.642
Thyolo	.194	1.376	2.929	4.028	4.885	5.868	6.566
Mulanje	.214	1.413	2.941	4.041	4.907	5.854	6.504
Chikwawa	.179	1.252	2.659	3.665	4.440	5.303	5.908
Nsanje	.227	1.481	3.108	3.330	5.261	6.176	6.772

Notes: See Table 5.1 above.

		15-19	20-24	25-29	30-34	35-39	40-44	45-49
	1972	.177	1.309	2.887	4.088	5.010	5.957	6.593
Total	1982	.204	1.348	2.882	4.092	5.007	5.836	6.348
	1984	.233	1.653	3.560	4.935	5.917	6.925	7.623
	1972	.171	1.277	2.818	3.989	4.897	5.839	6.474
Rural	1977	.193	1.333	2.884	4.094	5.034	5.946	6.530
	1982	.208	1.362	2.904	4.112	5.027	5.860	6.376
	1984	.227	1.520	3.217	4.494	5.504	6.545	7.235
	1972	.239	1.634	3.512	4.943	6.001	7.003	7.652
Urban	1977	.164	1.216	2.732	3.958	4.894	5.755	6.295
	1982	.179	1.220	2.691	3.922	4.851	5.613	6.049
	1984	.188	1.224	2.706	4.085	5.305	6.357	6.932

Table 5.5

Age Specific Fertility Rates Derived from the reported Children Ever Born using Brass Polynomial Function: Malawi, Regions+, Districts+, Rural and Urban

	15-19	20-24	25-29	30-34	35-39	40-44	45-49	TFR
Malawi	.228	.337	.298	.251	.175	.072	.008	6.85
Northern*	.217	.349	.321	.251	.148	.044	.000	6.64
Chitipa	.178	.287	.254	.187	.102	.026	-.001	5.17
Karonga	.241	.338	.296	.242	.136	.017	-.011	6.30
Rumphi	.231	.317	.280	.229	.116	-.004	-.018	5.75
Nkhata Bay	.170	.348	.352	.271	.168	.077	.014	7.00
Mzimba	.213	.359	.328	.248	.152	.059	.007	6.83
Central*	.239	.354	.322	.281	.196	.078	.007	7.39
Kasungu	.245	.364	.335	.296	.206	.079	.007	7.65
Nkhota Kota	.264	.340	.284	.241	.142	.017	-.013	6.37
Ntchisi	.055	.413	.199	-.057	.214	.550	.227	8.00
Dowa	.238	.402	.364	.292	.216	.120	.025	8.29
Salima	.237	.324	.287	.255	.172	.053	.001	6.64
Lilongwe	.236	.337	.314	.284	.192	.061	.000	7.12
Mchinji	.252	.366	.323	.287	.220	.107	.016	7.86
Dedza	.238	.326	.285	.262	.197	.083	.009	7.00
Ntcheu	.209	.333	.322	.274	.172	.053	.001	6.81
Southern*	.221	.325	.273	.223	.165	. 081	.013	6.51
Mangochi	.247	.302	.227	.189	.125	.032	-.004	5.59
Machinga	.242	.316	.258	.225	.159	.056	.002	6.28
Zomba	.225	.326	.271	.218	.154	.068	.009	6.36
Chiradzulu	.189	.329	.288	.220	.172	.112	.028	6.69
Blantyre	.199	.321	.288	.229	.153	.068	.010	6.34
Mwanza	.194	.352	.324	.250	.179	.103	.023	7.13
Thyolo	.231	.328	.275	.238	.189	.100	.018	6.89
Mulanje	.221	.319	.268	.231	.189	.107	.021	6.78
Chikwawa	.223	.354	.304	.239	.173	.092	.018	7.01
Nsanje	.237	.355	.291	.232	.180	.102	.021	7.09

Notes: See Table 5.1 above.

		15-19	20-24	25-29	30-34	35-39	40-44	45-49	TFR
	1972	.174	.330	.326	.261	.176	.087	.017	6.85
Total	1982	.215	.346	.322	.274	.199	.095	.016	7.33
	1984	.206	.308	.276	.250	.202	.110	.020	6.86
	1972	.171	.332	.328	.260	.176	.089	.018	6.87
Rural	1977	.212	.344	.313	.252	.170	.075	.011	6.88
	1982	.218	.347	.320	.273	.199	.097	.016	7.35
	1984	.208	.313	.270	.238	.203	.124	.027	6.91
	1972	.193	.318	.307	.261	.175	.070	.008	6.66
Urban	1977	.216	.285	.314	.318	.170	-.021	-.034	6.24
	1982	.195	.327	.333	.287	.178	.052	-.000	6.85
	1984	.205	.253	.316	.354	.192	-.033	-.033	6.22

Fig 5.13 ASFR Graduated using Brass
Polynomial function: Malawi

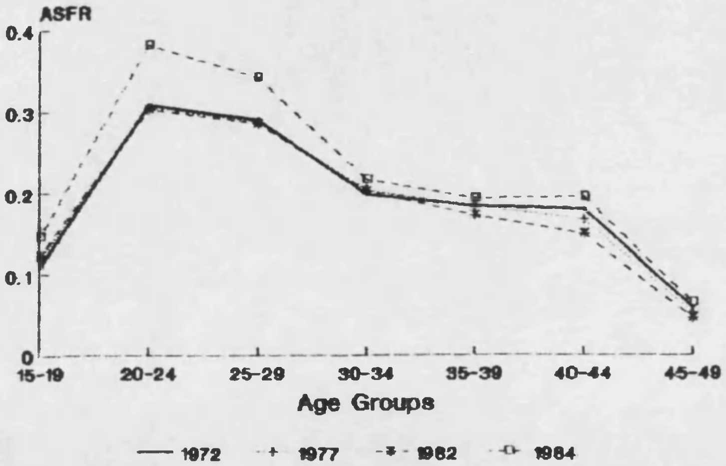
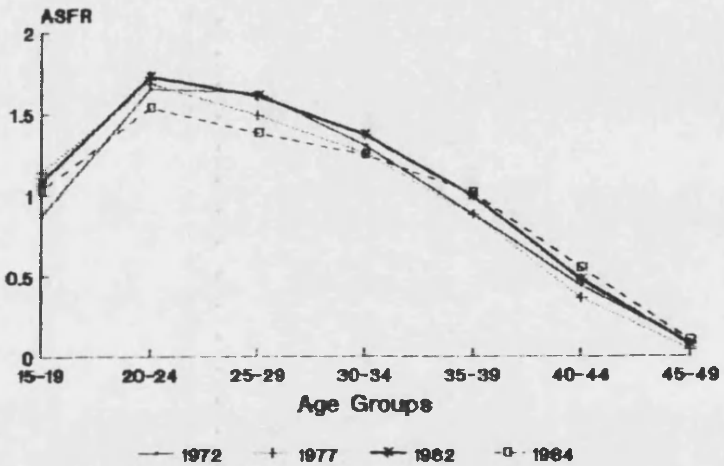


Fig 5.14 ASFR derived from CEB using
Brass Polynomial Function



5.4.3.2 Brass P/F Ratio

The technique accepts the shape of the fertility curve as presented by the reported current rates, but rejects the overall level as being distorted. The reports of retrospective fertility for the younger women (women in their twenties and thirties), are regarded to be more reliable than those of the older women. The latter are rejected because they are affected by memory-lapse which leads to omission of children. However, the reports of the youngest age group (15-19) are not at all reliable. This stems from the fact that the age group 15-19 is affected by small numbers of both women and children. There are also theoretical difficulties associated with modelling of fertility at this age group.

From the analysis in the preceding sections this looks not to be the most rational thing to do, as the examination of reported fertility schedules indicate that the current rates are distorted both in "shape" and "level". The former seems to have been caused by age mis-reporting whilst omission and under-reporting of current births is responsible for the latter.

The method converts the ASFR [denoted as f(i) where i represents age groups 15-19, 20-24, ..., 44-49] to mean parity equivalent [denoted as F(i)] using appropriate multiplying factors which are selected on the basis of the mean age of the fertility schedule (m) and the ratio of the ASFR for the age groups 15-19 and 20-24, f(1)/f(2). The latter is used for age groups below 30 and the former is used for age groups above 30 years. The calculated m values and f(1)/f(2) ratios are given in Table S5.1 and the P/F ratios were obtained for all the age groups and are presented in Table 5.6 below.

The ratios decline from the high values of the age group 15-19 to reach their smallest levels in the last age group. Exception to this are the ratios for the 1970/72 MPCS (total, rural and urban) which indicate low values for the age group 15-19. This pattern confirms the existence of certain systematic biases, probably related to small numbers associated with this age group: both the females and their births and age mis-reporting occurring at the beginning of child-bearing.

Empirical evidence consistently reveal that the P/F ratio for age group 15-19 is usually out of line with the rest probably reflecting the failure of the method to describe the fertility pattern at the onset of childbearing. The value for the second age group appears to be similarly affected. Although the P/F ratios for the older age groups appear somewhat plausible they cannot be willingly accepted since, as noted in the preceding sections, they suffer from the omission of CEB.

The P/F ratios further suggest that either the current fertility was under-reported or the mean parity data were over-reported. But the expected pattern in the developing countries is for the latter to be omitted. Accordingly the former appears to be the case. This confirms the discussion in sections 5.4.1 and 5.4.2

above. This could be related to high infant mortality. It could be argued that since a good proportion of children born in the last 12 months were dead at the time of the interview and they were (deliberately) not reported by the women as the memory is still fresh in their minds.

There are slight differences between regions, districts and data sources and, in some cases, a commentary is called for. First and foremost, the P/F ratios for 1972 urban areas reveal a rather diverse pattern. For all age groups the values are less than one, suggesting that either the lifetime fertility was under-reported or the current fertility was over-reported or fertility has been rising. Given that little information on demographic parameters is available in Malawi all these possibilities are plausible. The possibility of a rise in fertility will be examined in section 5.5 below and of the first two, it looks certain that current fertility was overstated. Two points may be raised to corroborate this statement. Firstly, the TFR derived from the reported CEB (Table 5.5) suggest that fertility was constant in the seventies. Secondly, since the 1972 MPCS is said to have been overshadowed by the urban strata, it can in the same way be contested that the births were over-reported. This could have happened partly as a result of the concentration of health facilities in urban localities.

At this point, it can be noted that because of the fore-mentioned debility, the 1972 data appear to suffer from sampling errors attributable to the weights used to derive the published demographic statistics for the entire population. That the extension of the findings from the sample population to the study population did present some problems can further be deduced from the observation that the published figures for the rural population all end up with a zero digit probably reflecting that the figures were both estimated and rounded.

The P/F ratios for Ntchisi district also display a deviant pattern. The ratios for age groups 20-24, 25-29, ..., 40-44 are less than one. In contrast the values for age groups 15-19 and 45-49 look plausible and are comparable with the values for the other districts. No valid reason can be suggested for this pattern. It is possible the ratios are a consequence of mis-classification of the raw data. Ndawala(1989) re-calculated the P/F ratios for the various districts and didn't obtain any deviant pattern. As a result of this difficulty, in this study, the P/F ratios for the whole country were used to adjust the reported fertility for Ntchisi district. These gave fertility estimates which compare favourably with those of neighbouring districts and are consistent with expectation.

Table 5.6.

Brass P/F ratios by age group: Malawi, Regions+, Districts+, Rural and Urban - 1977

	15-19	20-24	25-29	30-34	35-39	40-44	45-49
Malawi	1.617	1.357	1.226	1.205	1.149	1.101	1.055
Northern region	1.468	1.326	1.214	1.162	1.102	1.047	0.999
Chitipa	1.495	1.130	1.036	0.972	0.906	0.846	0.799
Karonga	1.400	1.255	1.138	1.107	1.059	0.991	0.941
Rumphi	1.324	1.286	1.305	1.106	1.035	0.987	0.901
Nkhata Bay	1.286	1.194	1.139	1.082	1.026	0.971	0.941
Mzimba	1.486	1.331	1.209	1.160	1.094	1.042	1.006
Central Region	1.644	1.348	1.200	1.169	1.118	1.077	1.023
Kasungu	1.385	1.303	1.174	1.150	1.099	1.055	1.003
Nkhota Kota	1.652	1.306	1.167	1.101	1.034	0.973	0.889
Ntchisi	1.557	0.988	0.844	0.778	0.730	0.670	1.229
Dowa	1.502	1.260	1.152	1.127	1.057	0.945	0.955
Salima	1.637	1.277	1.167	1.119	1.091	1.033	0.979
Lilongwe	1.464	1.270	1.148	1.131	1.092	1.061	0.988
Mchinji	1.553	1.321	1.196	1.127	1.080	1.052	1.002
Dedza	1.687	1.298	1.146	1.119	1.079	1.045	0.996
Ntcheu	1.529	1.280	1.173	1.175	1.122	1.076	1.020
Southern Region	1.631	1.371	1.258	1.241	1.183	1.133	1.100
Mangochi	1.807	1.486	1.341	1.304	1.216	1.136	1.076
Machinga	1.625	1.367	1.249	1.225	1.175	1.108	1.061
Zomba	1.547	1.355	1.262	1.273	1.223	1.169	1.146
Chiradzulu	1.394	1.235	1.444	1.170	1.098	1.095	1.089
Blantyre	1.430	1.320	1.224	1.218	1.157	1.095	1.066
Mwanza	1.677	1.323	1.222	1.206	1.153	1.106	1.075
Thyolo	1.434	1.317	1.202	1.171	1.132	1.097	1.051
Mulanje	1.425	1.228	1.149	1.136	1.097	1.072	1.044
Chikwawa	1.605	1.451	1.380	1.365	1.284	1.239	1.189
Nsanje	1.530	1.274	1.174	1.151	1.100	1.068	1.048

+ see Table 5.1

		15-19	20-24	25-29	30-34	35-39	40-44	45-49
	1972	0.910	1.165	1.186	1.138	1.143	1.103	1.046
Total	1982	1.397	1.280	1.247	1.226	1.221	1.209	1.158
	1984	1.341	0.981	0.962	0.890	0.924	0.930	0.886
	1972	0.925	1.185	1.220	1.167	1.169	1.127	1.066
Rural	1977	1.621	1.362	1.232	1.206	1.149	1.101	1.055
	1982	1.397	1.279	1.245	1.223	1.218	1.206	1.157
	1984	1.421	1.132	1.088	0.956	0.973	0.985	0.939
	1972	0.883	0.915	0.950	0.938	0.954	0.997	0.756
Urban	1977	1.553	1.319	1.205	1.183	1.133	1.080	1.016
	1982	1.402	1.302	1.262	1.246	1.242	1.207	1.138
	1984	1.791	1.175	1.161	1.080	1.175	1.064	0.875

Seemingly the values that look tolerable are the ratios for the age groups 25-29, 30-34 and 35-39. They are moderately constant and imply an adjustment factor within the acceptable limits. The results of adjusting fertility by employing the P/F ratios for these age groups are presented in Table 5.7 below. Brass(1968) recommended that the P/F ratios for the younger age groups 20-24, 25-29 and 30-34 or various combinations of these (say the average of the first two, last two or all three) should be used to adjust the reported level of fertility.

The estimates for the age group 20-24 are implausibly high and cannot be relied upon. Age groups 25-29, 30-34 and 35-39 gives quite probable estimates. So too are the "averages" calculated from various combinations of these two (25-34 and 25-39). For the country as a whole the estimates lie between 7.3 and 8.0. The lower limits being values for urban areas.

Another salient feature revealed in Table 5.7 concerns the rural-urban differentials. The deviant trait highlighted earlier for the 1972 MPCS on disappears leaving a picture which suggest a lower fertility in urban than rural areas but the difference is quite small.

Table 5.7

Estimated TFR using P/F ratios for various age groups: Malawi, Regions+, Districts, Rural and Urban - 1977

	Age groups used					
	20-24	25-29	30-34	35-39	25-34	25-39
Malawi	8.7	8.0	7.9	7.6	8.0	7.8
Northern region	8.7	8.1	7.8	7.4	7.9	7.8
Chitipa	7.4	6.8	6.4	5.9	6.6	6.4
Karonga	8.5	7.7	7.5	7.2	7.6	7.5
Rumphi	8.2	8.4	7.1	6.6	7.7	7.4
Nkhata Bay	8.7	8.3	7.9	7.5	8.1	7.9
Mzimba	9.1	8.3	7.9	7.5	8.1	7.9
Central Region	9.6	8.7	8.5	8.2	8.6	8.5
Kasungu	10.1	9.1	8.9	8.5	9.0	8.8
Nkhota Kota	9.5	8.5	8.0	7.5	8.3	8.0
Ntchisi	6.8	5.8	5.3	5.0	5.6	5.4
Ntchisi*	9.3	8.5	8.4	8.1	8.5	8.4
Dowa	10.5	9.6	9.4	8.8	9.5	9.2
Salima	8.8	8.0	7.7	7.5	7.9	7.8
Lilongwe	9.2	8.3	8.2	7.9	8.3	8.2
Mchinji	10.5	9.5	8.9	8.6	9.2	9.0
Dedza	9.3	8.2	8.0	7.7	8.1	8.0
Ntcheu	8.6	7.9	7.9	7.6	7.9	7.8
Southern Region	8.1	7.5	7.4	7.1	7.5	7.4
Mangochi	7.9	7.1	6.9	6.5	7.0	6.8
Machinga	8.3	7.5	7.4	7.1	7.5	7.4
Zomba	7.7	7.1	7.2	6.9	7.2	7.1
Chiradzulu	7.7	9.0	7.3	6.8	8.1	7.7
Blantyre	8.0	7.4	7.4	7.0	7.4	7.3
Mwanza	8.9	8.2	8.1	7.8	8.2	8.0
Thyolo	8.8	8.0	7.8	7.5	7.9	7.8
Mulanje	8.1	7.6	7.5	7.2	7.5	7.4
Chikwawa	8.7	8.3	8.2	7.7	8.2	8.0
Nsanje	8.7	8.0	7.9	7.5	8.0	7.8

* estimates based on P/F ratios for the whole country.

		20-24	25-29	30-34	35-39	25-34	25-39
Total	1972	7.8	7.9	7.6	7.6	7.8	7.7
	1982	8.2	8.0	7.9	7.8	7.9	7.9
	1984	7.6	7.4	6.9	7.1	7.1	7.1
	1972	7.8	8.0	7.7	7.7	7.8	7.8
Rural	1977	8.2	8.1	7.9	7.6	8.0	7.9
	1982	8.2	8.0	7.9	7.8	7.9	7.9
	1984	8.9	8.5	7.5	7.6	8.0	7.9
	1972	7.1	7.3	7.3	7.4	7.3	7.3
Urban	1977	8.3	7.7	7.6	7.9	7.6	7.7
	1982	7.9	7.7	7.6	7.6	7.7	7.6
	1984	8.2	8.1	7.6	8.2	7.8	8.0

5.4.3.3 Gompertz Relational Model

The Gompertz function can be expressed as:

$$\frac{F(x)}{F} = \underline{A}^{\underline{B}^{x}} \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad \text{(iv)}$$

where F(x) is the cumulated fertility up to age x, F is the total fertility rate, A and B are constants lying between 0 and 1 and x represents age or age group. After taking the natural logarithm twice in succession on both sides of the equation (iv), we have

$$-\log(-\log(\frac{F(x)}{F})) = -\log(-\log(\underline{A}) + x \log\underline{B} \quad \ldots\ldots \quad \text{(v)}$$

which is of the form y = a + bx, a linear equation. (The negative of the double logarithm is taken so as to make the coefficients positive since log function is not defined for negative values). Therefore the double logarithm transformation of the proportion of fertility up to age x, becomes a linear function of age x. Brass(1977) suggested that the fit (equation (v)) can be improved by relating the cumulated proportion to a standard set of fertility. Therefore equation (v) can be rewritten as

$$Y(x) = \underline{A} + \underline{B}Ys(x) \quad \ldots\ldots\ldots\ldots\ldots \quad \text{(vi)}$$

where $Y(x) = -\log(-\log(\frac{F(x)}{F}))$, $Ys(x) = -\log(-\log(\frac{Fs(x)}{Fs}))$ A, B, F(x) and F are defined as above and Fs(x) and Fs are similar values for the standard population. The model also holds if instead of using the cumulated proportions F(x) we use the mean parity for age group i, P(i) (where i= 15-19, 20-24 ... 40-44 45-49).

Booth(1979) examined the goodness fit of the method and provided the standard pattern of fertility basing on schedules generated from Coale and Trussell(1974) fertility model.

So far, in its simplest form, the method assumes that TFR (denoted by "F" in the above equations) is available (from whatever source). However, in developing countries, TFR is usually unknown and the problem is to determine its value. As a result of this drawback Zaba(1981) modified the method further by separating the examination of the fertility pattern from the estimation of fertility level. She suggested that instead of using the cumulated proportion, we use the ratio of cumulated fertility for the successive age groups, namely $\frac{F(x)}{F(x+5)}$.

If we let $Z(x) = -\log(-\log \frac{F(x)}{F(x+5)})$

$$Zs(x) = -\log(-\log \frac{Fs(x)}{Fs(x+5)})$$

and assuming that the Gompertz function hold, we have

$$Z(x) = \underline{A} + \underline{B}Zs(x) \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (vii)$$

$$= \underline{A} - \underline{B}\log(-\log \frac{Fs(x)}{Fs(x+5)})$$

$$= \underline{A} - \underline{B}\log(-\log \frac{F\exp-(\exp-(Ys(x)))}{F\exp-(\exp-(Ys(x+5)))})$$

$$= \underline{A} - \ln(e^{-\underline{B}Ys(x)} - e^{-\underline{B}Ys(x+5)}) \quad \ldots(viii)$$

which by further mathematical manipulation and expanding the equation using Taylors series we obtain

$$Z(x) - e(x) = \underline{A} + 0.48(\underline{B}-1)^2 + \underline{B}g(x) \quad \ldots\ldots \quad (ix)$$

where e(x) and g(x) are given and g(x) represents the first derivative of Z(x) with respect to $\underline{B}$ and then putting $\underline{B}$ equal to one and e(x) is equal to Zs(x)-g(x).

If B is close to one, as in most applications, the second term on the right-hand side of equation (ix) would be negligible and A becomes the sole constant term of the equation. The standard values of g(x) and e(x) are given in Table 5.8a below.

Similarly, if we define Z(i) as $-\log(-\log(\frac{P(i)}{P(i+5)})$ and using exactly the same arguments and justifications as in the preceding paragraphs we can rewrite equations (vii) to (ix) by merely replacing x by i, and standard values for g(i) and e(i) are given in Table 5.8b.

Table 5.8a

Standard e(x), g(x) and Ys(x) values for Current Fertility (with a half year shift)

Age x	e(x)	g(x)	Ys(x)
10-14	-	-	-1.8444
15-19	1.3364	-1.4501	-0.7712
20-24	1.4184	-0.7430	-0.0410
25-29	1.2978	-0.0382	0.6294
30-34	0.9670	0.8356	1.3897
35-39	0.4509	2.1649	2.4736
40-44	0.0462	4.4564	4.4984
45-49	-	-	9.3416

Source: Brass(1981)

Table 5.8b

Standard e(i), g(i) and Ys(i) values for Parity Data

age x	i	e(i)	g(i)	Ys(i)
15-19	1	1.2897	-1.7438	-1.0787
20-24	2	1.4252	-1.0157	-0.3119
25-29	3	1.3725	-0.3353	0.3538
30-34	4	1.1421	0.4391	1.0569
35-39	5	0.7061	1.5117	1.9534
40-44	6	0.2763	3.2105	3.4130
45-49	7	-	-	6.0557

Source: Brass(1981)

The relational Gompertz model has been employed for three reasons. Firstly, to estimate TFR from both current and lifetime fertility data. Secondly, to ascertain any possible trend in the fertility as reflected in the pattern of the points observed using the graphic methods. Thirdly, to derive a plausible age pattern of fertility. (The first aim is handled in this section whilst the second and third objectives are examined in section 5.5 and 5.6 respectively).

The graphs of Z(x)-e(x) against g(x) and Z(i)-e(i) against g(i) are shown in Figures 5.16 to 5.19. Since the graphs for the various sub-divisions (regions, districts and rural-urban) are similar, only the national figures have been presented. The points for the first four age groups (15-19, 20-24, 25-29, 30-34) can be considered to lie on a straight line. Therefore the values for the parameters $\underline{A}$ and $\underline{B}$ were calculated from these age groups (using group average method). These are given in Table 5.9 below.

The calculated values of _A_ and _B_ are close to the central values of zero and one respectively indicating that childbearing occurs at an early age with about half of it occurring by the age of 27 as in the standard. This also suggests that not only does marriage occur early in life but also that childbearing takes place over a wider age range as is the case with populations experiencing natural fertility[2].

2 See appendix VI for the applicability of this assumption.

Fig 5.16 Comparing CEB and ASFR using GRM for Malawi (total): 1972

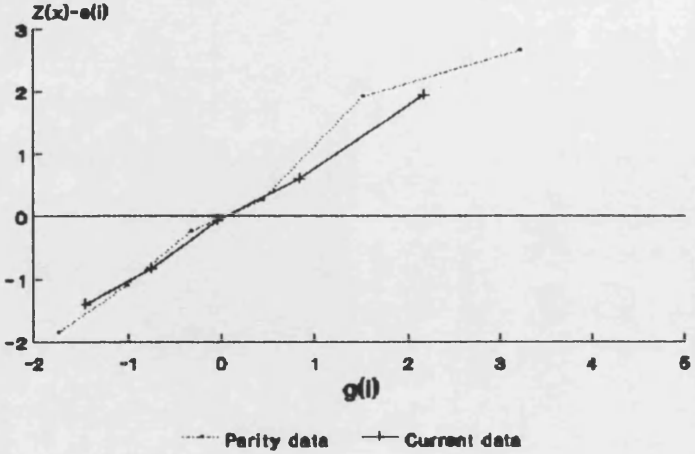


Fig 5.17 Comparing CEB and ASFR using GRM for Malawi (total): 1977

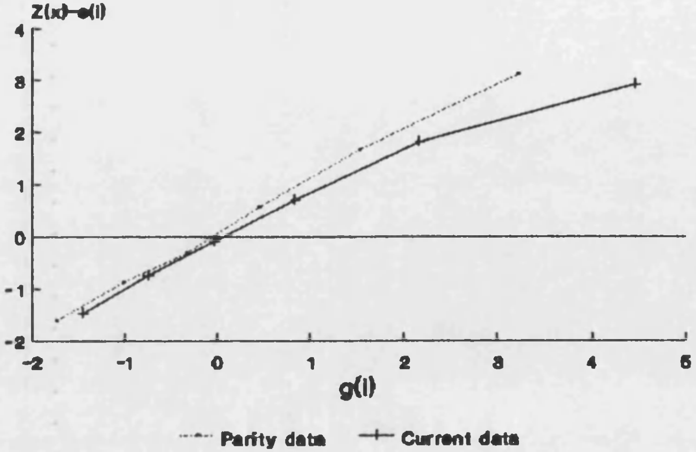


Fig 5.18 Comparing CEB and ASFR using GRM for Malawi (total): 1982

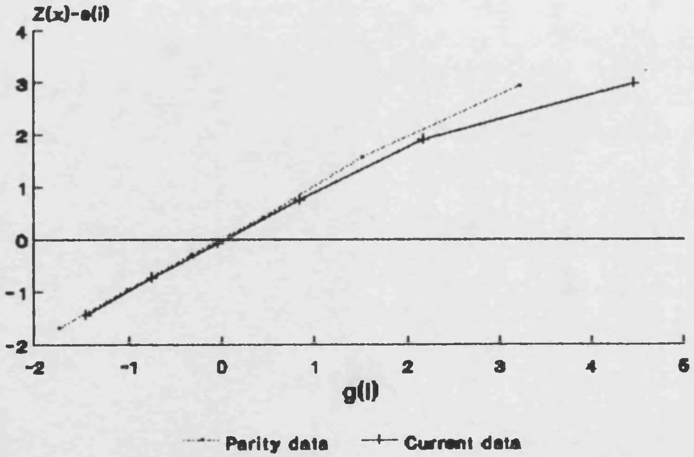


Fig 5.19 Comparing CEB and ASFR using GRM for Malawi (total): 1984

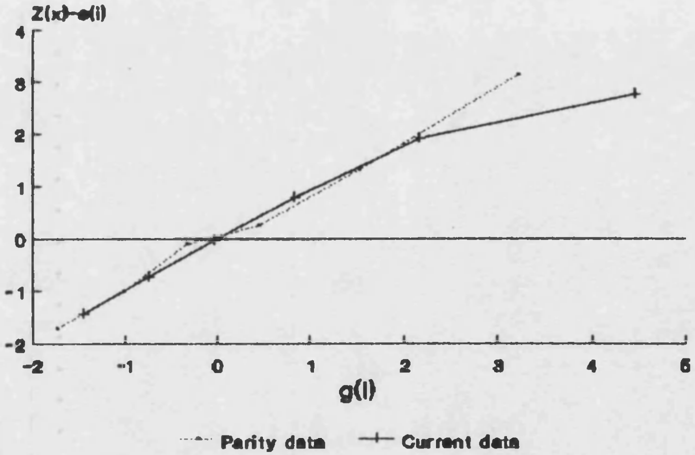


Fig 5.20 Comparing CEB and ASFR using GRM for Malawi (Rural): 1972

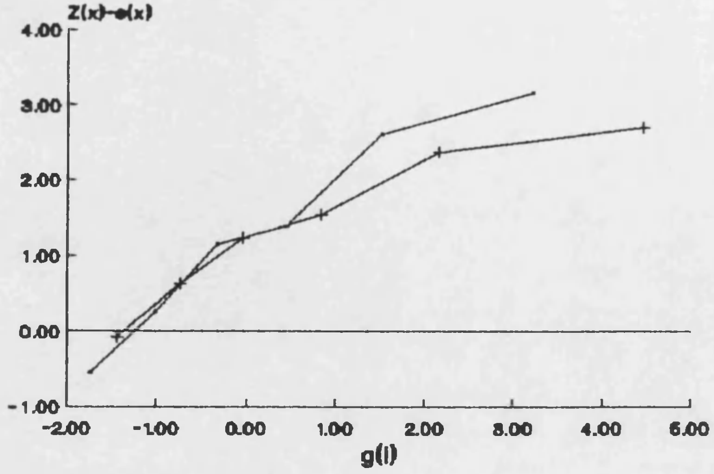


Fig 5.21 Comparing CEB and ASFR using GRM for Malawi (Rural): 1977

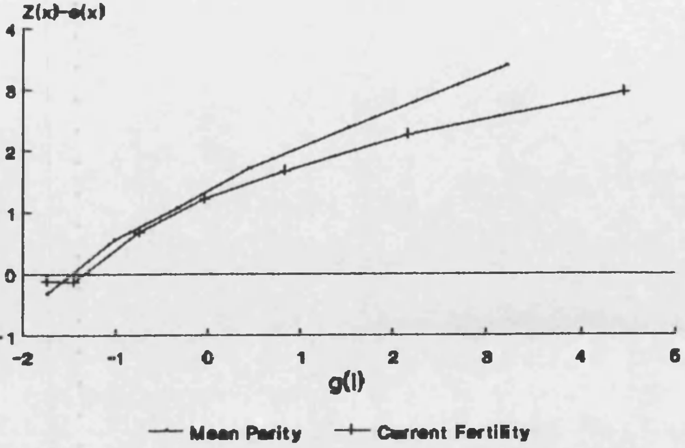


Fig 5.22 Comparing CEB and ASFR using GRM for Malawi (Rural): 1982

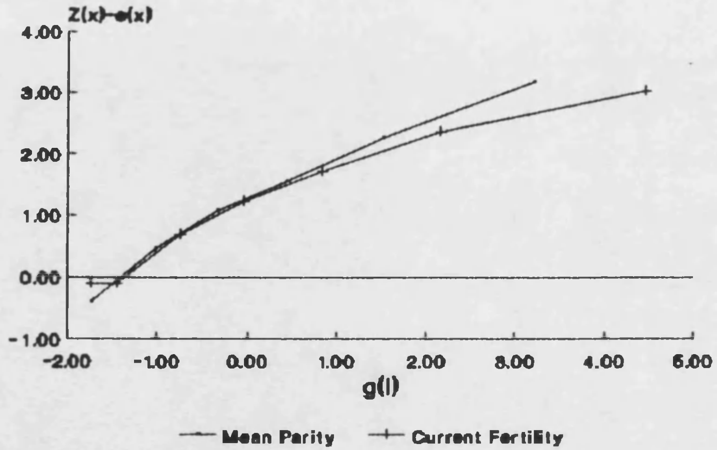


Fig 5.23 Comparing CEB and ASFR using GRM for Malawi (Rural): 1984

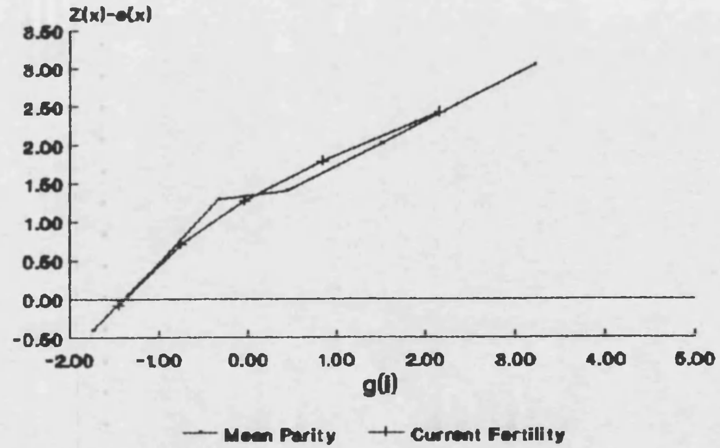


Fig 5.24 Comparing CEB and ASFR using GRM for Malawi (urban): 1972

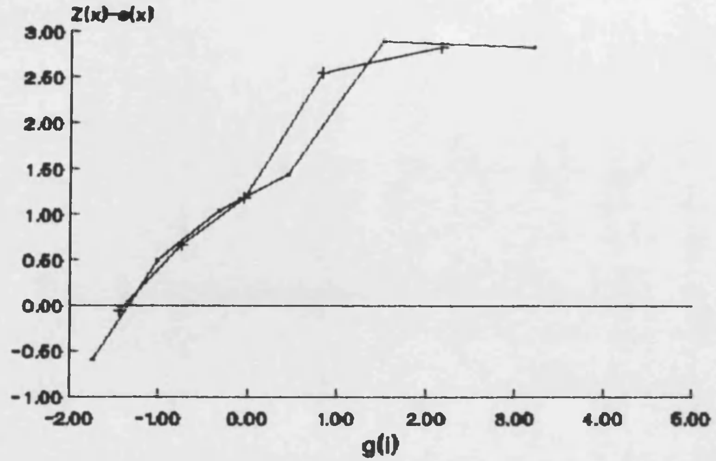


Fig 5.25 Comparing CEB and ASFR using for Malawi (urban): 1977

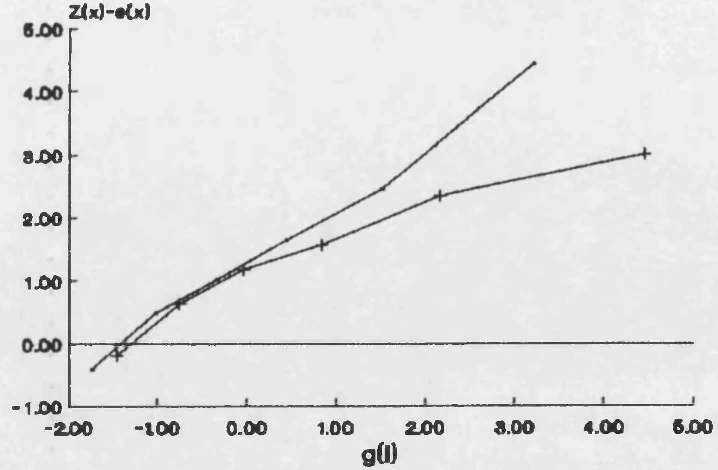


Fig 5.26 Comparing CEB and ASFR using GRM for Malawi (urban): 1982

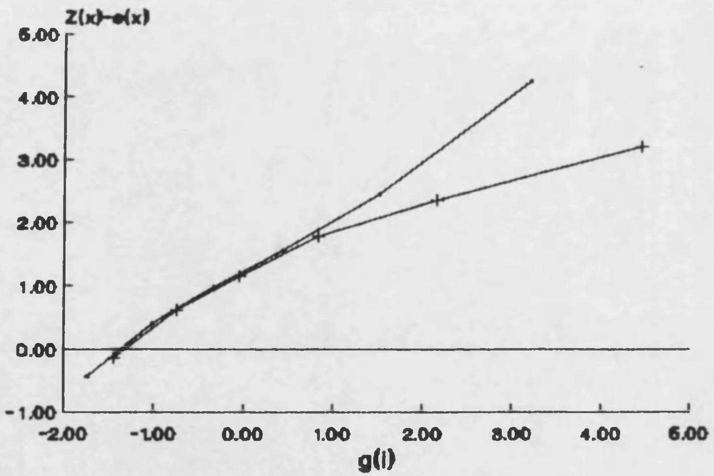


Fig 5.27 Comparing CEB and ASFR using GRM for Malawi (urban): 1984

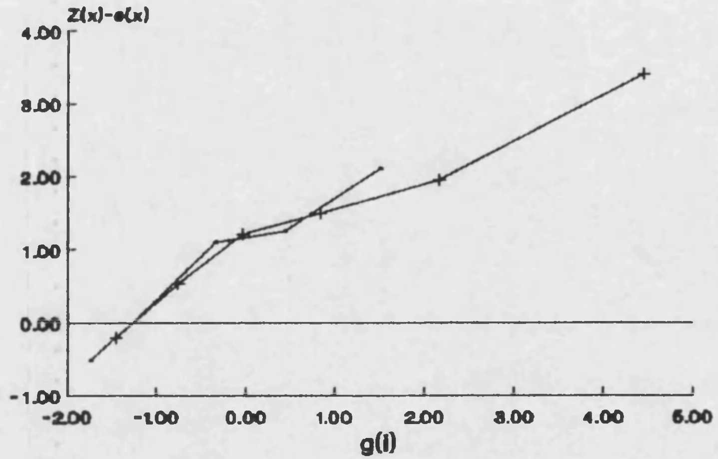


Fig 5.29 Comparing CEB and ASFR using GRM for Nothern Region (1977)

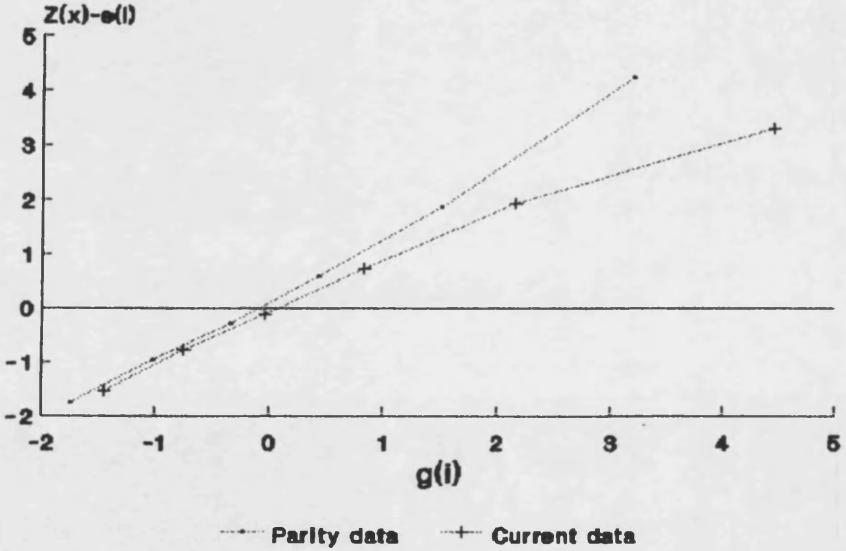


Fig 5.30 Comparing CEB and ASFR using GRM for Central Region (1977)

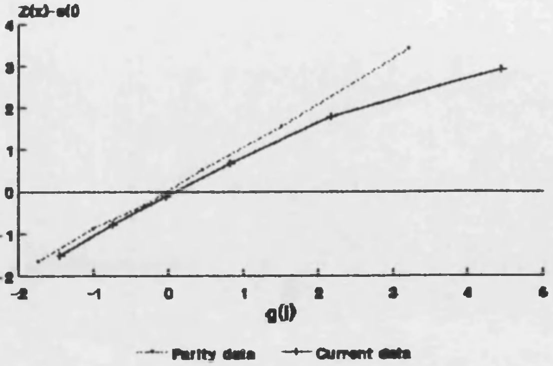


Fig 5.31 Comparing CEB and ASFR using GRM for Southern Region (1977)

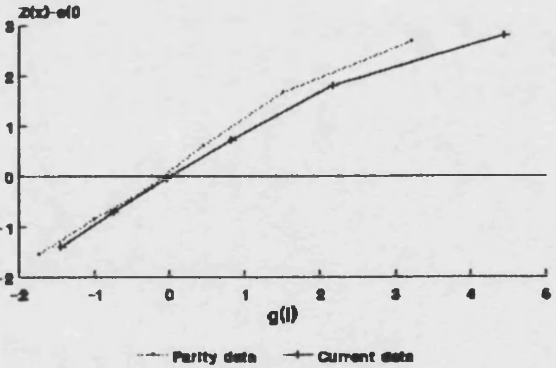


Table 5.9a

Parameters obtained from the Gompertz Relational Model: Malawi, regions and District - 1977

	Mean Parity		Current Fertility	
	A	B	A	B
MALAWI	0.068	0.956	-0.072	0.941
Northern Region	0.097	1.050	-0.092	0.974
Chitipa	1.075	0.166	0.968	-0.105
Karonga	1.007	0.136	0.978	-0.020
Nkhata Bay	1.073	0.192	0.944	-0.059
Rumphi	1.073	0.001	0.983	-0.186
Mzimba	1.063	0.103	0.983	-0.100
Central Region	0.036	0.953	-0.112	0.947
Kasungu	0.950	0.018	0.920	-0.118
Nkhota Kota	0.987	0.187	0.941	-0.053
Ntchisi	0.937	0.049	0.939	-0.119
Dowa	1.016	0.066	0.967	-0.123
Salima	0.925	0.054	0.941	-0.068
Lilongwe	0.953	0.025	0.954	-0.085
Mchinji	0.948	0.035	0.905	-0.143
Dedza	0.899	0.047	0.938	-0.093
Ntcheu	0.979	0.016	0.962	-0.105
Southern Region	0.106	0.949	-0.039	0.932
Mangochi	0.951	0.249	0.906	0.013
Machinga	0.907	0.117	0.912	-0.017
Zomba	0.703	0.140	0.953	0.030
Chiradzulu	0.999	0.106	0.968	-0.036
Blantyre	0.974	0.064	0.931	-0.069
Mwanza	1.010	0.035	0.987	-0.108
Thyolo	0.938	0.069	0.917	-0.053
Mulanje	0.910	0.064	0.904	-0.041
Chikwawa	0.993	0.116	0.910	-0.056
Nsanje	0.974	0.128	0.952	-0.021

Table 5.9b

Parameters obtained from the Gompertz Relational Model: Malawi, Rural and Urban

		Mean Parity A	Mean Parity B	Current Fertility A	Current Fertility B
Total	1972	-0.047	1.040	-0.105	0.924
	1982	-0.001	0.965	-0.047	0.952
	1984	0.015	0.999	-0.014	0.974
Rural	1972	-0.042	1.057	-0.118	0.929
	1977	0.075	0.956	-0.070	0.939
	1982	0.005	0.966	-0.044	0.950
	1984	0.037	1.001	0.007	0.977
Urban	1972	-0.071	0.968	-0.062	0.925
	1977	0.020	0.971	-0.111	0.953
	1982	-0.041	0.965	-0.060	0.978
	1984	-0.132	0.976	-0.165	0.955

Comparing the A and B values calculated from current fertility and mean parity data, one notices that in the majority of the cases the latter is less than the former. In terms of fertility, this means that current fertility implies a slightly older pattern of fertility than retrospective data. This could be attributed to the occurrence of age miss-statements which, as observed earlier, tends to push women towards the middle of childbearing. However one would normally expect that age mis-statement would affect both the current and parity data and no sufficient reason can be provided as to why current fertility should be more affected than mean parity data.

Using the fitted values of A and B and the standard Ys(x) and Ys(i) values for each age group TFR was estimated as follows:

$$TFR(x) = \frac{F(x)}{F*(x)} \qquad TFR(i) = \frac{P(i)}{P*(i)} \qquad \text{where}$$

$$F*(x) = \exp-(\exp-(\underline{A}+\underline{B}Ys(x))) \text{ and}$$

$$P*(i) = \exp-(\exp-(\underline{A}+\underline{B}Ys(i)))$$

Since age group 15-19 is sensitive to age misreporting and random variations and the analysis in the previous sections have noted the tendency to omit children after age group 30-34, age groups 15-19, 35-39, 40-44 and 45-49 were excluded from further analysis. The estimates for age groups 20-24, 25-29 and 30-34 were then averaged and the results of this exercise are presented in columns (1) and (2) of Table 5.10.

With the exception of the districts of Chitipa, Nkhata Bay, Rumphi, Nkhota Kota and Ntchisi in 1977, 1972 rural and the 1984 FFS, the estimates based on mean parity are slightly higher than the estimates based on current fertility. This could be attributed to underreporting of current births by women as noted above. Although in such situations the average of the two estimates would be preferred, the larger of the two was taken to represent the level of fertility as calculated from this method (see column (3) of Table 5.10). This scheme was followed since fertility in Malawi is believed to be high.

The ratio of the two estimates were calculated to "capture" the extent to which the current fertility was under-reported (or over-reported). These are given in column (4) of Table 5.10 below. The ratios suggest that current fertility is in general understated throughout the country apart from Ntchisi, Chitipa, Rumphi, Nkhata Bay and Nkhota Kota which overstated fertility by 32 percent, 17 percent, 4 percent, 3 percent and 2 percent respectively. In 1972 the rural population overstated their level of fertility by about 9 percent whereas in the 1984 FFS fertility was overstated by 8 percent.

According to this method, the urban population in 1972 understated fertility. This observation contradicts the earlier finding based on Brass P/F method which showed that the reported level of fertility was overstated in 1972. This may be due to errors in the data although differences in the estimation procedures might have contributed something.

Table 5.10a

Fertility Estimates Calculated using Gompertz Relational Model: Malawi, Regions and Districts -1977

	(1)	(2)	(3)	(4)=(1)/(2)
Malawi	6.13	7.00	7.00	0.876
Northern Region	6.38	7.24	7.24	0.882
Chitipa	6.36	5.42	6.36	1.173
Karonga	6.56	6.78	6.78	0.970
Nkhata Bay	6.34	6.17	6.34	1.028
Rumphi	7.22	6.93	7.22	1.041
Mzimba	6.66	6.92	6.92	0.962
Central Region	6.81	7.60	7.60	0.897
Kasungu	7.38	7.93	7.93	0.931
Nkhota Kota	6.85	6.76	6.85	1.015
Ntchisi	6.65	5.01	6.65	1.327
Dowa	7.89	7.99	7.99	0.987
Salima	6.55	7.02	7.02	0.932
Lilongwe	6.91	7.44	7.44	0.929
Mchinji	7.56	7.85	7.85	0.963
Dedza	6.72	7.12	7.12	0.945
Ntcheu	6.55	7.14	7.14	0.918
Southern Region	5.54	6.50	6.50	0.852
Mangochi	4.99	5.77	5.77	0.864
Machinga	5.69	6.55	6.55	0.869
Zomba	5.36	6.55	6.55	0.819
Chiradzulu	5.90	6.23	6.23	0.947
Blantyre	5.78	6.47	6.47	0.893
Mwanza	6.30	6.97	6.97	0.904
Thyolo	6.71	6.85	6.85	0.980
Mulanje	6.19	6.65	6.65	0.932
Chikwawa	5.63	6.83	6.83	0.825
Nsanje	6.47	6.89	6.89	0.940

Source: calculated by author.

Notes (1) fertility estimates based on current fertility data using GLM.
(2) fertility estimates based on mean parity data using GLM.
(3) plausible estimates of fertility

Table 5.10b

Fertility Estimates Calculated using Gompertz Relational Model: Malawi, Rural-Urban

		(1)	(2)	(3)	(4)
	1972	6.32	6.95	6.95	0.909
TOTAL	1977	6.13	7.00	7.00	0.876
	1982	6.15	7.41	7.41	0.830
	1984	7.25	6.70	7.25	1.081
	1972	7.48	6.84	7.48	1.094
RURAL	1977	6.11	7.01	7.01	0.871
	1982	5.83	7.42	7.42	0.786
	1984	6.54	6.53	6.54	1.001
	1972	6.16	7.26	7.26	0.848
URBAN	1977	6.15	6.75	6.75	0.911
	1982	6.18	7.27	7.27	0.850
	1984	7.36	7.19	7.36	1.024

Source and Notes: see preceding table.

5.4.3.4 Stable Population Model

As noted earlier, fertility plays a greater role in determining the age structure of the population. Moreover, presently, Malawi has no definite propositions to control fertility, and organized family planning remains to be implemented. As a move towards this direction in 1982, a child spacing programme was initiated and by 1985 the first "pilot" clinics were established in selected areas. The aim of the programme is not to regulate fertility although, indirectly, fertility will be affected. To date, however, the programme's major problem appears to be the widespread lack of acceptability as the people are suspicious with its aims (apparently the people regard the programme as a means of birth control or family planning, which they vigorously reject because not only does it contradict the established norm of having large families but also they don0t understand why they should restrict the numbers of the children they should have when most of them are going to die). Therefore, there seem to be sufficient reasons to believe that over the period covered by this study the observed fertility was not affected by contraception (or child spacing programme) and thus fertility could be said to be natural (see appendix VI).

Furthermore, the preceding chapter on mortality has demonstrated that the pace of decline in mortality is very slow. This suggests that the assumption of constant decline in mortality is applicable to Malawi. Hence, the population of Malawi can be said to be quasi-stable.

The only condition of stability which may not be completely satisfied is that of a "closed" population. As pointed out in previous chapters, a substantial proportion of Malawian men (used to) leave the country in search of better employment opportunities existing in the neighbouring countries. The female population is however less affected by migration and the examination of the reported age distribution revealed more or less the same percent distribution for the female population in both censuses. This observation may be taken as indicating not only the absence of mass female migration but also that the female population can be said to be "stable" or almost "near stable".

In situations such as those existing in Malawi, where insufficient knowledge exist on demographic parameters, including fertility and where a vital registration system is non-existent and is likely to remain so for sometime, estimates of fertility based on the reported age distributions obtained from censuses and surveys have been used to indicate the levels, trends and differentials in fertility, so long as care is taken to allow for the effects of mortality and age mis-statements3.

Several measures of fertility have been proposed some of which are, the ratios of children to their parents - Child Adult Ratios (CAR) and a refined CAR ratio relating children to their mothers - Child Woman Ratios (CWR). In countries like Malawi where more males than females are deemed to be involved in labour migration, only ratios that make use of the female population can be preferred, since they are less likely to be distorted by migration.

Generally speaking, the data for both children and women are less likely to be distorted by age mis-statement. In the case of the children this could be ascribed to the fact that the events (birth) took place in the recent past - say the last five years for children in the age group 0-4, or the last 10 years for those in the age group 5-9. In either case, and in all the data sources utilized in this study, these events occurred at a time of great historical changes, that it seems likely that the respondent could either easily remember when a

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3 See for example Mitchell(1964) and Caldwell(1967).

particular event took place (year or date of birth) or are likely to do so with proper probing during the interview. Indeed, it is somehow reassuring to note that even in 1921 J.C Abraham, the Census Superintendent, observed that:

> as regards the division of 5 years and under although native parents have no means of telling exact ages of their children, they can probably be relied on to remember that period of time with some degree of accuracy ... (NG,1921,p.x)

Since women in childbearing age groups show a tendency to cluster around the centre of the child bearing period, it can be rightly assumed that, subject to the limits imposed by the general understatement or omission of the census and survey figures, the total number reported as belonging to age range (15-49) is correct.

Two methods of estimating TFR based on the reported CAR were applied to the Malawi data and each will be examined in turn.

Rele Method

Rele(1967) developed a method of estimating fertility (GRR) from the reported CWR. It is based on the finding that in a stable population the relationship between GRR and CWR, can be approximated by a linear equation. That is

$$GRR = a + b\ CWR \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (x)$$

where a, b are constants and GRR and CWR are as defined above.

Using thirty six stable populations, generated from United Nations(1955) model life tables, Rele has presented regression coefficients for the equation and for each level of mortality as defined by e(0) ranging from 20 to 60 years in multiples of 10.

The method was tested for its validity using data from the developed countries where it was possible to compare fertility estimates derived from this method with measures obtained from the vital registration system. It was then applied to Latin American countries where the estimates were found to be consistent with those obtained from other indirect procedures. Since then Rele(1987, 1988) has further demonstrated the applicability and relevance of the method by using data from the Asian section of the developing countries and subsequent studies by other researchers have further confirmed that the method produces acceptable estimates (El-Shalakan,1989; Mhloyi and Mazur,n.d).

In theory the estimated level of mortality should refer to the period when the children were born. In practice this creates some problems especially in statistically underdeveloped countries like Malawi where mortality statistics are far from being complete and our knowledge about the level is just as minimal as that of fertility.

Another problem arises from the fact that the method is based on the original UN model stable population which have since been superseded by more robust models - Coale and Demeny(1966, 1983), Brass(1971), United Nations1982). But the analysis in chapter IV on mortality has demonstrated that in so far as the available demographic data in Malawi is concerned the difference between the various stable population models is both negligible and trivial. This implies that, if properly utilized, the technique might produce plausible estimates of fertility for Malawi.

The method has several advantages. First and foremost, it is simple to use and less demanding in terms of data and parameters since the level of mortality can be specified to the nearest multiple of ten.

Another attractive aspect of the method, especially as regards to the Malawian situation, lies in the fact that Rele attempted to choose "indices which makes the assumption of quasi-stability less crucial in the estimation procedure" (Rele,1967) and, as he later concluded, he managed to come up with a procedure which give rise to plausible estimates in populations which are "far from stable":

> though the basic ideas for the present approach have been taken from stable population concepts, with a few modifications it has been possible to develop a method which can be utilized to estimate fertility within a reasonable degree of accuracy for populations which are far from stable or quasi-stable. ... [Although] one would expect that better results could be obtained with this method for populations which are close to stable or quasi-stable than for other populations.
> (Rele,1967,p.40).

The method is also relevant for developing countries with a long series of censuses and surveys of acceptable quality in that it allows one to obtain fertility measures for two different periods in the past. This stems from the fact that children aged 0-4 years were born in the last five years whereas those aged 5-9 years were born 5-10 years before the enumeration. It follows then that on average the estimated TFR calculated from these age groups refers to the respective periods 2.5 and 7.5 years preceding the enumeration. Therefore, in countries where fertility data is lacking and the reported age statistics are reasonably good, the method provides an ingenious way of measuring any changes in fertility during the last eight years or so. But in view of the nature of the reported statistics in Malawi this approach is not attempted here. Moreover if the censuses and surveys are available at five (or ten) years interval the calculated CWR from one survey can be compared with corresponding CWR calculated from another survey. This may be useful in determining the quality of data and the robustness of the derived estimates (Rele 1987, 1988).

The CWR can be calculated in various ways (see Table 5.11a) but CWR derived from children aged 0-4 and women aged 15-49 was found to be closer to linearity than CWR based on children aged 0-4 and women aged 15-44 years (Rele,1967). Consequently the use of the former is recommended, unless children under the age of 5 are severely under-enumerated, in which case the CWR calculated using children aged 5-9 and women aged 20-54 is recommended. The CWR for the two censuses and three surveys are presented in Table 5.11.

Table 5.11a

Child Woman Ratio: Malawi, Regions and Districts - 1966

	CWR(1)	CWR(2)	CWR(3)	CWR(4)
Malawi	819.3	739.9	745.7	695.6
Northern Region	851.4	764.4	790.9	723.3
Chitipa	935.7	854.2	898.0	832.4
Karonga	766.3	691.6	731.8	670.7
Nkhata Bay	818.3	712.5	780.9	702.9
Rumphi	811.7	737.9	805.7	732.0
Mzimba	879.4	791.3	786.4	721.4
Central Region	844.0	764.2	734.8	689.1
Kasungu	853.8	769.9	786.3	729.4
Nkhota Kota	839.5	741.8	672.7	619.1
Ntchisi	871.7	795.1	760.4	710.0
Dowa	896.1	810.7	742.9	701.2
Salima	738.6	666.1	633.4	597.3
Lilongwe	845.2	767.8	699.2	663.8
Mchinji	906.6	829.6	921.0	864.8
Dedza	837.2	759.5	749.1	706.3
Ntcheu	807.3	726.5	775.5	698.4
Southern Region	794.3	717.0	743.2	693.7
Mangochi	761.6	668.1	682.2	639.7
Machinga	770.1	690.7	740.1	688.2
Zomba	758.2	688.8	781.9	722.9
Chiradzulu	788.7	718.8	798.4	728.6
Blantyre	802.1	741.6	748.5	703.4
Thyolo	869.5	793.3	783.7	738.1
Mulanje	809.0	728.9	766.6	714.7
Chikwawa	773.9	701.6	660.8	624.7
Nsanje	815.9	712.5	673.7	629.3

Source: calculated from appropriate census reports.

Notes: (i) CWR(1), CWR(2) = the ratio of children aged under five to women aged 15-44, 15-49 years, respectively.
(ii) CWR(3), CWR(4) = the ratio of children aged 5-9 years to women aged 20-49, 20-54 years, respectively.

Table 5.11b

Child Woman Ratio : Malawi, Regions and Districts: 1977

	CWR(1)	CWR(2)	CWR(3)	CWR(4)
Malawi	913.4	833.5	812.5	752.4
Northern Region	892.2	813.5	884.0	809.4
Chitipa	932.7	852.1	1069.1	986.0
Karonga	866.7	789.8	835.3	775.5
Nkhata Bay	890.9	802.0	899.1	816.6
Rumphi	913.1	831.5	925.6	844.1
Mzimba	888.6	813.7	847.0	772.9
Central Region	960.1	878.3	801.6	745.2
Kasungu	941.6	873.7	813.4	760.5
Nkhota Kota	979.8	890.6	828.2	766.2
Ntchisi	972.1	893.6	800.2	742.2
Dowa	988.5	901.7	809.4	752.7
Salima	938.8	851.2	775.5	716.4
Lilongwe	957.2	880.6	779.3	730.6
Mchinji	991.9	917.6	893.9	836.8
Dedza	981.0	891.5	804.0	739.8
Ntcheu	895.6	804.1	797.6	731.0
Southern Region	882.8	804.2	805.1	745.3
Mangochi	841.3	762.4	770.8	710.3
Machinga	885.0	798.2	808.5	714.1
Zomba	819.5	745.2	757.5	700.4
Chiradzulu	818.4	745.3	769.7	709.7
Blantyre	878.0	820.7	805.3	758.5
Mwanza	899.6	823.2	857.8	792.6
Thyolo	938.2	857.9	862.0	802.0
Mulanje	909.5	825.8	802.4	741.0
Chikwawa	932.1	842.9	850.0	787.6
Nsanje	961.2	855.4	848.4	771.2

Source and Notes: see Table 5.11a above.

Table 5.11c

CWR for Malawi, Rural and Urban (1966, 1972, 1977, 1982 and 1984)

		CWR(1)	CWR(2)	CWR(3)	CWR(4)
	1966	819.3	739.9	745.7	695.6
	1972	716.2	658.9	699.8	640.4
	1977	913.4	833.5	812.5	752.4
TOTAL	1982	924.6	855.5	919.7	846.1
	1984	929.8	862.1	990.0	883.7
	1966	819.3	738.3	749.6	698.2
	1972	701.0	642.3	659.6	600.9
RURAL	1977	915.0	831.9	815.8	753.3
	1982	925.8	853.3	921.8	844.2
	1984	929.3	857.4	994.5	881.8
	1966	819.4	776.0	660.6	636.4
	1972	863.1	827.6	831.8	795.7
URBAN	1977	896.7	852.1	773.4	742.0
	1982	912.7	876.6	898.1	866.9
	1984	934.0	897.7	954.0	899.7

Source: see Table 5.11a above.

From the calculated CWR several tentative points regarding fertility levels and differentials in Malawi can be suggested. Firstly, the ratios indicate that the level of fertility in the country is very high. Secondly, they seem to suggest marked inter- and intra-regional differentials in fertility. For instance, fertility can be said to be low in the Southern region with such districts as Mangochi, Machinga and Zomba showing the lowest levels of fertility in the region. On other hand, the CWR for Northern and Central Regions suggest quite high but similar levels of fertility, and the implied fertility is highest in the districts of Chitipa, Mchinji, Dowa, Ntchisi, Kasungu and Mzimba, just to mention a few.

Generally speaking, the CWR is not a very satisfactory measure for comparing fertility levels of the various regions and districts. For instance, the Southern Region being the most urbanized region in the country, and the districts of Blantyre, Lilongwe, Mzimba and Zomba containing the four major urban localities, are likely to be characterized by a lower level of infant and child mortality, and by a greater proportion of the younger and more fertile women in the adult female population due to the selective effects of rural-urban migration. However, the small difference observed between the rural and urban areas suggest the absence of rural-urban differentials in terms of fertility behaviour. Thus it can be argued that migration have a negligible effect on the reported CWR. The effect of the other distorting factor - mortality - will be eliminated through the application of the technique.

To obtain fertility measures using Rele procedure the following steps were followed:

(a) looking at each e(0) estimate for Malawi as a whole; region, district, rural and urban areas (Table 5.12), "lower" and "upper" bounds within which the estimate lies were determined;

(b) GRR and TFR were then calculated using equation (x) above for both the "lower" and "upper" bounds;

(c) by linearly interpolating between the estimates obtained in step (b) the desired estimate was obtained;

(d) the difference between fertility estimates calculated from the CWR having the same numerator was observed to be small, and hence the two values were averaged and the results from this exercise are presented in Table 5.12.

The calculated estimates seem plausible and are comparable to other estimates prepared by the UN (Ross, et.al.,1989).

According to this procedure, TFR was 6.7 children per woman in the mid sixties rising to 7.1 children per woman in the early seventies, and to 7.4 children per woman in the late seventies. Estimates derived from the 1970/72 MPCS are suspiciously low and do not agree with the estimates from the other sources. In the absence of any explanation, this was attributed to errors in the data, particularly age mis-reporting as the analysis of the reported age distribution revealed that the 1970/72 MPCS had a distinctive pattern of age mis-reporting.

Table 5.12

Fertility Estimates Obtained by using Rele Method: Malawi, Regions, districts, Rural and Urban

	1966	1977
Malawi	6.66	7.07
Northern Region	6.67	7.00
Chitipa	7.31	7.77
Karonga	6.16	6.78
Nkhata Bay	6.33	6.94
Rumphi	6.44	7.12
Mzimba	6.89	6.93
Central Region	6.77	7.27
Kasungu	7.01	7.27
Nkhota Kota	6.35	7.38
Ntchisi	7.20	7.46
Dowa	7.20	7.55
Salima	6.02	7.17
Lilongwe	6.47	7.00
Mchinji	7.74	7.68
Dedza	6.81	7.33
Ntcheu	6.61	6.82
Southern Region	6.41	6.76
Mangochi	6.08	6.56
Machinga	6.38	6.81
Zomba	6.44	6.33
Chiradzulu	6.55	6.32
Blantyre	6.24	6.61
Mwanza		7.01
Thyolo	6.81	7.14
Mulanje	6.54	6.82
Chikwawa	6.17	7.35
Nsanje	6.28	7.34

		Total	Rural	Urban
	1966	6.66	5.98	6.71
	1972	5.83	5.61	6.75
Total	1977	7.07	7.12	6.56
	1982	7.42	7.47	7.31
	1984	7.48	7.53	6.99

Carrier and Hobcraft method

The basis of this method is the derivation of the CAR calculated by dividing the population under 15 by the adult population aged between 15-44 years. From this, the Mean Reproduction Rate (MRR), can be calculated by using the following formulae:

$$MRR = CAR(1.64 + 0.8\ CAR) \quad \ldots\ldots\ldots\ldots \quad (i)$$

where CAR and MRR are as defined above.

By using the proportion surviving to age 2, 12, obtained from mortality estimates, GRR and TFR can be calculated as follows:

$$GRR = MRR \,/\, 12 \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (ii)$$

$$TFR = GRR (1 + SEX\ RATIO) \quad \ldots\ldots\ldots \quad (iii)$$

The method has two advantages over Rele's technique. Firstly, the fact that Carrier and Hobcraft method employs a broader age range (age group 0-14) as opposed to Rele method which uses age group 0-4 implies that the effect of age distortions on the final estimates are minimized. Secondly, the technique can be applied to data of both sexes or the two sexes separately as long as both the numerator and denominator refer to the same sex. This is a further advantage in that it permits us to use the CAR, calculated from the female population only. The calculated CAR and MRR are given in Table 5.14.

To obtain GRR from MRR we need to have the proportion surviving to age 2 (12). These were obtained from childhood mortality (see chapter IV section 4.4 above). As noted in that section only 1982 MDS and 1984 FFS allow the estimation of childhood mortality by sex.

This means that for the 1970-72 MPCS and the 1977 MPC 12 for females, denoted l(2,f) had to be estimated using a procedure discussed in section 4.7 of Chapter IV.

Another problem that emerged was to provide "acceptable" estimate of l(2,f) for the 1966 MPC. As noted above, data from which mortality estimates can be calculated were not collected in the 1966 census. Therefore l(2,f) for the 1966 had to be "estimated" from other "sources". In the first scenario it was assumed that the same l(2,f) as obtained in the 1977 census was applicable to the 1966 census. This is the same as assuming that mortality has remained constant during the inter-censal period, an assumption which, according to the analysis presented in chapter IV above and experience from other developing countries, is not wholly appropriate. However given that the rate of mortality decline slowed down and slightly worsened in the mid seventies, it may be argued that the level of mortality was the same for the two periods. This is particularly true for the childhood mortality and thus the l(2,f) estimates for the two periods may not differ very much. The second scenario was to accept the old UN assumption that in population with e(0) less than 45, e(0) changes by 2.5 years every five years. In terms of the MLTs this is similar to the shift from one level to another. Accepting that e(0) in 1977 was 38 years then the value for 1967 was 33 years. Using the estimated e(0) value for 1970-72 the implied value for 1966 would be 34 years. Similarly using MLT obtained from Carrier and

Hobcraft(1971) the implied l(2,f) values were obtained.

The fertility measures derived from this method are given in Table 5.14 below. The estimates obtained appear plausible and are comparable to those obtained from Rele's procedure. One major exception should however be noted. The TFR estimate for the 1984 FFS is suspiciously/credibly high. This could be attributed to errors in the data especially age mis-reporting.

Table 5.13

CAR, MRR, GRR and TFR calculated using Carrier-Hobcraft Method - 1966

	CAR	MRR	GRR	TFR
Malawi	0.981	2.38	3.17	6.44
Northern Region	1.050	2.60	3.36	6.81
Chitipa	1.133	2.88	3.57	7.25
Karonga	0.977	2.36	3.05	6.19
Nkhata Bay	1.051	2.61	3.24	6.58
Rumphi	1.061	2.64	3.24	6.58
Mzimba	1.052	2.61	3.01	6.10
Central Region	0.993	2.42	3.38	6.86
Kasungu	1.042	2.58	3.29	6.68
Nkhota Kota	0.942	2.25	2.82	5.73
Ntchisi	1.028	2.53	3.45	7.00
Dowa	1.017	2.50	3.37	6.84
Salima	0.861	2.01	2.61	5.30
Lilongwe	0.971	2.35	3.01	6.11
Mchinji	1.124	2.86	3.72	7.55
Dedza	0.991	2.41	3.14	6.37
Ntcheu	1.022	2.51	3.06	6.22
Southern Region	0.956	2.30	2.98	6.05
Mangochi	0.871	2.04	2.48	5.04
Machinga	0.925	2.20	2.71	5.50
Zomba	0.956	2.30	2.79	5.67
Chiradzulu	1.003	2.45	3.03	6.16
Blantyre	0.960	2.31	2.75	5.58
Thyolo	1.023	2.52	3.13	6.36
Mulanje	0.985	2.39	2.94	5.97
Chikwawa	0.910	2.15	2.57	5.22
Nsanje	0.963	2.32	2.94	5.96

Table 5.14

CAR, MRR, GRR and TFR calculated using Carrier-Hobcraft Method - 1977

	CAR	MRR	GRR	TFR
Malawi	1.053	2.61	3.49	7.08
Northern Region	1.100	2.77	3.57	7.25
Chitipa	1.238	3.26	4.03	8.18
Karonga	1.051	2.61	3.36	6.82
Nkhata Bay	1.116	2.83	3.52	7.14
Rumphi	1.163	2.99	3.67	7.46
Mzimba	1.068	2.66	3.07	6.22
Central Region	1.069	2.67	3.73	7.57
Kasungu	1.048	2.60	3.31	6.72
Nkhota Kota	1.090	2.74	3.43	6.96
Ntchisi	1.071	2.67	3.64	7.39
Dowa	1.090	2.74	3.70	7.51
Salima	1.016	2.49	3.24	6.58
Lilongwe	1.057	2.63	3.37	6.84
Mchinji	1.134	2.89	3.76	7.64
Dedza	1.076	2.69	3.50	7.11
Ntcheu	1.073	2.68	3.27	6.63
Southern Region	1.030	2.54	3.29	6.68
Mangochi	0.951	2.28	2.79	5.65
Machinga	1.013	2.48	3.06	6.21
Zomba	0.974	2.36	2.86	5.81
Chiradzulu	1.013	2.48	3.07	6.23
Blantyre	1.046	2.59	3.08	6.26
Mwanza	1.095	2.76	3.43	6.97
Thyolo	1.102	2.78	3.41	6.93
Mulanje	1.044	2.58	3.09	6.27
Chikwawa	1.058	2.63	3.33	6.75
Nsanje	1.109	2.80	3.28	6.66

Table 5.15

CAR, MRR, GRR and TFR calculated using Carrier-Hobcraft Method - 1977

		CAR	MRR	GRR	TFR
	1966	0.981	2.38	3.17	6.44
	1972	0.751	1.68	2.25	4.56
Total	1977	1.053	2.61	3.56	7.22
	1982	1.131	2.88	3.84	7.80
	1984	1.223	3.20	4.28	8.68
	1972	0.714	1.58	2.42	4.90
Rural	1977	1.055	2.62	3.61	7.32
	1982	1.130	2.87	3.75	7.61
	1984	1.222	3.20	4.14	8.40
	1972	0.842	1.95	2.56	5.20
Urban	1977	1.035	2.55	3.11	6.31
	1982	1.141	2.91	3.44	6.98
	1984	1.235	3.24	3.85	7.82

Note: Although the method was applied correctly and the estimates are plausible for a developing country, the fertility estimates for Malawi as a whole in comparison with those of rural and urban areas display an abnormal pattern. Given that the population of Malawi is predominantly rural it is expected that the GRR and TFR values for the whole country should (i) closely resemble those of rural areas, and (ii) lie between similar values for rural and urban areas. This is not the case in Table 5.15 above. No reason can be suggested to account for these abnormalities. It can only be speculated that the difficulties encountered in estimating the proportion surviving to age 2 for females, l(2,f), and the enormous rural - urban differentials in mortality as seen in chapter IV may partly be responsible for this.

Discussion

In the preceding section some of the leading methods in fertility estimation (Brass,1968, 1981) as well as a number of less well known and presumably forgotten procedures (Brass,1960; Coale and Demeny,1967; Brass,1975; Rele,1967; Carrier-Hobcraft,1971) have been employed in order to derive plausible measures of fertility for Malawi. The application of these procedures was largely influenced by the observation that these methods have been applied in other developing countries. Although the results of this exercise do indicate some success, in the sense that some of the less known techniques (Rele,1967 and Carrier Hobcraft,1971) have given rise to somewhat plausible estimates, it may be worth mentioning that most of the techniques utilized for the purpose of estimating fertility were neither equally efficient in providing the estimates for the different time periods nor was any individual technique efficient over the entire period. The varying requirements and assumptions of the methods, together with the varying nature of the census or survey data are responsible for this predicament. Throughout the analysis, these sources of error were taken into consideration and the estimates presented in the preceding sub-sections are thus probable as long as the methods themselves are relevant.

Several points can be mentioned to illustrate this point. Firstly, all the Brass procedures and the Coale and Demeny formulae could not be applied to the 1966 MPC since the required statistics were not collected.

Secondly, the results obtained from the 1970-72 MPCS, using the stable techniques, were implausibly low. As we shall see in the following paragraphs, this could be attributed to errors in the data. Thirdly, the current and retrospective data in the 1984 FFS were obtained from different questionnaires and thus refers to different populations4. Therefore in order to apply Brass procedures a further simplifying assumption was necessary.

Generally speaking the Brass formulae and the P/F ratio method produced estimates which were higher than those based on the other techniques whereas the polynomial function (Brass,1960) and Coale and Demeny formulae (United Nations,1967) produced very low estimates (in fact the estimated level implied by these methods were very close to the reported level which was demonstrated to have been under-reported). This finding is however expected since these two methods are based on retrospective data which have been found to be greatly affected by omission of children. The estimates based on Rele(1967), Carrier and Hobcraft(1971) and Gompertz relational method fell somewhere in between these two extremes. Since the true level of fertility is believed to be higher than the reported level, the latter being under-reported, it can be recommended that in the process of determining the fertility level in Malawi, the procedures which gave low fertility estimates should be

4 Current fertility data was obtained from the individual questionnaire whereas retrospective fertility came from the household questionnaire.

excluded from further analysis.

Of the remaining techniques, Brass(1968, 1975, 1981), Rele(1967) and Carrier and Hobcraft(1971), it is interesting to note that the estimates obtained from these techniques are close to each other with minor differences here and there. For instance the Rele estimate for the 1972 MPCS (5.6) is lower than the one obtained by the use of GRM (7.5) and the opposite is true in the 1984 FFS. The former giving (7.2) and the latter (6.5).

Furthermore, in most cases, the estimates obtained by "stable techniques" lie between those calculated using Brass P/F method and Relational Gompertz Model. It follows then that, other things being equal, if the last two procedures are averaged as it is sometimes done (see NSO,1984b), or all the acceptable sets are averaged, the resulting "mean" estimates will be moderately close to estimates derived from Rele and Carrier and Hobcraft procedures. If one set of estimates are to be accepted then the measures obtained from the reported age distributions seems appropriate. Of the two methods considered those derived from Carrier and Hobcraft procedure can be preferred5.

Before proceeding further, it must be noted that the stable techniques employed in this study are by no means perfect. They are affected by three types of error: (i) errors resulting from age mis-reporting; (ii) errors

5 An additional advantage of accepting these set of estimates lies in their ability to allow the estimation of fertility for the earlier periods.

arising from the departure from stability; and (iii) errors arising from mortality estimation. In Malawi, like elsewhere in developing countries, the knowledge of the level of mortality is scanty and just like with fertility it has to be estimated. This was done in the previous chapter. In Malawi, instability can take place as a result of labour migration. However, it has been argued that the female population is least affected by migration. This observation is likely to be a reasonable assumption for the national population and a hazardous one for such sub-populations as the regional and urban populations. As a result of this much faith can be placed on Carrier and Hobcraft method as opposed to Rele procedure. In this study, therefore, we shall use estimates obtained from Carrier and Hobcraft technique. It has been shown in chapter III that age heaping, concentration of women around the centre of childbearing period, and under-enumeration especially of children are some of the characteristic features of the Malawian data. The use of such "large" age groups as children under the age of 15 (age group 0-14) somewhat reduces the effect of age heaping. The examination of the reported age distributions do indicate that although there was a concentration of women in the age range 15-49 the overall number in this age range appear to be correctly reported. This suggest that of the three factors suggested above, under-enumeration is the major cause of disparities in fertility estimates obtained using these methods. The effect of these can be expected to be greater in the

1970-72 MPCS than in the 1977 MPC, the 1982 MDS and the 1984 FFS. This arises from the fact that in chapter III it was observed that under-enumeration of children was greater in 1970-72 than in the other data sets. Moreover, fertility estimates presented in Table 5.16 reflect that the estimates for the 1970-72 MPCS calculated using Rele and Carrier and Hobcraft methods are incredibly low. This could be attributed to under-enumeration of the children aged below 15 or over-enumeration of women in the childbearing age groups or a combination of both.

Table 5.16 presents fertility estimates as obtained under the different procedures. The table reveals that the various methods have produced almost identical estimates of fertility for the different time periods.

The estimates presented in this section are comparable to fertility measures presented by other researchers. Blacker (quoting NSO(1973) suggested that fertility in Malawi lies between 7 and 8 children per woman. This observation seems to have influenced the estimate of TFR of 7.6 children per woman usually quoted by the NSO. Hill(1986) presented a somewhat similar estimate of 7.5 children per woman. Fertility estimates for the period before 1970 are rather scanty. Kazeze(1981) quoting UNECA estimated that in 1966 TFR for Malawi was 6.5 children per woman.

Table 5.16

Estimates of TFR calculated using various Techniques and for different periods: Malawi

Data/Method	1966	1970	1977	1982	1984
1. Reported TFR	-	6.7	6.4	6.4	7.7
2. CEB	-	6.9	6.9	7.3	6.8
3. Coale	-	7.1	6.4	6.9	6.6
4. Brass formulae	-	6.0	8.0	7.6	5.4
5. Brass polynomial	-	6.9	6.9	7.3	6.9
6. Brass P/F ratio	-	7.8	8.0	7.9	7.1
7. Brass GRM	-	7.0	7.0	7.4	7.3
8. Rele	6.6	5.8	7.1	7.4	7.5
9. Carrier and Hobcraft	6.4	4.6	7.2	7.8	8.7

5.5 Fertility Differential

The level of fertility for Malawi as a whole conceals quite wide variation between the different geographical areas (regions, districts, urban and rural). In this section, an attempt will be made to examine rural-urban and regional fertility differentials. In the process some probable factors responsible for fertility differentials in Malawi will be presented. It will further be shown that the level of fertility for the different geographical areas considered in this study are consistent with the observed social and economic conditions in the country.

5.5.1 Rural-Urban Differentials

Generally speaking the reported and estimated fertility for rural and urban areas display a slightly higher fertility in rural than urban areas. This is in line with expectations and most studies from both developing and developed countries have observed the same pattern of rural-urban fertility differentials (UNECA,1979).

The explanation for this tend to focus on differences in social and economic variables such as the presence in urban areas of educated women, working class women, high standard of living and high income. Explaining rural-urban fertility differentials in this way is in total agreement with and encouraged by the theory of demographic transition which argues that because of social and economic development fertility decline is likely to start in urban than rural areas.

There is one exception to this general pattern: the reported fertility in the 1970/72 MPCS is higher in urban than rural areas by about 18 percent. It must also be noted that when Rele estimates are considered, fertility is higher in urban than rural areas in 1966 and 1970-72 and the opposite is true for the remaining data sets (see Tables 5.17 and 5.18 below).

In all cases, however, the rural-urban differential in fertility is so small that the variations could be interpreted as a product of errors in the data, probably arising from the smallness of the urban population and sampling variations in the case sample surveys. As noted earlier the 1970-72 MPCS was dominated by the urban population and as a result of this some problems were encountered in estimating the parameters for both rural and urban population which could be attributed to this weakness. Furthermore, it has been suggested in this study that, this phenomena can be seen in the other surveys.

On the other hand, the observed difference in the 1970-72 MPCS could be real as the available literature in Malawi do suggest that as early as 1969 when the proportion urban was just around 5 percent, the country was already experiencing certain "social problems" which came about as a result of "urbanization". Following this observation, within an interval of twelve months, two seminars on "urbanization in Malawi" were conducted. The first one was organized by the University of Malawi (UOM,1969) and the other by the Department of Community Services (DSC,1970)6.

Among the problems discussed, and the one which concerns us here, was the question of "family breakdown". The nature of the problem discussed was that many women were leaving rural areas for the urban areas to join (or accompanying) their husbands. The (couples) families were, however, not prepared for the problems they were going to face in their new environment (such as housing problems, overcrowding, food, transportation, low incomes). These resulted in arguments and quarrels

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6 For those interested in finding out more about the problems discussed at these seminars, reference can be made to the relevant publications.

between the husband and wife since they could not cope up with the above-stated "urban pressures". Eventually, these arguments culminated into the break up of the family.

Table 5.17

Estimates of TFR calculated using various Techniques and for different periods: Rural

Data/Method	1966	1970	1977	1982	1984
1. Reported TFR	-	6.7	6.4	6.4	7.7
2. CEB	-	6.9	6.9	7.3	6.8
3. Coale	-	7.2	6.8	6.9	6.5
4. Brass formulae	-	5.9	7.5	7.6	5.4
5. Brass polynomial	-	6.9	6.9	7.4	6.9
6. Brass P/F ratio	-	7.8	8.0	7.9	8.0
7. Brass GRM	-	7.5	6.1	5.8	6.5
8. Rele	6.0	5.6	7.1	7.5	7.5
9. Carrier and Hobcraft	-	4.9	7.3	7.6	8.4

Table 5.18

Estimates of TFR calculated using various Techniques and for different periods: Urban

Data/Method	1966	1970	1977	1982	1984
1. Reported TFR	-	7.7	6.3	6.1	7.0
2. CEB	-	6.7	6.4	6.9	6.1
3. Coale	-	6.1	6.2	6.8	7.1
4. Brass formulae	-	7.4	7.7	8.0	5.8
5. Brass polynomial	-	6.7	6.2	6.9	6.2
6. Brass P/F ratio	-	7.3	7.6	7.7	7.8
7. Brass GRM	-	7.3	6.8	7.3	7.4
8. Rele	-	6.8	6.6	7.3	7.0
9. Carrier and Hobcraft	-	5.2	6.3	7.0	7.8

It can be further argued that in a home where the father and the mother are always arguing, it is difficult to look after the children properly. The same could be said about broken families with a single parent. In both cases the children (daughters) were more likely to be attracted to the lures of the urban life which are in general not

compatible with academic life. This culminated in their leaving school too early due to early marriage or unwanted pregnancy. That this was likely to have taken place can further be illustrated by the following extract taken from the opening verse of one of the most popular Malawian hits in the late seventies:

> Zonse ayambitsa ndi Makolo (2X)
> Kumuchotsa mwana pasukulu (2X)
> Mwana wanga wakula ukwatire
> Tidzidya msomba eeh eeh
> Masamba tatopa nao eeh eeh.7
>
> It all started with the parents
> by getting the child out of school.
> My child you are now grown up, get married
> so that we can be eating fish
> we are tired of vegetables.

This part of the song can be interpreted to mean that because of the "economic" problems the family were facing, which were the major source of marital disputes and quarrels, parents were now looking at children as economic assets, who should get married and start providing the family with some material benefits. It is encouraging to note that the available data on the distribution of married women by age groups indicate an increase in the proportion married in the younger age

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7 "Mwana Wanga Wakula Ukwatire" by Namakhwa Brothers Band.

groups.

Consequently, it can be suggested that because of the large amount of female migration, particularly those in the reproductive age groups, and the resulting increase of proportion marrying which this inflow of women is believed to have caused, fertility was bound to be higher in urban areas than in rural areas. Furthermore, the reduction of labour emigrants, as discussed in Chapter III, meant that more males were now available in the "marriage market"; and since most of these (together with their spouses) were likely to end up in the "cities" rather than in the villages since that is where opportunities exists (employment, "high life" and freedom, just to mention a few) fertility levels could be expected to be high in the former. This pattern is indeed expected in societies experiencing a change in the pattern of marriage whereby more people are now getting married than before and childbearing is quite early as was the case in Western Europe soon after the Second World War.

Despite the lack of necessary statistics to show that this was indeed the case, apart from relying on the inferences made by learned observers as in the preceding paragraphs, and at the same time, persuaded by the view that this situation cannot be ruled out, it remains an open argument that this factor could only affect a negligible proportion of women and, therefore, unlikely to have given rise to such a noticeable difference in fertility as the tables seem to indicate since the population of Malawi is predominantly rural and the proportion urban is quite small.

The smallness of the rural-urban differentials can be attributed to the absence of any real difference between the two populations. Essentially, this could have happened as a result of the similarities between the rural and urban way of living and the strong ties the urbanites maintain with their relatives they have left behind in the villages. For instance, consider the following exchange taken from a novel by a leading Malawian writer, between Nyatoshi, a primary school teacher who lives in the city and is using contraceptives and her mother who lives in the village:

> .... And yet there she was, ..., confronted - much sooner than she had expected - with her mothers question: Why was she not yet pregnant.
> "But why do you ask, Mother?" She said with a laugh.
> "You answer my question."
> "But its still early, Mother." She ventured ...
> "Don´t say its too early," Nyatoshi retorted
> "You yourself have already said Ndisale is now big."
> (Tito Banda,1987)

The close ties urbanites maintain with their rural peers led Gondwe(1970) to claim that urban dwellers in Malawi can be described as having "one leg in the town and another leg in the village". This is further illustrated by Selous Kalilombe´s advice that all urbanites should build a house at home since this is where they eventually retire in the event of sudden death of the breadwinner (usually a father) or retirement.

The higher estimate for urban areas may further be attributed to a reduction in the length of birth interval due to supplementation and bottle-feeding which leads to a reduction in the duration and intensity of breast-feeding or a reduction in the adherence to taboos regarding sexual intercourse and abstinence. Later on, following the adoption of the "urban way of life" which in the case of women includes using contraception, fertility in urban areas may fall below that of rural areas.

In analyzing the relationship between urban fertility and migration, Pool(1971, 1977) identified three stages. First stage is identified as having a very strong in-flow of males with women entering the urban areas being highly selective in that spinsters, divorcees, widows and sterile women tend to dominate. At this stage fertility may be higher in urban than rural areas.

The second stage takes place when the urban areas becomes more developed thereby initiating changes in the structure of in-migrants and family migration becomes important. At this stage urban fertility would be as high or slightly higher than rural fertility. This will happen as a result of improvements in public health, a reduction in the duration of lactation and postpartum abstention and a change in the structure of the urban population.

The third and final stage occurs when the city has matured resulting in a further reduction in urban fertility as a result of improved education and employment opportunities for women, contact with other ethnic groups and changes in attitudes, norms and behaviour of the people.

The above-description appears to be relevant in understanding fertility differentials between rural and urban areas in Malawi. During the colonial period, the nature and pattern of rural-urban migration was such that more males than females were migrating into urban areas. In part, this was due to the colonial policy that allowed only domestic servants mainly males to reside in the then existing urban areas (townships) leaving their wives and children in rural areas. Therefore this period bore the characteristics of the population in stage one.

The gaining of independence in 1964 initiated some "large-scale" female in-migration into the major urban areas in Malawi. The two seminars on urbanization in Malawi referred in the preceding paragraphs have documented this phenomenon. This represents a shift from stages one to two and as Pool's hypothesis imply urban fertility was expected to be just as high or slightly higher than rural fertility during the early seventies. Both the reported statistics and estimated fertility seem to confirm this statement by indicating a similar level of fertility for rural and urban areas.

The explanation for rural-urban differentials in fertility presented in this section appear plausible given the level of social and economic development in Malawi. The deficiency of the data has however prevented us from a detailed investigation of these factors herein suggested. Therefore, as the quantity and quality of data improves studies should be designed to explain these subjects further.

5.5.2 Regional Differentials

The reported and estimated regional differentials in fertility shows that fertility is highest in Central region followed by the Northern region and lowest in the Southern region. On the face of it, the observed regional differentials can be said to closely resemble the nature and pattern of social and economic development in Malawi.

The Southern Region is the most urbanized and industrialized region in Malawi, and hence one would "normally" expect it to have a relatively high proportion of the educated elite and the expatriate population (mostly of European origin) whose fertility is assumed to be lower than the uneducated and the indigenous rural population.

But other than that, this factor, together with the historical and social experiences which these "industries" can be said to have brought, appear to have given rise to a society with an eroded and diluted culture, that have further given rise to widespread marital disruptions[8].

Several factors appear to be responsible for this. For instance, male labour migration from the surrounding areas to the emerging urban centers (in the Southern Region) meant that with the passage of time the likelihood of both partners, the husband at work and the

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8 As we shall see later on, in a much publicized case concerning the Yao of Southern Malawi, S.S. Murray, the 1926 Census Superintendent, called this process "demoralisation".

wife at home, extra-marital relationships were high. Eventually, this was likely to lead to the breakdown of the first marriage and inception of the second union. If the second husband leaves again for work or the first husband returns back home, the women are back in the "marriage market" and the cycle starts again. This "system" of marriage is also likely to be a factor in the spread of venereal diseases which have long been associated with infertility (and low fertility). The effect of this factor is explained in some detail in a separate sub-section below.

One can also argue that with increased labour demand in industries some women found themselves migrating to the urban centers where they could find employment, especially in the service sector (catering, petty trade selling food stuffs) and in industries doing such "light" jobs as tobacco grading. Seemingly, this created a certain class of working "women" who were likely not to execute their marital and family obligations to the "society's expectations", and were vulnerable to separation and divorce. Therefore it is probable that these women remain single for sometime during their reproductive years thereby reducing the number of children they ever bore. It is reassuring to mention that more recently, a Malawian female academic, Loveness Gondwe-Kaunda has indicated that men in general, and Malawian men in particular, don't like marrying "career" or working women (Gondwe-Kaunda,1990).

Furthermore, studies done in other African countries have established that in-migrants tend to increase fertility of the receiving areas. This stems from the fact that migrants are usually young adults belonging to the childbearing age groups. This finding seems relevant to the Malawian situation, especially when one considers that the Central Region districts of Kasungu, Mchinji, Lilongwe and Dowa are among the districts which experienced a lot of in-migration during the inter-censal period 1966-77 and are amongst the districts having the highest fertility.

The impact of migration cannot be fully studied in Malawi since the available data on fertility do not distinguish between the migrant and non migrant. Moreover, in the absence of proper understanding of the characteristics of the sending and receiving areas and the experiences of the migrants before and after migration, it is rather impossible to ascertain with precision the negative effect of migration on fertility.

Apart from the social and economic development variables per se, several factors can be suggested to account for the observed inter- and intra- regional differentials in fertility in Malawi. These are: (i) ethnicity; (ii) voluntary control of fertility; (iii) religion; (iv) marital factors; and (v) disease. Before examining each of these factors in turn a word of caution is in order. Just as with the other aspects of the demography of Malawi, the following discussion is hindered by the deficiency of data. It is aimed at stimulating further discussion pertaining to the correlates of fertility differentials in Malawi.

(i) **Ethnicity**

Studies in other countries have shown that fertility differentials exist between different ethnic groups (Davis,1973; Gaise,1976; UNECA,1979; Omideyi,1983). Other investigators working on the demography of Malawi have suggested the existence of ethnic differentials in fertility (NG,1926; Mitchell,1965). In her anthropological study of the Ngoni, Read quoted a Chewa man as having said: "No wonder the Ngoni had so few children when they had no dongosolo"9. Moreover, the classical demographic transition theory has noted differences in fertility which could only be explained in terms of the distribution of ethnic groups (Coale,1973).

Virtually no data is available to investigate the effect of ethnicity on fertility in Malawi. Despite this handicap, it is tempting to relate the observed differentials in fertility to the "historical" distribution of the major ethnic groups in Malawi. One way of doing this is to examine the observed variations in fertility side-by-side with the distribution of the ethnic groups in the country. However one has to be careful when doing this sort of exercise as previous discussions have described migration "streams" that have followed the pattern of social and economic transformation in the country (section 1.4 above).

Despite these movements there are reasons to believe that the norms and behaviour of individuals in any given

9 See Read(1938,7).

area are to a large extent influenced by the dominant ethnic group in the area[10]. This means that if one is residing in a Yao area one's mode of life and code of conduct tends to reflect the customs and beliefs of the Yao. The same can be said of the other ethnic groups in Malawi.

Based on this, a number of assertions can be made. Firstly, the Central Region districts of Kasungu, Dowa and Mchinji which reported the highest fertility rates are largely made up of the Chewa, the largest ethnic group in Malawi. Secondly, the districts of Mangochi and Machinga which invariably show the lowest fertility in Malawi have the largest proportion of the Yao: most of whom are muslims. Using this criterion the ethnic groups existing in the country can be classified into three categories as follows:

(a) High Fertility - Chewa,

(b) Moderate Fertility - Tumbuka, Ngoni, Nkhonde, Tonga, Lomwe, Mang'anja

(c) Low Fertility - Yao

The problem with this scheme is that it is not exhaustive enough as it has simply placed two ethnic groups into two extreme categories (high and low) leaving all the other groups in one category (moderate). On the one hand this problem came about as a result of the "crude" nature of data which does not, in actual fact, present fertility differentials by ethnic group. On the

10 Remember the old English saying: When in Rome do as Romans do.

other hand this is a consequence of the small difference observed between the estimates of one district and another as noted in both reported and estimated fertility. To the optimistic observer however, this may be taken as a reflection that the ethnic variations in fertility in Malawi are quite small. Indeed, other researchers who have attempted to study this subject appear to have come to the same conclusion (Mitchell,1965).

Mitchell(1965), in his study concerning urban Africans in Zambia, conducted between 1951 and 1954 in the towns along the railway line, classified the ethnic groups found in the study population into four categories based on the observed fertility differentials using age-standardized CWR. These categories ranged from high fertility, to moderate fertility, to low fertility and to very low fertility. It is interesting to note that amongst the ethnic groups included were those found in Malawi. This is partly due to the incidence of labour migration as some of the groups included came exclusively from Malawi. The factor of international boundaries which cut across ethnic divisions may also be important.

Mitchell's study revealed that most of the ethnic groups found in Malawi have "moderate" fertility. This agrees well with the above observation that fertility differentials among the different ethnic groups is small.

To date the only study which has presented fertility estimates for the various ethnic groups found in Malawi is the 1926 census (see Table 5.19 below). Classifying the ethnic groups into the three categories high, medium and low fertility the following pattern emerges:

(a) High Fertility - Nguru

(b) Moderate Fertility - Yao, Ngoni

(c) Low Fertility - Tumbuka, Nkhonde, Tonga, Wemba
Nyanja, Chikunda, Chewa.

Table 5.19

Average Family Size by Ethnic Group in Malawi - 1926

Rank	Ethnic group	Average family size
1.	Nguru (Lomwe)	7.59
2.	Ngoni	6.69
3.	Yao	6.23
4.	Nyanja	6.14
5.	Chikunda	6.06
6.	Nkhonde	5.92
7.	Tumbuka	5.92
8.	Tonga	5.80
9.	Wemba	5.46
10.	Chewa	5.42

Source: NG(1926, p.xxv)

Note: The ranking is by this writer and not the 1926 census report.

From Table 5.19 three points can be raised concerning ethnic differentials in fertility. Firstly, with minor exceptions, the differences are quite small and can be explained in terms of differences in sampling procedures and the resulting sample sizes. Indeed, the Census Superintendent noted that "details of the tribes involved were not quoted in every instance and it would be unwise to attempt to make any deductions from tribal figures" (NG,1926). Fortunately for us, the Superintendent continued by pointing out that the above estimates were given "for reference in case of future enquiries along similar lines" (NG,1926).

Secondly, comparing Table 5.19 with what has been described in previous paragraphs of this section, the whole picture regarding ethnic differentials in fertility seems to have changed. The 1926 census indicate that ethnic groups in the Southern Region (Yao, Nyanja, Lomwe) reported a higher fertility than those in the Centre and North (with the possible exception of the Ngoni). In this study, it has been suggested that the ethnic groups in the Centre have a relatively high fertility followed by those in the North whereas the groups in the South have low fertility.

There are reasons to believe that this "altered position" is a product of social and economic development that has taken place in Malawi during the colonial and post-independent periods[11]. In the twenties the Southern Region was the only centre of attraction in the country and hence it had a higher proportion of in-migrants, whereas in the post-independent period, particularly in the seventies, this feature is more noticed in the Central Region. At the same time, one can argue that from a historical point of view, in the twenties, most of the people in the Southern Region were

11 It is impossible in a study of this sort to map out all the changes that have occurred in Malawi and a study of this nature is missing from the available literature on Malawi.

recent immigrants who (as it has been demonstrated above) tend to show a high level of fertility. By 1970 these people were settled in their new environment and thus showing their "true" pattern of fertility.

The above argument can be illustrated more vividly by examining the Yao in some detail. Table 5.19 indicate that the level of fertility for the Yao was amongst the highest in Malawi in the twenties whereas it has been argued in this study that the districts which have the highest proportion of the Yao population display the lowest fertility. This "confusion" is not new as the following observation by the Census Superintendent in 1926 indicate:

> Incidentally it would appear that if there is any truth in the frequent allegation that Yao women are unwilling to bear children, it must be a recent development forming part of the general demoralization of the tribal spirit formerly so noticeable among the Yao (NG,1926, p. xxv).

Furthermore the above statement by the Census Superintendent suggests one reason for the observed change in fertility, namely that the "Yao women are unwilling to bear children". Whether this decision was taken consciously or forced upon them by other unforeseen "circumstances" remains to be verified. But as we shall see later on it is probable that this attitude, if it is indeed true, might have been influenced by such factors as male migration and venereal diseases.

Writing about the "Yao country", Abdullah(1919), to date the only leading Yao historian had this to say about his people and country:

> In those days the whole country teemed with people,

> there was not an uninhabited spot anywhere; the people in this superabundance of which I speak absolutely swarmed everywhere. Right from the hilly country near the lake ... the whole of this area was covered with villages; the people filled it completely, like the gruel in that plate.
>
> They were extraordinarily fertile; one woman would have sixteen or seventeen or more, because in those days there was no such immorality as is prevalent now. They married late, not being in a hurry, the youth of those days bided their time, remaining in the bachelor quarters for many years. And so with the women also, they did not get married till their breasts were fully developed almost until they had begun to drop, then they were married. Moreover other folks wives went in wholesome dread and that is why they had the good fortune to bear so many children, and without cases of difficult labour. The children which they bore in those days were comely and well built. When such an one appeared they would say, "Ah, that is so-and-so's child who fills one with desire".
>
> They would not initiate the boys and girls until they had come to full boyhood or girlhood. The staple food of the boys and girls of old was coarse sorghum flour, the boys used to eat grass-hoppers as relish, and the girls, crabs, which they used to go and catch in the streams.
>
> For they used to pay due regard to the traditional prohibitions, and the reasons that they had such good luck in bearing children was this care in their observance; and there was none of these various diseases so prevalent nowadays.
>
> A chief of the old married only two wives, and the lesser people only one; they never had large number of wives.

According to the above quotation it is clear that Abdallah, just like the 1926 Census Superintendent, believed that there was a change in the fertility behaviour among the Yao in that women were now having fewer children than before [although he observed that in the past women could have sixteen or seventeen or more children, which are closer to the "maximum values" observed in natural fertility population

(Bong aarts,1982) one might be tempted to think that they were exaggerated].

Secondly, Abdullah listS some factors which he considered to be responsible for this change and these are immorality, early age at marriage, traditional prohibitions, type of food consumed and diseases12. These factors are not mutually exclusive. For example both immorality and early exposure to sexual intercourse (as indicated by early age at marriage) may foster the spread of venereal diseases.

Lastly it is important to note that whereas the 1926 Census Superintendent simply talked of "demoralisation" and unwillingness to have children, Abdullah took the pain of explaining in some detail how these processes and attitudes came about.

(ii) **Voluntary Fertility Control**

Traditional and cultural values in Malawi encourage individuals to have many children. Childlessness, is regarded as both pitiful and shameful and should at all costs be avoided or prevented13. Consequently, given

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12 Although Abdallah did not specify the name of diseases, for a number of reasons which will become clear later on, it could be assumed that he was taking about venereal diseases.

13 If everything else fails and one is pronounced barren tradition demanded the hiring of someone (a brother, relative, or a friend) to come and make the wife pregnant on one's behalf. This hired man was called "Fisi" (a Hyena). If it is the wife who is barren she could be divorced or the husband was allowed to marry a second wife or the wife's side may look for a replacement which may take the form of the sister to the wife. It should also be mentioned that the existence of such customs underlines the importance of children in Malawian setting.

this, one would expect that any voluntary childlessness taking the form of birth control and family planning is unlikely and very limited as it is interpreted as "greed" on the part of those who practice it.

Prolonged lactation which acts as a traditional method of child spacing is prevalent throughout Malawi and conception during the lactation period is universally condemned as it is believed that it leads to the death of the child who is suckling. If a couple breaks this "rule" and their child dies they have no one to blame but themselves, and they are likely to be briefed about the merits of upholding traditional beliefs and customs by community "elders"14. With this in mind, it seems probable that, some sort of contraception (traditional or modern abstinence, coitus interruptus, strings or abortion) is used to avoid conception during breast-feeding which normally lasts for about two years. Although insufficient information is available as regards to the existence of contraception in "traditional societies", especially in rural Malawi, the available literature, dating as far back as the early twenties, suggests that contraception might have been used among the Yao of Southern Malawi (NG,1921,1926; Mitchell,1949). Details about the type of methods used are nonexistent

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14 There are reasons to believe that the observance of this custom is on the decline especially in urban localities. In rural areas one strongly believes the practice is still there. The author attempted to ask some Malawians studying in London about the existence of this custom. Most of the respondents seem to have heard about the existence of this custom but unfortunately, being among the educated urban elite, they could only speculate about its existence in rural areas.

but Mitchell(1949) noted that Yao women were using abortion as a means of avoiding pregnancy at the time when the husband was away.

Two issues arise from the above observation. Firstly, we are again talking about the Yao. This may serve to suggest that the Yao have an interesting social net-work and that various aspects of their demography are worth studying. To an inquisitive researcher this may be taken as further evidence that a detailed demographic-anthropological study of the various ethnic groups can be an enriching undertaking.

Secondly, the socio-economic history of Malawi indicates that the Yao were engaged in long distance trade including the notorious East African slave trade. As we have pointed out in previous chapters, because of the absence of exploitable resources in Malawi, men throughout the country were involved in the circulatory labour migration (even though the level and magnitude varied from one area to another). Therefore, from what we have learnt about the Yao as regards to contraception vis-a-vis migration, we cannot avoid speculating whether or not the same can be said about the other ethnic groups in the country and a further examination of this aspect is well overdue.

The picture portrayed in the above paragraphs suggests that the overall situation as regards to fertility control is the same in all parts of the Malawi with the possible exception of (i) urban areas where less attention is placed on traditional norms and values and modern methods of contraception are likely to be more accessible; and (ii) the Yao, who seem to practice some form of fertility control. Since the population of Malawi is predominantly rural and the Yao are just one of the several ethnic groups found in the country, voluntary fertility control is unlikely to be responsible for the observed differences in fertility.

(iii) **Marital Factors**

In the absence of contraception, fertility is expected to be high in areas where (i) marriage occurs early in life and is universal, (ii) marital disruptions (divorce, separation, widowhood) are minimal and (iii) more people get and remain married. Two aspects of marital factors, namely marital status and age at marriage, will be discussed in this study.

Marital status

The available statistics indicate that marriage in Malawi is universal. In 1972 72 percent of all females and 57 percent of all males aged 10 years and over had "ever been married". The corresponding percentages were 76 percent and 61 percent in 1977 and 74 percent and 59 percent in 1982, respectively. These figures indicate a tendency towards increased proportion of ever married for both sexes. This observation is supported by reports by independent observers particularly in urban areas (see section 5.5.1). The slight decline in the proportion ever married observed in 1982 can be attributed to sampling variations.

In absence of measures to control one's fertility the observed changes in the marital distribution are likely to lead to a rise in fertility. However, the overall effect of these changes in the proportion ever married will depend on the changes in other marital factors such as the age composition of the ever married population.

An examination of the distribution of the population by marital status and age reveal certain features concerning marital distribution in Malawi (see Tables 5.20 and Figures 5.32 to 5.35). The proportion single for both males and females decline with the age of the respondent, and at each age group more men than females are reported single. The proportion of the currently married population increases with age, reaching a maximum in the age group 25-29 in 1972, 1977 and 1982 and in the age group 30-34 in 1984. The values for age groups 20-24, 25-29 and 30-34 are in general close to each other. After these age groups the proportions remain more or less constant and display a tendency to decline at the advanced age groups (Figure 5.33). Similarly, the proportions divorced and separated and widowed increase with age (Figure 5.34 and 5.35 respectively). The general shape of the former is concave indicating a rapid increase with age at the younger age groups and a constancy thereafter. In contrast the proportion widowed is convex indicating a near constancy in the younger age groups (below age 30) and a steep increase after age 30.

The small fluctuations displayed in the data could be attributed to age mis-reporting, small numbers especially in the case of marital disruption information at advanced age groups and sample variations in the case of the survey data. The proportion divorced and separated and widowed are higher for the females than males. This could be explained in terms of (i) sex difference in mortality which favours females (ii) higher rates of remarriage among males than females and (iii) the incidence of polygamy.

Although the above described pattern is observed in all four sources of data which collected and published information on marital status there are certain variations which can be summarized as follows:

(i) there is a decrease in the proportion single particularly in the younger age groups (below age 30);

(ii) there is an increase in the proportion married especially in the age groups below age 30. This increase is greatest between 1972 and 1977;

(iii) there is a reduction in the proportions (a) widowed and (b) divorced and separated. The changes in these proportions are more noticeable in age groups beyond 35 years.

These changes imply a concentration of women in the childbearing age groups. In the absence of any contraception, such changes in the marital distribution are likely to lead to an increase in fertility.

Fig 5.32 Proportion of Single Women by Age group

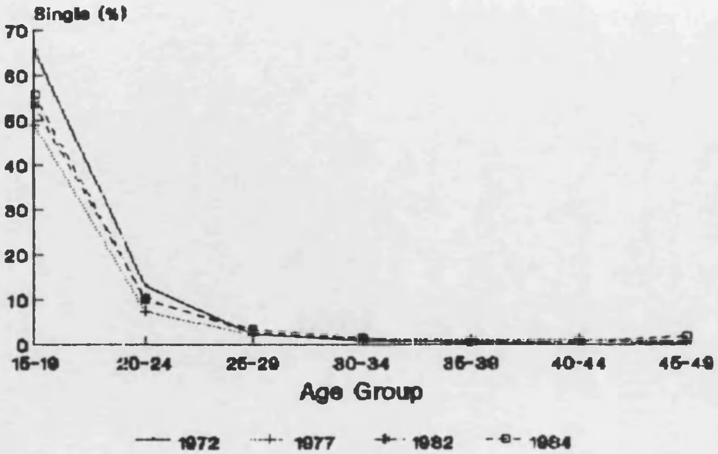


Fig 5.33 Proportion of Married Women by Age group

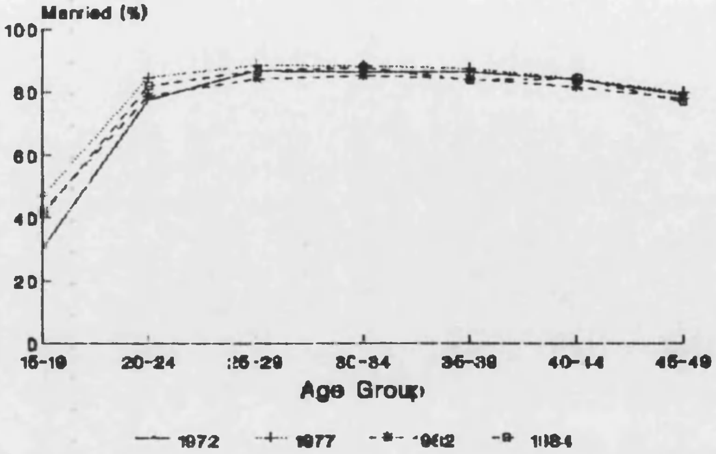


Fig 5.34 Proportion of Divorced and Separated Women by Age group

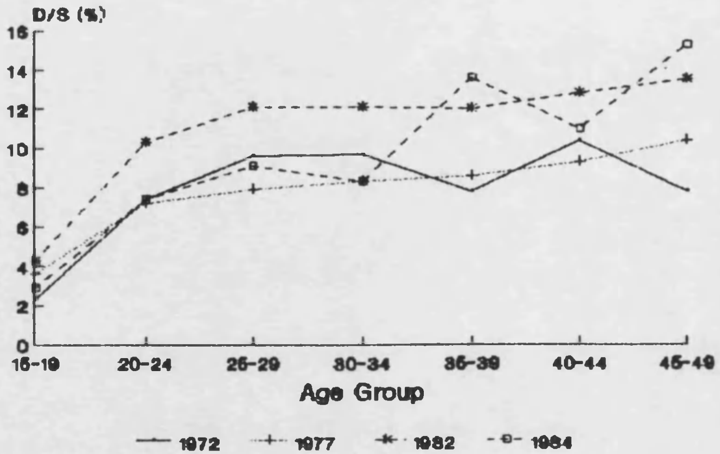


Fig 5.35 Proportion of Widowed Women by Age group

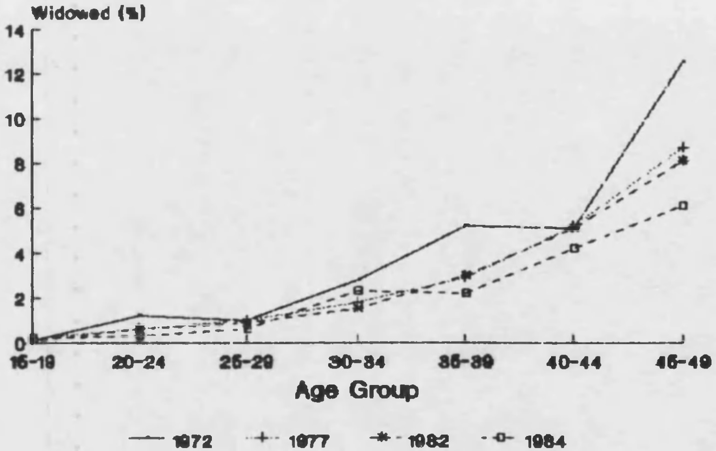


Table 5.20a

Population aged 10-54 by Marital Status
1972 MPCS

Age Group	Never Married F	Never Married M	Married F	Married M	Separated Divorced F	Separated Divorced M	Widowed F	Widowed M
10+	23.5	37.0	58.4	55.0	6.8	1.5	6.6	0.6
10-14	73.1	73.5	2.7	0.3	0.1	-	0.1	-
15-19	65.5	97.2	30.6	1.5	2.3	-	0.1	-
20-24	13.0	61.2	77.6	36.3	7.4	1.1	1.2	-
25-29	2.4	16.0	86.8	80.0	9.6	2.7	1.0	0.2
30-34	0.8	5.6	86.4	90.8	9.7	3.4	2.8	0.2
35-39	0.5	1.9	86.3	94.5	7.8	2.3	5.2	0.8
40-44	0.2	2.7	83.9	95.5	10.4	1.2	5.1	0.4
45-49	0.3	1.1	79.1	94.9	7.8	2.6	12.5	1.4
50++	0.4	0.8	58.9	94.1	11.2	2.6	28.7	2.2

Note (i) - indicate that the proportion is less than 0.1 .

Table 5.20b

Population aged 10-54 by Marital Status 1977 MPC

Age Group	Never Married F	Never Married M	Married F	Married M	Separated Divorced F	Separated Divorced M	Widowed F	Widowed M
10++	23.0	39.2	63.0	57.5	6.9	2.2	6.9	1.0
10-14	96.7	99.5	2.8	0.3	0.2	-	0.1	0.0
15-19	48.9	93.8	47.0	5.8	3.6	0.3	0.2	-
20-24	7.4	49.3	84.7	48.5	7.2	2.0	0.6	0.1
25-29	2.2	13.3	88.7	83.1	7.9	3.2	1.0	0.3
30-34	1.3	4.9	88.4	91.2	8.3	3.4	1.8	0.4
35-39	1.0	2.9	87.3	93.3	8.6	3.2	2.9	0.6
40-44	1.0	2.3	84.3	93.6	9.3	3.3	5.2	0.8
45-49	0.9	1.8	79.8	94.0	10.4	3.2	8.7	1.0
50++	1.1	1.2	56.4	75.8	10.9	3.3	31.4	3.4

Table 5.20c

Population aged 10-54 by Marital Status 1982 MDS

Age Group	Never Married F	Never Married M	Married F	Married M	Separated Divorced F	Separated Divorced M	Widowed F	Widowed M
10+	25.6	41.1	58.1	55.2	9.3	2.6	6.8	0.9
10-14	97.8	99.1	1.8	0.5	0.2	-	0.1	-
15-19	53.4	94.6	42.1	4.9	4.3	0.3	0.1	-
20-24	10.4	51.3	78.7	45.9	10.3	2.6	0.6	0.2
25-29	2.6	14.7	84.3	81.3	12.1	3.9	0.9	0.1
30-34	1.1	4.9	85.2	90.1	12.1	4.7	1.5	0.3
35-39	0.7	2.5	84.2	92.7	12.0	4.1	3.0	0.7
40-44	0.6	1.8	81.5	93.3	12.8	4.1	5.1	0.7
45-49	0.6	1.4	77.8	94.3	13.3	3.4	8.1	0.8
50++	0.5	0.9	53.1	90.8	14.8	4.3	13.5	3.9

Table 5.20d

Female aged 15-49 by Marital Status 1984 FFS**

Age Group	Never Married	Married	Separated Divorced	Widowed
15-19	55.67	40.99	2.94	0.19
20-24	9.91	82.11	7.35	0.31
25-29	3.35	86.93	9.07	0.61
30-34	1.54	87.93	8.26	2.28
35-39	0.34	83.72	13.63	2.19
40-44	0.50	84.31	10.96	4.24
45-49	1.92	76.73	15.26	6.09

** Males were not tabulated by marital status in 1984. This could be attributed to the emphasis given in the survey to the collection of data on maternal and child mortality and fertility.

Age at marriage

Age at marriage affects both the age pattern of fertility and the level of fertility. It is observed that increasing the age at marriage beyond a certain age, reduces the level of fertility. In fact postponement of marriage to a later date, as suggested by Malthus, is a common form of fertility control. In India for example, the 1978 legislation requires that girls and boys are to marry only after attaining the age of 18 and 21 years respectively (Mahadevan,1984) and a number of studies from both developed and developing countries have manifested the effectiveness of this factor in regulating fertility (United Nations,1961; Wyon and Gordon,1971; Glass and Grebenik,1954). However since fecundity varies with age and reaches its peak around the age 30, marriage contracted near that age will have little effect on fertility.

Marriage registration is not compulsory in Malawi and only a small proportion of marriages are registered with the Registrar's General. This arises from the fact that most of the marriages are contracted under the "customary law" which requires the consent (through the fulfilment of certain obligation, say the payment of bride-wealth: "lobola") of the interested parties. As a result of this handicap no reliable marriage statistics exists in Malawi and like fertility and mortality, age at marriage has to be obtained through indirect methods. One such method is to calculate the Singulate Mean Age at Marriage (SMAM) using the proportion single for each age group (Hajnal,1953).

Table 5.21 shows SMAM for the 1977 census and the three sample surveys. The 1966 MPC didnOt collect data on marital status of individuals. Because of small numbers involved, probably arising from sampling variations, estimates for 1972 and 1984 urban areas and 1984 rural were not calculated. The estimates presented in Table 5.21 indicate a slight increase in the mean age at first marriage. Other students of the demography of Malawi have also expressed a similar view (Zamaere,1987; Ndawala,1989). This could be attributed to various changes taking place in the economy such as the rise in education and employment opportunities particularly for women. A detailed investigation of nuptiality patterns in Malawi is outside the domain of this study and this area requires a careful analysis in the future.

Table 5.21

Singulate Mean Age at Marriage

	Male			Female		
	Malawi	Rural	Urban	Malawi	Rural	Urban
1972	23.81	23.81	23.90	17.69	17.46	-
1977	22.96	22.78	24.02	17.68	17.56	18.43
1982	23.26	23.09	24.30	18.19	17.77	19.02
1984	*	*	*	18.04	-	-

Notes: (i) - incalculable due to small numbers
(ii) * data not published

A comparison of the present estimates of age at marriage which are calculated from survey and census data, with earlier estimates provided by well informed observers, appear to suggest that the age at marriage has slightly increased. Fraser(1915,50) noted that "women are mothers when they are still underdeveloped girls". Lyall Grant, the Census Superitendant in 1911, noted that "every male native over 17 and every female native over 14 is married" (NG:1911,4). Tito Banda(1987,23) in his recent novel writes: "like most girls of her time, she had first marriage at an early age of fifteen, there being in those days nothing else for a girl to think about after becoming of age". Stubbs(1970,18) noted that "first marriage was early, the female being between 13 and 15". Similar estimates of age at first marriage for various ethnic groups in Malawi are also given by Ibik(1970).

A rise in age at first marriage is usually associated with a decline in fertility. This is largely due to the related decrease in the number of childbearing period assumed to be 35 years (starting from age 15 to age 49). A number of recent studies have established that infant mortality is high among teen-aged mothers. Furthermore the incidence of foetal loss and complications during labour which may lead to secondary sterility and childlessness are said to be high among teen-aged mothers. These findings suggest that such a rise in age at marriage as indicated in the Malawian data, whereby the mean age at marriage is rising from ages below 15 years to ages just under 20 years, denotes a transition from more to less risky age groups and may thus leddto a rise in fertility. Studies however suggest that any increase in age at marriage below age 19 has little impact on fertility (McDonald,1984).

There is a distinct rural-urban differential. Age at marriage for both sexes is lower in rural than in urban areas. Mean age at marriage in the latter exceed that of the former by about one year. The small difference between the two estimates probably explains the absence of any noticeable variation between rural and urban fertility. It can be argued as in the preceding paragraph that the rural-urban differentials in age at marriage is such that fertility may be higher in urban than rural localities.

Diseases

A number of diseases such as malaria, influenza, Schistomasis, tuberculosis, leprosy, yaws, gonorrhoea and syphilis are said to depress fertility either by causing sterility or sub-fecundity, or by inducing foetal wastage through spontaneous abortion, or by inhibiting conception, or by reducing coital frequency. The most studied group of diseases which have been associated with low fertility particularly in Africa are venereal diseases (Romaniuk,1969; Odile,1987).

In Malawi, necessary data on this topic are lacking. However, rather surprisingly, the available literature in the country suggest a high incidence of venereal diseases among the Yao (Smith,1901; NG,1921, 1926). This observation is related to the other factors outlined in the previous sub-sections. Firstly, the slightly early age at marriage (and exposure to sexual intercourse), observed among the Yao suggest that the Yao are exposed to a greater risk of contracting venereal diseases than the other ethnic groups. Secondly, since the Yao marry at the time when they are not yet (mentally) fully "matured" and prepared for married life one expects greater incidence of separation and divorce to take place among them. Sure enough this seems to be happening and anthropological evidence again confirm that marriage, divorce and re-marriage rates are high among the Yao (MItchell,1949). Thus, the observed incidence of venereal diseases may not only encourage couples to divorce/separate but also to increase the level of childlessness among them.

Restricting the analysis at regional level where some statistics are available, the level of childlessness is slightly higher in the Southern Region, followed by Central Region and then Northern Region (see Table A5.1 and figure A5.1 in appendix VI). Despite the fact that the levels of childlessness in Malawi and its regions are close to those observed in population experiencing natural fertility and can therefore be attributed to physiological factors, one may still be tempted to connect the observed regional differences with the occurrence of venereal diseases.

Other studies on regional differentials in fertility attribute the low fertility in the Southern Region to high incidence of marital instability and the intermediary fertility in the Northern Region to late marriages (NSO,1984b; MOH,1988). These observations are consistent with the explanation presented in the previous sections. The high level of education attainment in the Northern Region may partly be responsible for the slight delay in marriage. The high level of social and economic development in the Southern Region may be said to account for both marital instability as argued in section 5.5.2 above and the high incidence of venereal diseases as suggested in the preceeding paragraphs. In fact sexually transmitted diseases may be the cause of marital instability.

Before leaving this section it must be pointed out that due to insufficient data most of the studies utilized in this section are obviously dated and new studies are therefore called for. It is the hope of the author that by including them in the study, the interest into these forgotten aspects of the population of Malawi will be activated.

In addition, during the search of the possible determinants of fertility differentials it was found that the colonial census reports, particularly the 1926 and 1921 censuses (in that order), provide more information on the possible correlates of fertility than the modern censuses. This stemmed from the fact that the colonial administrators (including census officials who were mostly seconded from other government departments) were particularly interested in the customs of the indigenous population. Therefore, there seem to be a need to critically evaluate these reports and see how they can assist in the compilation of the demographic history of Malawi.

It must further be noted that although most of the arguments raised in previous paragraphs of this section appear to be mere speculation and remains to be verified as more data become available and more studies are conducted, most of what has been said is relevant in trying to understand the level of fertility among the Yao of Southern Malawi who seem to reveal a low fertility.

5.6 Trends in Fertility

There is insufficient demographic data to enable a detailed and conclusive examination of fertility trends in Malawi. To provide some insights into this aspect of the demography of Malawi, four approaches were followed. Firstly, estimates by previous investigators were assembled and analyzed. Secondly, the various estimates derived in this study were examined. Thirdly, the "Zaba criterion" based on the observed pattern of current and parity fertility points in figures 5.16 to 5.19 was employed. Fourthly, hypothetical ASFR and TFR were constructed and the results compared with the reported values. The results from the above-mentioned analyses were then related to social and demographic changes that have occurred in Malawi: in terms of changes in breast-feeding patterns, levels of childlessness, widowhood and migration.

It has already been mentioned in Chapter I that estimates by earlier investigators are not representative of fertility in Malawi as a whole. This is largely due to the fact that the estimates are usually based on small sample surveys conducted in pre-determined areas mostly by researchers with little or no demographic background. If we put aside this difficulty and just examine the estimates as they are, one notices a "slight" rising trend of fertility over time (see Table 5.22 and figure 5.36). But an increase of 2 percent over a period of half a century is incomprehensible and does not mean anything. Thus the small difference between estimates from one source to another may in actual fact be a reflection of the absence of any change in fertility.

Table 5.22

Some estimates of Fertility by earlier Researchers

Source/ Investigator	Year	Area Covered	Estimate
Census	1926	national	6.32
Mitchell	1958	Machinga	6.
Bettison	1953	Blantyre (rural)	6.
Kazeze	1966	national	6.5
Luckman	1972	national	7.
NSO survey	1972	"	7.6
Census	1977	"	7.6
NSO survey	1982	"	7.6
NSO survey	1984	"	7.6

Fig 5.36(a) TFR estimates (Brass P/F)

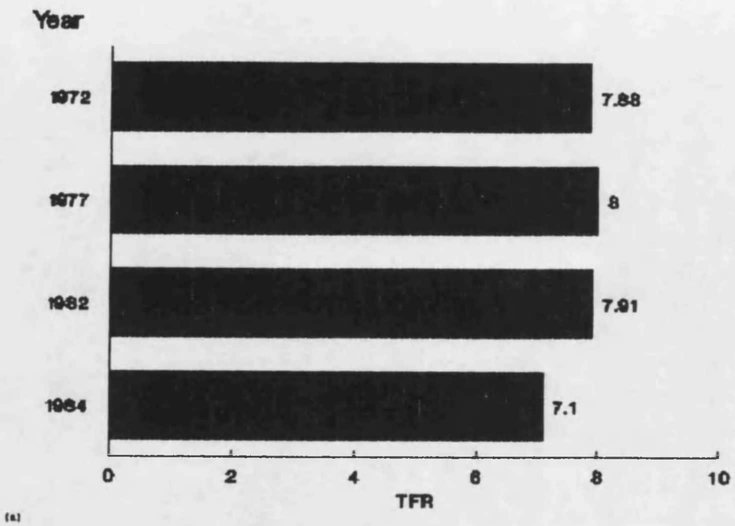


Fig 5.36(b) TFR estimates (GRM)

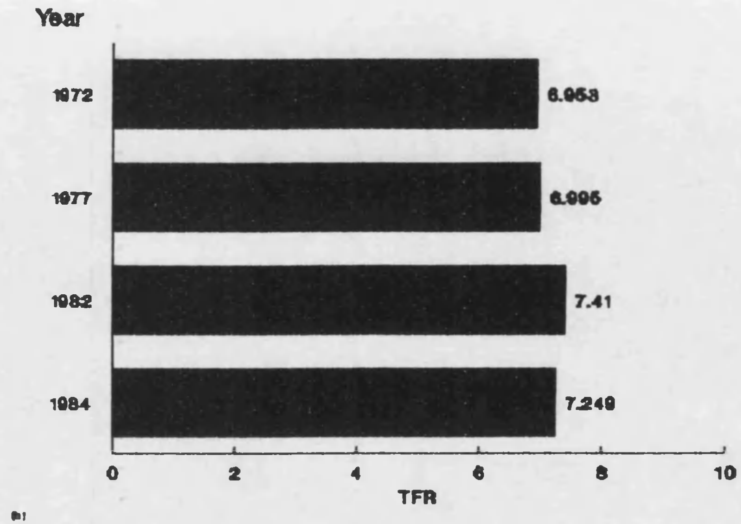


Fig 5.36(c) TFR estimates (Carrier and Hobcraft method)

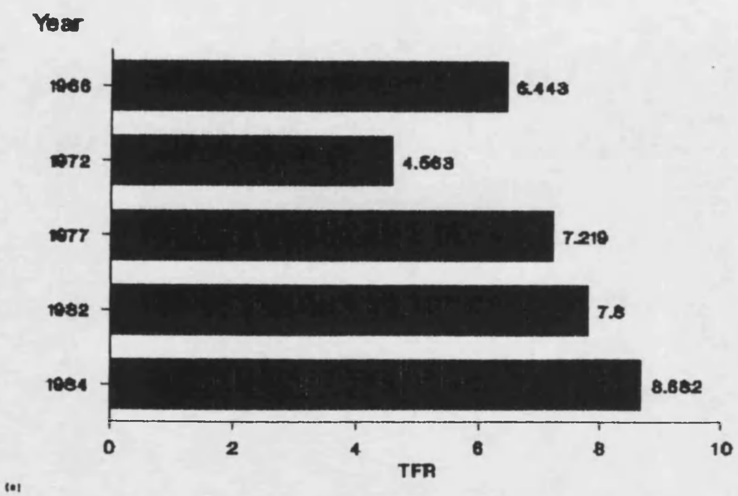


Fig 5.36(d) TFR estimates (Rele)

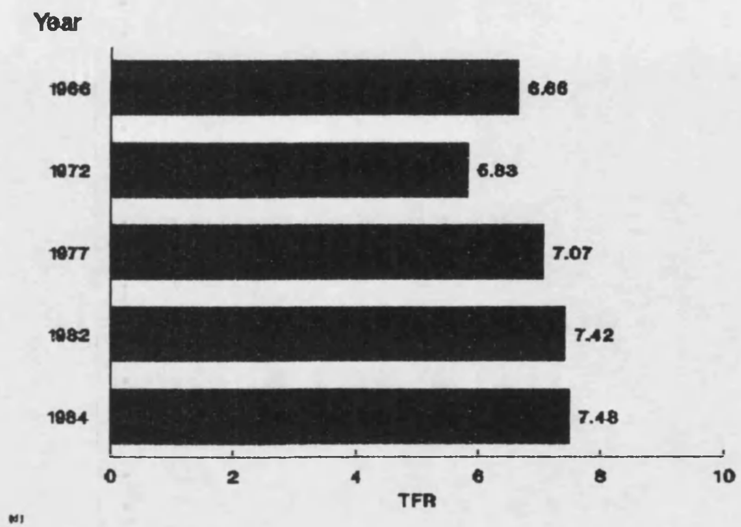


Fig 5.36(e) Reported TFR

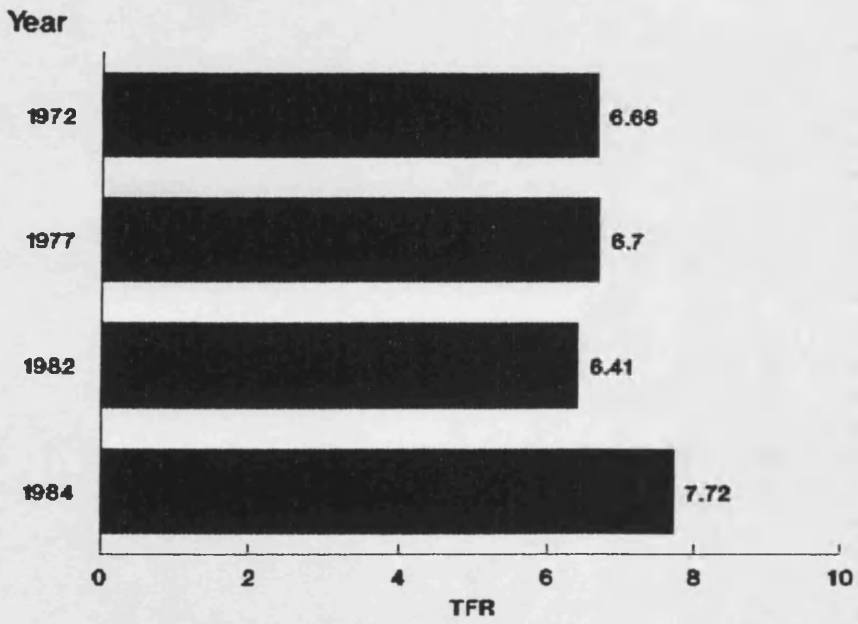


Fig 6.36(f) TFE derived from Reported
Children Ever Born (Brass Polynomial)

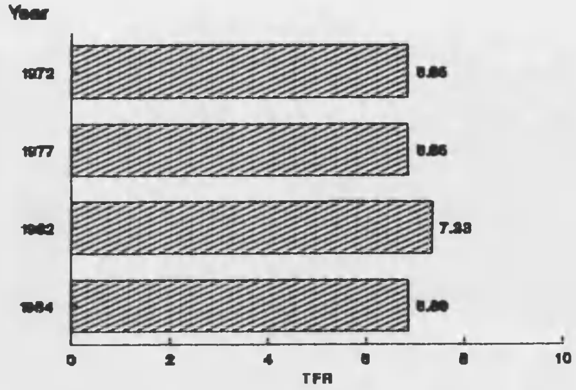
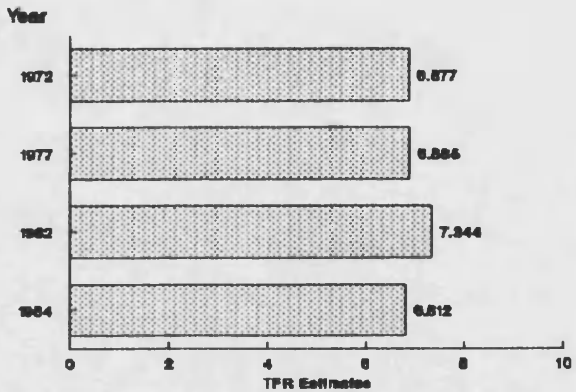


Fig 6.36(g) Children Ever Born
(women aged 45-49 years)



Examining the various estimates presented in section 5.4 above and illustrated in figures 5.36 one sees that the difference between one source and another is so small that it can be attributed to variations in the quality of data, sampling and differing assumptions for the estimation procedures. Notwithstanding these difficulties, the various procedures can be classified into two groups. Firstly, there are those procedures which portrays a rather constant fertility over time. These include most procedures suggested by Professor Brass. Secondly, there are those procedures which depicts a slightly rising trend.

Although the above analyses do not indicate a clear pattern of fertility trend one message is clear: that is, fertility has not declined during the period under review. For simplicity's sake one may conclude that fertility has

remained constant, even though it may have risen but if it has, the rate of increase must be very small.

Figures 5.16 to 5.19 above indicate that current fertility points are slightly above the mean parity points and according to Zaba(1981), in absence of any errors in the data, this is suggestive of a rise in fertility.

At national level, and for rural and urban areas, where it is possible to form a series of ASFR beginning from 1970-72 to 1984 another procedure was applied. This involved constructing hypothetical ASFR referring to the inter-survey period. Several procedures are currently available for carrying out this exercise (Artex,1973; Trussell,1981; United Nations,1983). In this study we have used Trussell procedure and the results of this exercise are given in Tables 5.23 to 5.25 below. The results indicate that the inter-survey fertility for the period 1977-82 was higher than for the period 1972-77. Moreover the estimated ASFR and TFR for the two inter-survey periods (1972-77 and 1977-82) were higher than the reported ASFR and TFR for 1972, 1977 and 1982. Putting aside the question of quality of data and the applicability and reliability of the estimation technique, this may be taken as additional evidence of a fertility rise.

Table 5.23

Estimates of ASFR and TFR for hypothetical "inter-survey" cohorts: Malawi

Malawi 1972-77

Age Group	Mean Parity	Hypothetical Cumulated Fertility	ASFR
15-19	0.4956	1.2219	0.2444*
20-24	2.2028	3.1781	0.3912
25-29	4.0979	4.9544	0.3553
30-34	5.7011	6.4309	0.2953
35-39	7.0192	7.4236	0.1985
40-44	7.6122	7.7695	0.0692
45-49	7.9784	8.0342	0.0529
		TFR =	8.0342

Note: * the value for age group 15-19 are very high. This is probably due to errors in the data, say age mis-reporting, sampling variations attributable to the small number of births occurring in this age group. There is also the additional problem arising from the general failure of various (fertility) models to describe the pattern of fertility at the beginning of childbearing period.

Malawi 1977-82

Age Group	Mean Parity	Hypothetical Cumulated Fertility	ASFR
15-19	0.4297	1.0406	0.2081*
20-24	1.863	2.6900	0.3299
25-29	3.5095	4.3219	0.3264
30-34	5.0837	5.7946	0.2945
35-39	6.4019	6.9548	0.2320
40-44	7.4021	7.7848	0.1660
45-49	8.0922	8.1488	0.0728
		TFR =	8.1488

Table 5.24

Estimates of ASFR and TFR for hypothetical "inter-survey" cohorts: Rural

1972-77

Age Group	Mean Parity	Hypothetical Cumulated Fertility	ASFR
15-19	0.504	1.2368	0.2474*
20-24	2.234	3.2498	0.4026
25-29	4.219	5.0931	0.3687
30-34	5.829	6.5618	0.2937
35-39	7.166	7.5812	0.2039
40-44	7.775	7.9375	0.0713
45-49	8.153	8.2101	0.0545
		TFR =	8.2101

1977-82

Age Group	Mean Parity	Hypothetical Cumulated Fertility	ASFR
15-19	0.435	1.0527	0.2105*
20-24	1.881	2.7105	0.3316
25-29	3.527	4.3339	0.3247
30-34	5.088	5.7920	0.2916
35-39	6.395	6.9458	0.2308
40-44	7.394	7.7785	0.1665
45-49	8.088	8.1446	0.0732
		TFR =	8.1446

Table 5.25

Estimates of ASFR and TFR for hypothetical "inter-survey" cohorts: Urban

1972-77

Age Group	Hypothetical Mean Parity	Cumulated Fertility	ASFR
15-19	0.399	1.0327	0.2065*
20-24	1.897	2.6966	0.3328
25-29	3.423	4.1746	0.2956
30-34	4.883	5.5177	0.2686
35-39	5.952	6.2165	0.1398
40-44	6.272	6.2849	0.0137
45-49	6.327	6.3713	0.0173
		TFR =	6.3713

1972-77

Age Group	Hypothetical Mean Parity	Cumulated Fertility	ASFR
15-19	0.38	0.9490	0.1898
20-24	1.75	2.5672	0.3236
25-29	3.409	4.2753	0.3416
30-34	5.118	5.9029	0.3255
35-39	6.553	7.1181	0.2430
40-44	7.528	7.8507	0.1465
45-49	8.077	8.1335	0.0566
		TFR =	8.1335

The possibility of a rise in fertility is consistent with the view held by other scholars of African demography who claim that most countries in Sub-saharan Africa have experienced enormous increases in fertility in the recent past. At a recent seminar at the LSE, Professor William Brass, one of the founders and moderators of "modern" African demography, categorically stated that he believes that there have been tremendous increases in fertility in Sub Saharan Africa over the last fifty years or so. Other researchers appear to hold the same view. Consider for example Moriba Toure who attributed the existence of the high rate of population growth to "high and rising birth rates everywhere".1 Writing in general terms, Dyson and Murphy(1986,92) have recently concluded that "increases in developing country fertility levels prior to the recent sharp declines have been widespread".

The suggestion of a slight increase in fertility is consistent with what one would expect given the nature and pattern of social and economic "development" that have taken place in Malawi. From a demographic point of view, after the Second World War, and especially after independence, there have been some improvements in the provision of social services, particularly in the field of health and education. For instance the widespread availability of ante-natal care, the large scale campaign against "major" diseases and sanitation programmes. These have led to the slight improvements in mortality as observed in the previous chapter. As a result of these changes in mortality the number of survivors to each age group, including the reproductive age groups, has increased and there have been a reduction in the number of widows. Therefore, the undoubted decline in mortality may be expected to exert some upward pressure on fertility since there will now be more women in the reproductive age groups.

In addition, following improved medical and health

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1 See Toure(1989;6).

facilities, it can be argued that the level of secondary sterility (as reflected by the proportion of childless women at the end of the child-bearing period) is expected to have declined. Table A5.1 and figure A5.1 (appendix IV) indicate a slight increase in the proportion childlessness between 1977 and 1984.

Furthermore, as a result of "return migration", as it is claimed in the literature, and the fall in the propensity to migrate as argued in this thesis (see chapter III), one can expect an increase in the proportion married and the length of time married couples spend together. In absence of contraception the likely end result of the above described changes is an increase in fertility.

Another aspect which has been associated with fertility increase in developing countries is the duration and frequency of breast-feeding. The amount of information available in Malawi on this subject is far from being complete. To date only one demographic survey namely the 1984 FFS has collected some information on breast-feeding. According to this source the average duration of breast-feeding is about 18 months. This estimate is slightly lower than the estimates given for the earlier periods. A study conducted in Dowa by Chimwaza(1982) indicated that children were breast-fed for 24 months. An earlier estimate for the same area given by Platt in 1939 was 36 months. Previous estimates suggest that mothers were breast-feeding their children for a period of up to two years()2. Therefore, if these estimates are accepted without question, it appears that the average duration of breast-feeding has declined from about three years to less than two years.

Other things being equal, if the decline in the duration in breast-feeding is indeed true as argued in the preceding paragraph, then in the absence of contraception (including induced abortion) fertility in Malawi is expected to have increased in the past.

Despite the above-described small but consistent favourable changes for a rise in fertility in Malawi, estimates presented in this study suggest that fertility has largely remained unaltered with some indications of a possible modest increase. The reason for this may be that the rate of change in fertility-inducing variables have been too low to counter other negative forces such as changes in the marital composition of the female population. The proportion of currently married women in the reproductive ages 15-49 has declined by about 4 percentage points (see Table 5.26 below).

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2 It must also be mentioned that one often encounters in the literature a suggestion that men were usually away from home on contract as migrant workers for a period of two years. This period, it is asserted, coincided with the period of breast-feeding and abstinence.

Table 5.26

Selected Female Demographic Characteristics:
Malawi: 1966 - 1984

	1966	1972	1977	1982	1984
Female aged 15-49 years over total population	25.0	24.8	23.4	22.6	21.4
Female aged 15-49 years over total female population		47.0	45.1	43.2	40.9
Married females aged 15-49 years over		72.9	77.6	73.4	69.3
Female aged 15-49 Married females aged 15-49 years over total female population		34.2	35.0	31.7	28.3
Married females aged 15-49 years over total population		18.1	18.1	16.5	14.8
Mean age of female population belonging to childbearing ages		29.7	29.1	28.9	29.2
Sex ratio for men aged 20-54 women aged 15-49	67.2	67.7	72.6	71.1	69.7

5.7 Age Structure of fertility

Almost all of the fertility studies conducted in Malawi so far have been concerned with the estimation of fertility levels. Very little effort has been made to determine the age structure of fertility. The study of the age pattern of fertility is useful in a number of ways. Firstly, in preparing population projections (national, school and labour-force projections) for development planning one needs to determine both the level and structure of fertility.

Secondly, when the level of fertility changes the structure also changes. With the adoption of the child-spacing programme and the possible changes in the fertility regulating behaviour when the programme gains wide-spread acceptability, studies in the age pattern of fertility are likely to become an area of research interest in the future.

Thirdly, the age structure of fertility of a given area may be indicative of the factors determining the level of fertility in that area. This assertion is particularly useful for countries such as Malawi where little is known about the factors influencing fertility, and arises from the fact that the shape of the fertility curve is determined by such factors as birth control practices and marital practices (divorce, re-marriage, separation and celibacy). For instance, the low values of ASFR observed in the age range 15-34 in Southern Region could be attributed to the existence of high levels of childlessness.

Examination in the preceding section has demonstrated that the age pattern of fertility is seriously distorted by age mis-reporting. Earlier attempts to correct these errors through the use of Brass polynomial function have proved unsuccessful. Besides, such procedures as Brass P/F method do not correct errors in the structure of fertility as they simply adjust the level of fertility at each age group using an "appropriate" multiplying factor. In addition the other estimation procedures employed in this study are more interested in providing robust fertility measure rather than the age pattern of fertility. In this section an attempt will be made to derive the age structure of fertility using Gompertz Relational Model (Zaba,1981).

Using the a and b parameters (presented in Table 5.9 above), the mean estimates of fertility obtained from the Gompertz method (Table 4.10) and the Ys(x) values (Table 5.8) model fertility distribution were constructed for Malawi and its sub-divisions. The fitted ASFR and TFR for the whole country, three regions and twenty four districts are given in Table 5.27 below. The fitted ASFR for the whole country and the three regions are illustrated in Figure 5.38.

Fig 5.37 Fitted ASFR using GRM: Malawi 1972 -1984

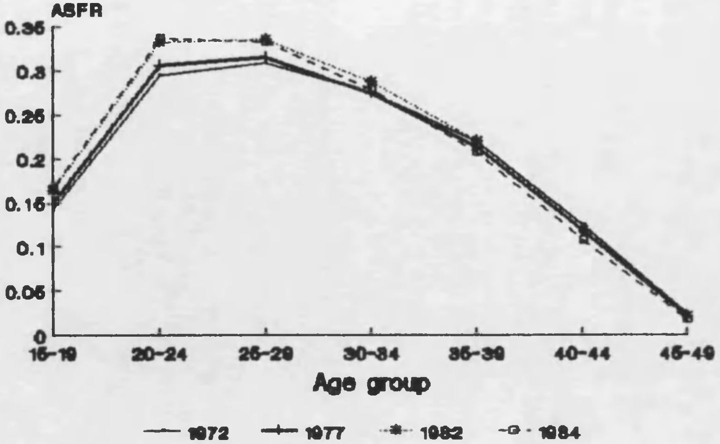

Fig 5.38 Fitted ASFR using GRM for Malawi and Regions: 1977

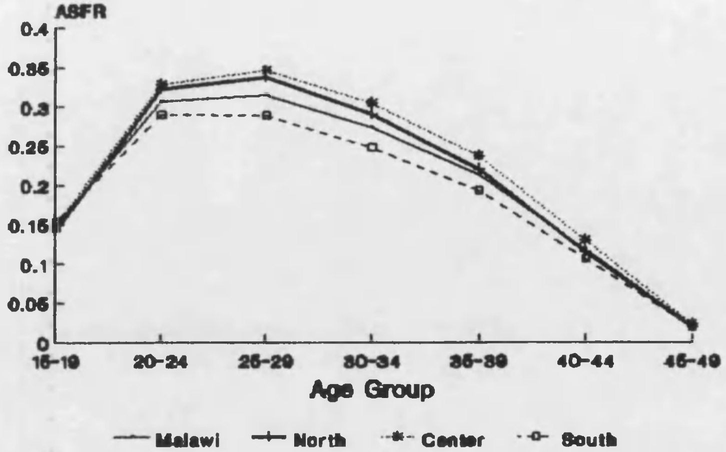

Fig 5.39 Fitted ASFR using GRM for Malawi (rural) 1972 -1984

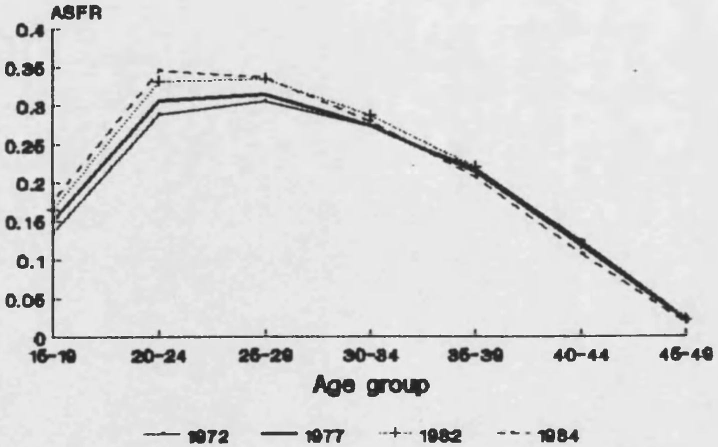

Fig 5.40 Fitted ASFR using GRM for Malawi (urban) 1972 -1984

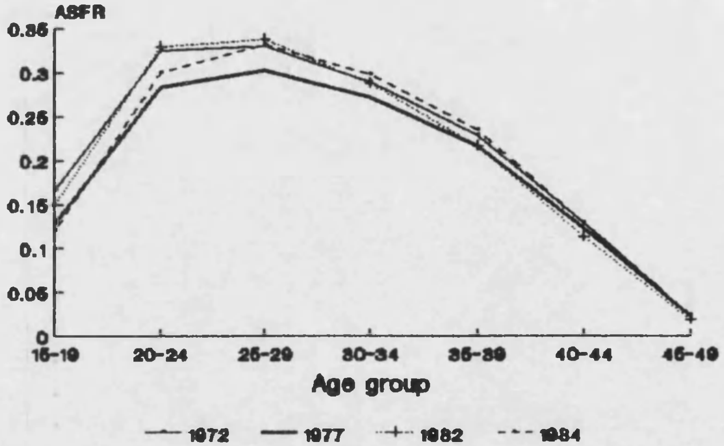

Table 5.27

Age Specific fertility Rates Obtained by fitting Gompertz Relational Model for Malawi, Regions+, Districts+, Rural and Urban

	15-19	20-24	25-29	30-34	35-39	40-44	45-49	TFR
Malawi	.149	.306	.314	.274	.214	.118	.021	7.00
Northern*	.142	.322	.337	.290	.220	.115	.019	7.24
Chitipa	.120	.278	.295	.257	.197	.104	.018	6.36
Karonga	.152	.314	.312	.262	.195	.101	.017	6.78
Rumphi	.138	.280	.285	.247	.191	.105	.019	6.34
Nkhata Bay	.110	.302	.343	.307	.237	.124	.021	7.22
Mzimba	.129	.307	.325	.281	.212	.110	.018	6.92
Central*	.148	.328	.346	.305	.238	.130	.023	7.60
Kasungu	.158	.332	.351	.315	.253	.145	.028	7.93
Nkhota Kota	.152	.303	.307	.265	.206	.113	.021	6.85
Ntchisi	.128	.282	.300	.267	.211	.117	.021	6.65
Dowa	.146	.345	.371	.320	.251	.134	.023	7.99
Salima	.150	.308	.315	.274	.214	.118	.021	7.02
Lilongwe	.151	.326	.339	.295	.228	.123	.022	7.44
Mchinji	.151	.320	.343	.313	.257	.151	.030	7.85
Dedza	.145	.307	.320	.282	.221	.123	.023	7.12
Ntcheu	.137	.311	.329	.288	.222	.119	.021	7.14
Southern*	.152	.289	.288	.248	.192	.106	.020	6.50
Mangochi	.153	.256	.246	.211	.167	.096	.019	5.77
Machinga	.162	.288	.283	.245	.194	.111	.022	6.55
Zomba	.168	.304	.291	.243	.183	.098	.017	6.55
Chiradzulu	.137	.284	.285	.242	.182	.096	.016	6.23
Blantyre	.141	.281	.288	.252	.198	.111	.021	6.47
Mwanza	.127	.309	.329	.285	.214	.110	.018	6.97
Thyolo	.157	.297	.299	.262	.208	.119	.023	6.85
Mulanje	.159	.287	.286	.251	.201	.117	.023	6.65
Chikwawa	.157	.294	.297	.261	.209	.120	.024	6.83
Nsanje	.160	.312	.310	.263	.201	.108	.019	6.89

Notes: (i) + 1977 Census (ii) * Regions

		15-19	20-24	25-29	30-34	35-39	40-44	45-49	TFR
	1972	.134	.288	.306	.273	.218	.123	.023	6.84
Rural	1977	.150	.307	.314	.274	.214	.118	.022	7.01
	1982	.165	.332	.335	.287	.221	.119	.021	7.42
	1984	.175	.345	.337	.280	.207	.107	.018	7.36
	1972	.166	.325	.330	.289	.228	.129	.024	7.48
Urban	1977	.128	.283	.303	.272	.217	.122	.023	6.75
	1982	.150	.329	.338	.288	.216	.112	.019	7.27
	1984	.121	.299	.331	.298	.235	.128	.023	7.19
	1972	.141	.294	.309	.275	.219	.124	.024	6.95
Total	1977	.149	.306	.314	.274	.214	.118	.021	7.00
	1982	.163	.332	.335	.288	.221	.119	.021	7.41
	1984	.166	.336	.333	.279	.208	.108	.018	7.25

A comparison of the reported and adjusted fertility schedules indicate that both curves have the same general shape and agree relatively well at age groups below 35 years of age (with the latter curve lying above the former). This shows that the Relational Gompertz model does not introduce a different age pattern of fertility. The latter has, however, an early and broad peak and a low rate for the last age group while the former has an early pattern with a high rate for the last age group. A similar observation is also made for the other neighbouring countries and Gaise(1976) observed the same for Ghana. As we have already noted above, this phenomenon could be attributed to the presence of some form of biases which could be said to be common through out this part of Africa and age mis-reporting appears to be the prime suspect. However more research into the various aspects of "age pattern of fertility" in Africa is called for before any conclusive statements can be made as regards to fertility at advanced age groups.

The fitted fertility distribution for the 1970-72 MPCS and the 1977 MPC are close to each other. The same can be said about the 1982 MDS and the 1984 FFS. It is however interesting to note that values of the last pair are higher than those of the first pair particularly for the age groups between 15 and 35 years. Assuming that these variations are not caused by errors, it can be suggested that they reflect either a change in fertility behaviour in that women below the age of 35 are now having more children than women aged above 35 years; or an increase in fertility caused by changes in the marital composition of the population as argued in section 5.5.2.

Since the former cannot be substantiated at this stage the latter looks somewhat credible.

The adjusted ASFR curves for the three regions reveal that the curve for the Centre is systematically above similar curves for the North and South whilst the curve for the latter is below the other two. The schedule for the North lies between these two, but closer to the curve for the Centre. This pattern is different from the one described in section 5.4 using observed ASFR whereby it was observed that after age group 35-39 the curve for the Northern Region fell below that of the Southern region. As suggested in that section and further demonstrated in appendix VI this pattern is feasible. Unfortunately, due to insufficient data, it is impossible to assess which of the two "suggested" patterns can be said to represent the age pattern of fertility for the three regions.

Lastly, because of the errors in the reported schedules, the available evidence suggest that the fitted values gives a better age pattern of fertility for the country and its sub-divisions than the observed values. It is interesting to note that the "fitted" age pattern of fertility closely resembles the pattern estimated by the NSO(1984b) employing a procedure described in United Nations(1967) which uses proportion of currently married and a standard schedule of marital fertility. This agreement can not only be taken as evidence that GRM gives a reliable age pattern of fertility, but also that a reliable pattern of fertility can be obtained through the use of GRM without assuming that fertility in Malawi is natural3.

5.8 Summary

In this chapter various methods of fertility estimation have been utilized in order to obtain plausible fertility measures for Malawi. As expected it has been shown that the level of fertility in Malawi is (and has been) very high by any standard and is among the highest in the region and on the continent. It is probable, however remote, that fertility has increased in the recent past. The various estimates calculated in this chapter suggest that TFR was around 6.5 children per woman in the mid-sixties, rising to around 7.0 and 7.5 children per woman in the early- and mid-seventies, respectively. The TFR estimates for the early-eighties appear to lie between 7.5 and 8.0 children. Unfortunately, because of the absence of necessary statistics, the factors responsible for the observed increase in fertility could not be fully documented. It has been suggested however that such factors as changes in breast-feeding patterns, marital variables and migration could be important. As expected for a developing country, the data upon which the estimates are based are undoubtedly unreliable as they are affected by various errors - age mis-reporting, memory failures in reporting past births and reference period errors - just to mention a few.

Fertility differentials in terms of rural-urban and regional differences has been related to social and

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3 For a definition of "natural fertility" and the applicability of this assumption for the population of Malawi see appendix V below.

economic development. Although it has been shown that fertility is "slightly" higher in rural than urban areas, it has also been suggested that this is a recent phenomenon with the earlier periods indicating a slightly higher fertility in urban than rural areas. Regional differentials indicate that fertility is highest in the Central region, followed by Northern region and the Southern region has the lowest fertility.

A combination of high but declining mortality, and high and possibly increasing fertility, as demonstrated in the previous chapter and in this chapter, respectively, is likely to result in rapid population growth. Rapid population growth has been associated with enormous pressure on the existing resources. Moreover the slow nature of social and economic development in developing countries is partly attributed to this factor. Thus the relationship of social and economic variables and demographic parameters in the Malawian context appear to be an interesting topic. Therefore the next chapter will attempt to study this relationship.

CHAPTER VI

POPULATION, SOCIETY AND ECONOMY

"Mutu umodzi susenza denga"
(One head cannot lift a roof)
A Chewa Proverb.

6.1 Introduction

The preceding chapters have in one way or the other touched upon the interrelationship between population and development in Malawi. In this chapter an attempt is made to study the inter-relations more closely than has been possible in the previous analysis. The ultimate objective is to relate the observed changes in the demographic variables to social and economic development. Like the other aspects of the study, the analyses presented in this chapter are hindered by the deficiency of existing data relating to the social and economic characteristic of the population. This is particularly serious at regional and district levels. As a result of this handicap, most of the analyses presented in this chapter are limited to national level statistics.

The first part of the chapter presents a brief review of the Malawi′s development plans since 1964. Emphasis is placed on the period after independence since that is the time when the people of Malawi assumed the responsibility for determining their future. Like any other independent developing country, soon after independence in 1964, Malawi embarked on ambitious, but important, "development" projects in various sectors of the economy. Several examples could be mentioned to illustrate this notion, for instance the establishment of the University of Malawi in 1964, the construction in 1971 of a railway line to link Malawi and the seaport of Nacala in Mozambique and the transfer of the seat of the government from Zomba to Lilongwe in 1975, to mention just a few. Naturally, these undertakings have affected the functioning of the various members of the society and the overall standard of living in the country. As mentioned in chapter I, one of the objectives of moving the capital from Zomba to Lilongwe was to foster equitable distribution of development and population.

The effect of some of these projects has attracted the attention of a number of researchers[1]. The demographic consequences of the projects have however received very little attention although some social scientists have pointed out about their effects. For instance Kishindo(1988) has shown how the matrilineal system has adapted to changing social, demographic and economic conditions and has partly attributed the problems faced in the education system in Malawi to "long term demographic variables". This will form the basis of discussion in this chapter. It will be argued that although success has in no doubt been achieved in most sectors of the economy, in almost all of them this success is hampered by the rapid population growth the country is experiencing. Two aspects should be borne in mind when reading this chapter. Firstly, this chapter hopes to clarify the above stated assertion: that

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1 Potts(1987) has examined the process of urbanization in Malawi paying special attention to the development of the new capital: Lilongwe.

population growth has hindered economic development. Secondly, the chapter hopes to demonstrate that the policy and decision makers should have known about the dangers of rapid population growth had they included the population variable when the plans were being drawn. The two objectives complement each other and a complete examination of both subjects deserve studies of their own. Before examining the various sectors of the economy, an understanding of the "development process" seems in order. This is presented in the next section.

6.2 Development Planning in Malawi

National development planning in Malawi is the responsibility of the National Development Council (NDC) which has the Department of Economic Planning and Development (DEPD) in the Office of the President and Cabinet (OPC) as its secretariat (MG,1969).

From the stated national plans, various government ministries and departments draw up their own enlarged versions of the plan2. These are meant to clarify how the objectives set out by the NDC will be carried out in practice.

There is no doubt that, the ministries and departments on the one hand and the NDC and DEPD on the other hand, work together in drawing up the national plan. The former acting as a consultant in so far as technical and professional matters are concerned.

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2 To distinguish the two, the former will be referred to as the "national plan" and the latter as the "individual plan".

Unfortunately, certain ambiguities in such aspects as which of the two comes first are apparent to the general observer. Moreover, in certain instances, there seem to be differences in contents which could not easily be interpreted as changes in the policies. For instance the first statement of development policies stated that during the planning period (1971-1980) no additional health facilities will be built whereas the first health plan covering the period 1973-1980 recommended the building of additional health units. In addition the present Health plan aims at reducing infant mortality from the prevailing rates of 151 infant deaths per 1000 live births "by a third over (the) five year period, 1987-1991" (OPC-DEPD,1987,112). At the same time the MOH estimated that infant mortality was 100 infant deaths per 1000 live births (MOH,1987c).

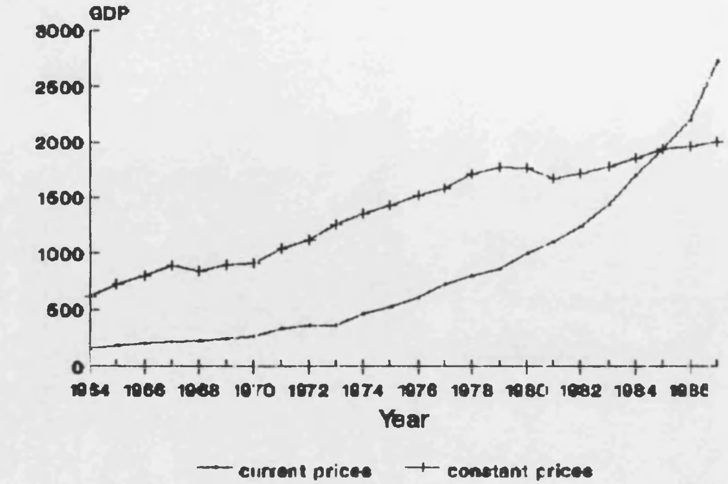
At the time of independence the national plans were formulated for a period of five years. The first post-independence plan covered the period 1964 to 1969 (MG,1965). This concentrated on improving the agricultural sector and laying out the infrastructure: roads, schools and hospitals. Five years however proved to be insufficient for a sound programme to be implemented and the period was extended to ten years. The first ten-year plan, published in 1971, covered the period 1971 to 1980 (OPC-EPD,1971). The second ten-year plan covering the period 1986 to 1997 was released in 1987 (OPC-DEPD,1987). During the transition period from the five to ten year plans the government prepared two development programmes: 1968-70 and 1970-72 (MG,1968, 1970). These documents will form the basis of government policy outlined in this section.

The overall objective in all these plans is to "improve the standard of living of the people". In order to achieve this objective and in the light of the background of Malawi (say the lack of exploitable mineral resources) emphasis is placed on improving the agricultural sector so as to be "self-sufficient" in food and to earn the much needed foreign exchange by selling the surplus, and the few cash crops which can be grown in Malawi (tea, tobacco, sugar). Looked at it in this way, all the other sectors of the economy appear to be relegated to a secondary position and are there to help in the attainment of the stated agricultural policies. It was because of this emphasis on agriculture that some researchers argue that the improvements of health facilities in Malawi took place only in those areas with agricultural potential (Coleman,1979).

6.3 Income

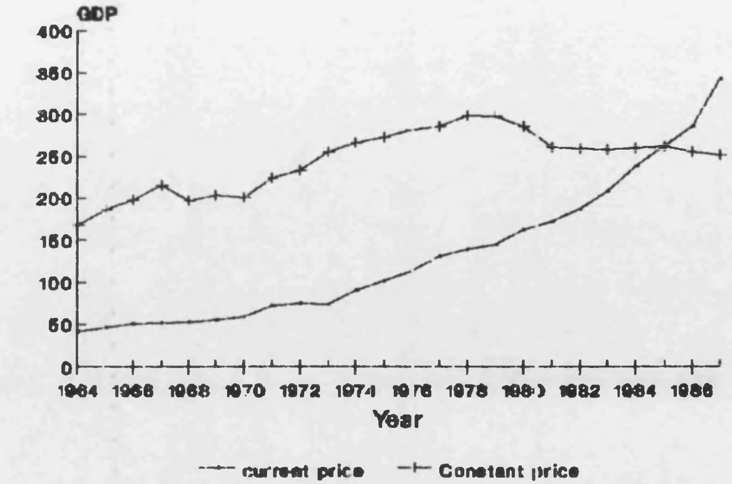
The decline in mortality observed in chapter IV could be attributed to the overall improvement in the general standard of living. Several indices are used to determine the "standard of living" of a given population and one such measure is income per capita. Although by international standards Malawi remains a least developed country, as seen

Fig 6.1 Gross Domestic Product: 1964-84



GDP values are in Malawi Kwacha.

Fig 6.2 GDP per capita: 1964 - 1984



GDP values are in Malawi Kwacha

Fig 6.3 GDP for Malawi (1964-1984)
(index 1964 = 100)

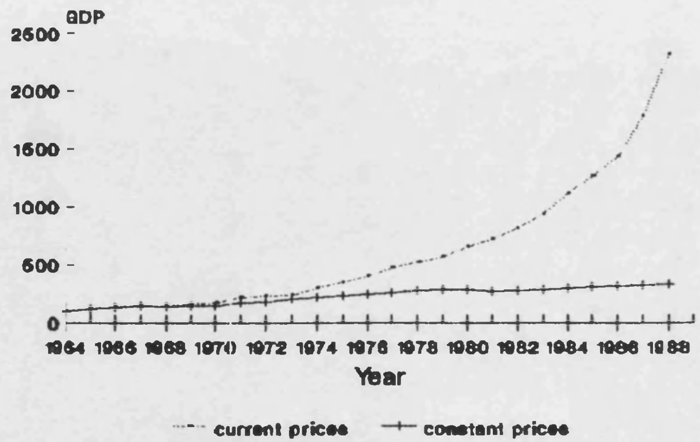


Fig 6.4 GDP per capita: 1964 - 1984
(index 1964 = 100)

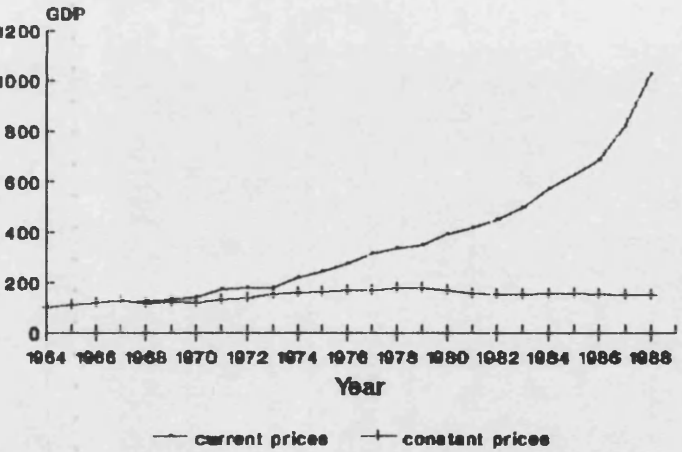


Fig 6.4a Average Monthly Earnings

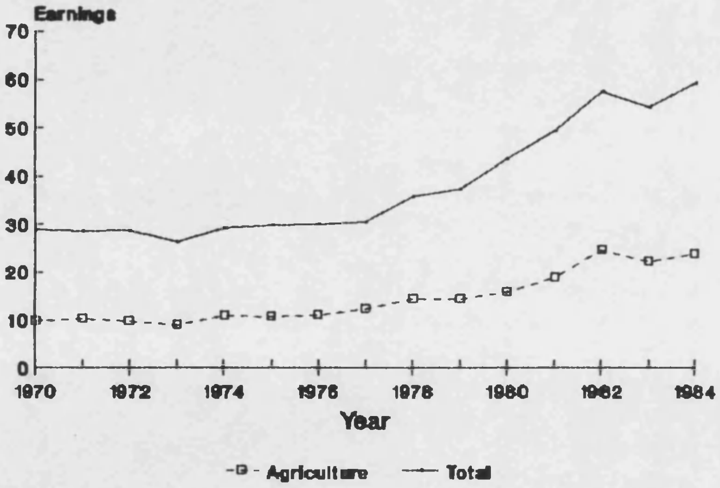
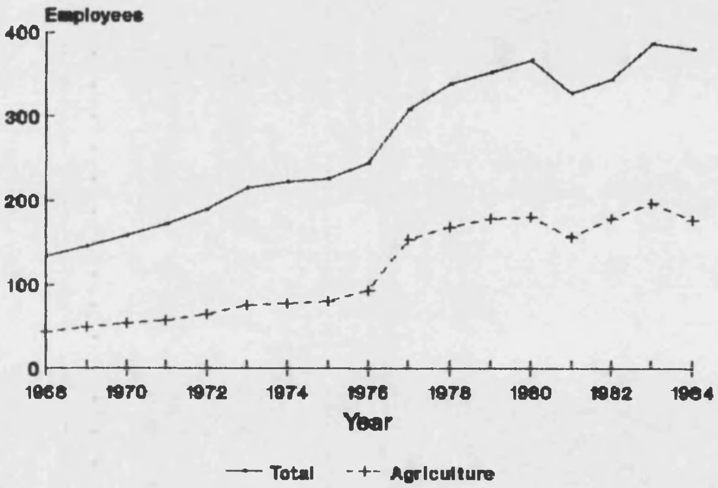


Fig 6.4b Number of Employees (1968-1984)



chapter I, income per capita show some improvement during the twenty year period 1964 to 1984 (see figures 6.1 to 6.4). This is particularly significant in the years 1964 to 1979.

In the "long run" higher levels of social and economic development is usually believed to lead to fertility decline. However, in the "short run", there is a growing body of evidence suggesting fertility increase in the early days of social and economic progress. The "near constancy" observed in the fertility may therefore be a reflection of the slow change in the "standard of living" that has taken place in Malawi. Assuming that other fertility correlates remain constant, a rise in fertility as suggested in this thesis, is still consistent with the changes that have occurred in the other demographic variables.

To measure the amount of income available to an individual in Malawi two indices were used: the minimum daily wage and the average earnings for those in "gainful" employment (see Table 6.1 and Table 6.1b respectively).

The minimum daily wage differs from one area to another, with cities and municipalities having a higher wage rate than all other areas. Table 6.1 also shows that during the twenty year period (1964-1984) the minimum daily wage has been reviewed six times: in 1965, 1967, 1973, 1980, 1981 and 1982. The adjustments in the last three consecutive periods could be related to adverse economic performance observed in early 1980s. The same could be said of the 1973 increase.

In general terms the data indicate a very small increase of the minimum daily wage. The same conclusion is reached if the average earnings data are examined (see Table 6.1b and Figures 6.2). This could partly be explained as reflecting a deliberate government policy (Giles and Jennings,1982). A government report published in 1970 designed to attract investors into Malawi noted that:

> under-employment in urban areas is a serious problem, so that labour intensive industries are particularly suitable for conditions in Malawi. ... Wages are generally rather low and the government is anxious to restrain wage inflation. (MG,1971,p.34).

It is the contention of this writer that the success of the above policy relies on the existence in Malawi of a large army of able bodied men ready to take up employment at any price. The latter depends on rapid population growth which implies a constant supply of men in the working age groups. The view that the availability of men is beneficial to the country is expressed in the first post-independence development plan in the following manner:

> For the country, although at present deficient in capital assets, has available a store of human resources. (MG,1965,7)

Table 6.1

Statutory Minimum Daily Wage Rate (in Tambala)

Year	Blantyre	Lilongwe	Mzuzu	Zomba	Other
1964	32	28	28	28	18
1965*	35	30	30	30	21
1966	35	30	30	30	21
1967*	38	32	32	32	23
1968	38	32	32	32	23
1969	38	32	32	32	23
1970	38	32	32	32	23
1971	38	32	32	32	23
1972	38	32	32	32	23
1973*	40	35	35	35	25
1974	40	35	35	35	25
1975	40	35	35	35	25
1976	40	35	35	35	25
1977	40	35	35	35	25
1978	40	35	35	35	25
1979	40	35	35	35	25
1980*	45	44	40	40	30
1981*	70	70	60	60	50
1982*	81	81	69	69	58
1983	81	81	69	69	58
1984	81	81	69	69	58
1985*	100	100	85	100	70

Source: Compiled from various Statistical Yearbooks

Notes: (i) The years with an asterisk (*) indicate when the minimum wages were revised.
(ii) 100 Tambala = 1 Kwacha

Table 6.1b

Average Monthly Earnings: 1970-1984

	Agriculture	Total
1970	9.78	29.02
1971	10.27	28.59
1972	9.76	28.86
1973	8.96	26.47
1974	10.85	29.21
1975	10.75	29.90
1976	11.10	30.11
1977	12.31	30.51
1978	14.47	35.83
1979	14.41	37.45
1980	15.91	43.66
1981	18.87	49.31
1982	24.71	57.58
1983	22.17	54.25
1984	23.83	59.25

6.4 Health

Soon after independence the ruling Malawi Congress Party (MCP) identified three major obstacles to Malawi's development process: namely poverty, ignorance and disease. The importance of disease is further reflected by its inclusion in the opening verse of the Malawi national anthem (God bless the land of Malawi).

> O God bless our land of Malawi
> Keep it a land of peace
> Put down, each and every enemy
> Hunger, disease, envy[3]
> Join together all our hearts as one
> That we be free from fear
> Bless our leader, each and everyone
> and Mother Malawi.

Since then the Government of Malawi has concentrated its efforts to fight the above stated obstacles. The main

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3 The underlining is by this writer to emphasise the point.

concern of the MOH has been to see to it that the entire population of Malawi is well served with public health measures.

During the nine year period 1964 to 1973, the government spent its meagre resources on the expansion of the existing hospitals (district and central/General hospitals) which were located in cities, major towns or district centres; and were thus designed to serve mostly the government officials located in these centres rather than the rural population per se .

In addition to this, relative to what was spent in other sectors like education and agriculture, the amount spent on health was quite minimal. Moreover it can be deduced that during this period the health sector was accorded low priority. This is reflected by the fact that not more than 2 percent (on development account) was spent on health (see Table S6.1). Therefore, the minimal investment that took place in the health sector during the first post-independence decade, could be expected to have limited effects on the improvement of the mortality situation in Malawi. Accordingly the gradual decline in mortality indicated in the preceding chapter on mortality could partly be related to this finding.

The government launched its first health plan in 1973. It was based on the 1971 World Health Organization (WHO) recommendation which suggested the following four-level structure of health units in a single district: the district hospital continued to act as a supervisory and advisory centre on all health issues in the district.

Below it and for every 50,000 people, rural hospitals (primary health centre) with dispensary, maternity and laboratory facilities were to be provided. Under each of these were five sub-centres, one for every 10,000 people and each made up of a dispensary and maternity unit. The core unit of the system was the health post which was supposed to serve 2,000 people.

The plan raises two issues which are relevant to a demographer. Firstly, the plan was demographic as seen from the fact that each unit was meant to serve a "specified population". Secondly, for the first time, there was a positive shift in the provision of health services from being urban-biased towards serving the rural population. Accordingly, this move could be expected to have a greater impact on the health of the rural population by reducing the level of IMR and maternal mortality for this population.

Basing on the above described plan the population of each district was projected and the expected health facilities calculated. The results of this exercise for selected years are presented in Table 6.2 below. The actual number of health facilities for corresponding years were also assembled from various statistical reports and these are also presented in Table 6.2 below.

Table 6.2

Expected and Actual Number of Rural Hospital by District for selected Years

	Expected		Actual		Deficiency	
	1981	1983	1981	1983	1981	1983
Malawi	128	138	38	38	90	100
Northern Region	15	16	11	11	4	5
Chitipa	2	2	1	1	1	1
Karonga	2	3	2	2	0	1
Nkhata Bay	2	2	2	2	0	0
Rumphi	1	2	3	3	-2	-1
Mzimba	7	7	3	3	4	4
Central Region	50	54	16	16	34	38
Kasungu	5	5	2	2	3	3
Nkhota Kota	2	3	1	1	1	2
Ntchisi	2	2	-	-	2	2
Dowa	6	6	2	2	4	4
Salima	3	3	-	-	3	3
Lilongwe	16	17	5	5	11	12
Mchinji	4	4	2	2	2	2
Dedza	7	7	4	4	3	3
Ntcheu	5	6	-	-	5	6
Southern Region	64	68	11	11	53	57
Mangochi	7	8	1	1	6	7
Machinga	8	9	3	3	5	6
Zomba	8	8	1	1	7	7
Chiradzulu	4	4	1	1	3	3
Blantyre	9	10	-	-	9	10
Mwanza	2	2	1	1	1	1
Mulanje	7	8	2	2	5	6
Thyolo	11	11	-	-	11	11
Chikwawa	5	5	1	1	4	4
Nsanje	3	3	1	1	2	2

Note: (i) - not available

(ii) Population projections were carried out using exponential formulae and inter-censal growth rate. The projected population was the divided by 50,000 to get the expected number of rural hospitals.

(iii) Deficiency equals Expected minus Actual. A positive value of deficiency indicates that the number of expected health facilities exceeds the available (actual) facilities in the area (country or region or district), that is there is a shortage (deficit) of facilities. A negative value however indicates the opposite: a surplus of health facilities.

Table 6.3

Expected and Actual Number of Sub Centres
By District For Selected Years by district

	Expected		Actual		Deficiency	
	1981	1983	1981	1983	1981	1983
Malawi	642	690	237	268	405	422
Northern Region	74	79	47	53	27	26
Chitipa	8	9	5	5	3	4
Karonga	12	13	5	4	7	9
Nkhata Bay	12	12	8	11	4	1
Rumphi	7	8	4	5	3	3
Mzimba	35	37	25	28	10	9
Central Region	249	268	62	71	187	197
Kasungu	24	26	10	10	14	16
Nkhota Kota	12	13	12	11	0	2
Ntchisi	10	11	3	3	7	8
Dowa	28	29	5	6	23	23
Salima	15	16	1	2	14	14
Lilongwe	81	86	14	18	67	68
Mchinji	19	21	3	3	16	18
Dedza	34	36	6	10	28	26
Ntcheu	27	30	8	8	19	22
Southern Region	319	342	128	144	191	198
Mangochi	37	41	8	11	29	30
Machinga	40	44	9	10	31	34
Zomba	38	40	9	11	29	29
Chiradzulu	19	20	3	3	16	17
Blantyre	47	51	28	32	19	19
Mwanza	9	10	1	1	8	9
Mulanje	36	38	33	35	3	3
Thyolo	54	57	31	31	23	26
Chikwawa	24	26	5	8	19	18
Nsanje	14	16	1	2	13	14

Note: (i) See table 6.2 above. The projected population was the divided by 10,000 to get the expected number of rural hospitals.

(ii) See notes (ii) and (iii) in Table 6.2 above.

Table 6.4

Expected and Actual Number of Health Post By District For Selected Years

	Expected		Actual		Deficiency	
	1981	1983	1981	1983	1981	1983
Malawi	3,208	3,451	306	336	2,902	3,115
Northern Region	371	397	55	67	316	330
Chitipa	41	43	9	11	32	32
Karonga	61	65	12	11	49	54
Nkhata Bay	58	62	7	9	51	53
Rumphi	37	40	7	9	30	31
Mzimba	174	187	20	27	154	160
Central Region	1,245	1,342	117	125	1,128	1,217
Kasungu	119	132	10	13	109	119
Nkhota Kota	58	64	7	7	51	57
Ntchisi	50	53	6	6	44	47
Dowa	138	145	3	6	135	139
Salima	76	82	8	12	68	70
Lilongwe	403	431	44	40	359	391
Mchinji	95	104	4	5	91	99
Dedza	169	181	17	17	152	164
Ntcheu	136	149	18	18	118	131
Southern Region	1,593	1,712	134	144	1,459	1,568
Mangochi	184	203	18	20	166	183
Machinga	201	218	12	15	189	203
Zomba	192	201	10	11	182	190
Chiradzulu	95	98	5	5	90	93
Blantyre	236	254	14	15	222	239
Mwanza	44	49	5	7	39	42
Mulanje	181	192	20	20	161	172
Thyolo	268	284	20	19	248	265
Chikwawa	119	131	20	21	99	110
Nsanje	70	79	10	11	60	68

Note: (i) See Table 6.2 above. The projected population was the divided by 2,000 to get the expected number of rural hospitals.

(ii) See notes (ii) and (iii) in Table 6.2 above.

A comparison of the "expected" and "actual" number of health facilities reveals several things. Firstly, the tables indicate that the "1973 health plan" was not realized. For instance in 1983, ten years after the scheme was adopted, there was a deficit of 100 rural hospitals, 422 sub-centres and 3,115 health posts (see Tables 6.2, 6.3 and 6.4). The difference is greater the lower the level of the hierarchy. This indicates that the implied effects of the plan on the rural population should not be exaggerated.

Several factors could be suggested for this and these include limited financial resources, lack of commitment on the part of the government and insufficient insight at the planning stage to the implication of population growth on the scheme initiated. The last point will be illuminated further below. The first factor is by all means the major constraint faced by all developing countries. The second point however arise from the fact that despite the acceptance by the government to follow WHO's recommendation evidence do suggest that it continued to execute its priority of renovating the existing health facilities (Msukwa,1981). Kydd(1987) makes a similar observation in as far as economic policies are concerned.

Secondly, the difference between the "expected" and "actual" number of health facilities suggests that the gap is smallest in the Northern region and largest in the Southern Region. The Central Region occupies the middle position with values closer to Southern Region. This further strengthens the earlier assertion that the Northern Region is better served with health facilities than the Central and Southern Regions.

Thirdly, Tables 6.2-4 also reveal a weakness which should be borne in mind in future health planning. Whereas there is no doubt that the structure proposed in the 1973-80 Health plan has enormous advantages, preliminary analysis of the situation in 1973 could have forewarn the planners (both the local personnel and the WHO experts) that to achieve the desired goals would require a vast amount of money which is outside the reach of most developing countries like Malawi, and requires a large sum of international and overseas aid.

Apart from the inadequate facilities, as demonstrated in the preceding paragraphs, the country also faces a shortage of medical and para-medical personnel. Ham(1989) and Msowoya(1990) have noted that "more Malawian doctors practice in the City of Manchester in England than in the whole (of) Malawi".

The overall situation of the medical personnel appears not to have changed much during the period 1964 to 1984. Assuming that all Medical Officers displayed in Table 6.5 below represents fully qualified medical doctors, it can be that concluded population growth surpassed the rate of increase of medical doctors. This arises from the fact that in 1968 one doctor was expected to serve 45,046 people. This ratio increased to 1:47,997 in 1974, 1:53,031 in 1981, 1:54996 in 1982 and to 1:55054 in 1984. It is hoped that with the opening of the Faculty of Medicine within the University of Malawi (in October 1991) the overall situation regarding the number of medical doctors will be improved.

The only exception seems to be that of the Nurses and Midwives, Clinical officers and Medical Assistants. The increase in the number of Clinical Officers and Medical Assistants can be attributed to the opening up of the Lilongwe School of Health Sciences in 1976 whereas the rise in the State Registered Nurses and Mid Wives is attributable to the establishment of Blantyre School of Nursing in 1965 and Kamuzu College of Nursing in 1980.

The above changes in the medical professions relates favourably to the slow rate of mortality reduction observed in the previous chapter. The moderate improvement in mortality can be attributed to changes in such para-medical professions as Clinical Officers, Nurses and Mid-wives. This arises from the observation that because of the absence of medical doctors a number of health posts are manned by these medical personnel. It is also frequently observed that even in hospitals having a qualified medical doctor, the above-mentioned personnel are responsible for most tasks which would normally (in a developed country) be handled by the former.

Table 6.5

Medical and Paramedical Personnel in Malawi
for Selected Years: 1968 - 1984

	1968(1)	1974(2)	1981	1982	1984
Medical Officers	95	106	121	121	130
Clinical Officers	-	49*	107*	215	184
Medical Assistants	435	473	547	628	579
State Registered Nurses and Mid Wives	174	313	402	521	388
Enroled Nurses and Enroled Mid Wives	146	706	1,293	1,628	1,614
Nursing Aides	-	503	-	-	-
Dentists	3	8	6	12	5
Dental Technicians	-	5	6	27	30
Dental Assistant	-	-	-	9	10
Dental Aides	-	5	-	-	-
Pharmacists	6	18	11	12	6
Pharmacetial Assistant	-	3	16	42	25
Pharmacetial Tech	-	19	-	1	1
Pharmacetial Aides	-	4	-	-	-
Physio/Occupational Therapist	2	-	-	6	4
Laboratory Technicians	3	19	31	43	28
Laboratory Assistant	-	35	85	96	75
Laboratory Aides	-	29	-	-	-
Radiographers	3	6	10	24	4
X-ray Assistant	-	1	2	12	12
Dark Room Aides	-	-	-	-	-
Health Inspectors	7	38	42	89	41
Health Assistants	118	76	4	-	41
Health Educators	-	2	161	169	153
Home-craft Workers	-	90	113	-	-
Vaccinators	-	2	-	-	-
Medical/Nursing Aides	-	170	1,701	-	-
Maternal and Child-health Assistants	-	-	32	-	-
Other		20	1,203	2,453	2,457
TOTAL	992	2,700	5,893	6,108	5,787

Source: (1) Compendium of Statistics 1970.
(2) Msukwa(1981) quoting MOH Medical and Paramedical Personnel Survey of 1973.
(3) complied by the writer from various issues of Malawi Statistical Yearbooks.

Notes: (i) * includes 15 and 46 Senior Clinical Officers in 1974 and 1981 respectively.
(ii) There were 16, 163, 3 and 3 Malawian doctors, State Registered Nurses and Midwives, Dentists and Pharmacists in 1974.

The number of population per hospital bed was further employed to illustrate the changes that have taken place in the health sector. These are given in Table 6.6 together with the corresponding "estimated" total population and the "reported" total number of hospital beds in Malawi. The total number of hospital beds has increased from 4,951 in 1966 to 9,197 in 1976 and 12,119 in 1984.

Examining the number of people served by one hospital bed (see Table 6.6) it can be noticed that there was a tremendous decrease in the number of hospital beds during the late sixties. This was followed by moderate decline in the seventies and in early eighties there was a slight increase in the ratio.

This pattern is attributable to the programme of expansion of the existing health facilities which the government adopted soon after independence. The stagnation in the expansion of hospital beds might be related to the stagnation in mortality as suggested in Chapter IV and could be explained in terms of the slight change in policy emphasis following the adoption of "1973 health plan".

Table 6.6

Hospital Beds and Population per Hospital Bed: Malawi 1966 - 1984 (various years)

Year	Population	Hospital Beds	Population per Hospital Bed
(1)	(2)	(3)	(4) = (2)/(3)
1966	4,039,583	4,951	816
1968	4,279,405	6,593	649
1970	4,533,465	7,425	611
1972	4,802,607	7,643	628
1974	5,087,728	9,053	562
1975		8,991	
1976	5,389,777	9,197	586
1977	5,547,460	9,617	577
1979	5,966,289	10,834	551
1980	6,187,416	11,375	544
1981	6,416,739	11,664	550
1982	6,654,562	11,664	571
1983	6,901,199	11,918	579
1984	7,156,976	12,119	591

Notes: (2) Calculated using the exponential formulae and the inter censal growth rate, except for 1966 and 1977 in which case the figures were taken from relevant census reports.

(3) obtained from various statistical reports.

6.5 Education

Table 6.7 shows the number of students enroled at selected levels of educational institutions in Malawi for the period 1964 to 1984. These are illustrated in Figures 6.5, 6.6, 6.7 and 6.8.

Enrolment rose for all the categories. The most outstanding increase occurred in the post-primary sector with the university component registering the greatest increase. This is obviously a consequence of the establishment of the national university (University of

Malawi) in 1964. Prior to this date, Malawians seeking university education had to go abroad (such places as Makerere in Uganda, University of Rhodesia and Nyasaland - later University of Rhodesia and now University of Zimbabwe - and Fort Hare in South Africa were popular). However due to the long distances involved and the fact that these universities had to serve other countries apart from their own, the numbers involved were naturally very small.

The growth in the secondary sector can be explained in terms of the government policy of building one government "day" secondary school in each district, which was initiated in 1961 soon after the establishment of the "self government" (USAID,1964).

The gradual increase in the primary sector can be attributed to the fact that very few primary schools have been built using government funds. The policy of the government is to leave the construction of the primary schools in the hands of the local community through the "self help" approach. This has the effect that only those communities with great respect for education will build more schools.

Table 6.7

School Enrolment by Educational Type

Year	Primary	Secondary	University	Teacher
1964	359,841	5,951	180	1,368
1965	337,720	7,573	87	1,340
1966	286,056	6,539	498	1,180
1967	297,456	7,921	672	1,085
1968	333,876	9,529	847	1,079
1969	333,996	10,930	977	984
1970	333,102	11,736	987	1,081
1971	362,561	12,868	1,040	1,321
1972	430,504	13,451	1,085	1,306
1973	481,524	13,779	1,059	1,283
1974	537,301	13,900	1,123	1,050
1975	611,678	14,489	1,146	1,343
1976	641,709	14,826	1,179	1,433
1977	663,940	15,140	1,153	1,653
1978	675,740	15,559	1,386	2,855
1979	705,956	16,488	1,619	1,754
1980	779,676	18,006	1,722	1,757
1981	809,862	19,110	1,829	1,808
1982	882,903	19,382	1,810	1,890
1983	868,849	22,245	1,961	1,920
1984	847,157	24,342	1,964	1,954
1985	899,459	25,177	1,974	1,802

Source: Various issues of Malawi Statistical YearBooks and Education Statistics.

Note: 1. Enrolment figures excluded non-integrated Schools.

2. Some of the fluctuations in the reported statistics can be attributed to changes in the structure of the education system in Malawi. In 1964 the Primary course was shortened to seven years and the secondary course lengthened to five years. In 1966 the original course of eight years primary was reverted to with the result that there was no form I in that year. Beginning October 1969 the "academic year" was changed from one that coincided with the calendar year to run from October to September.

Fig 6.5 Number of Primary School Pupils (1964 - 1984)

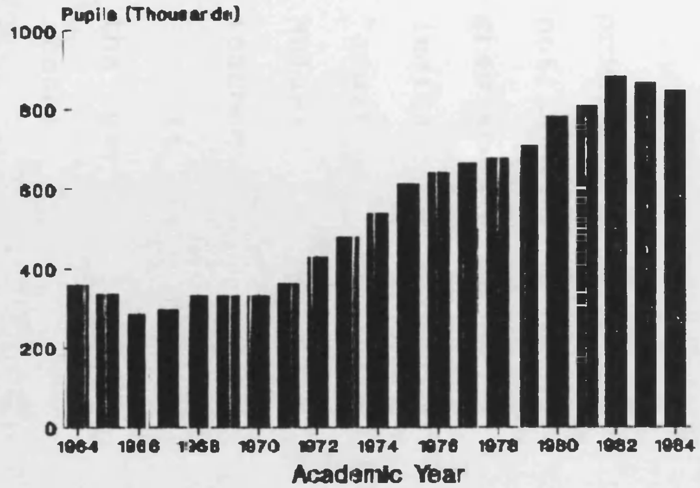


Fig 6.6 Number of Secondary School Students (1964 - 1984)

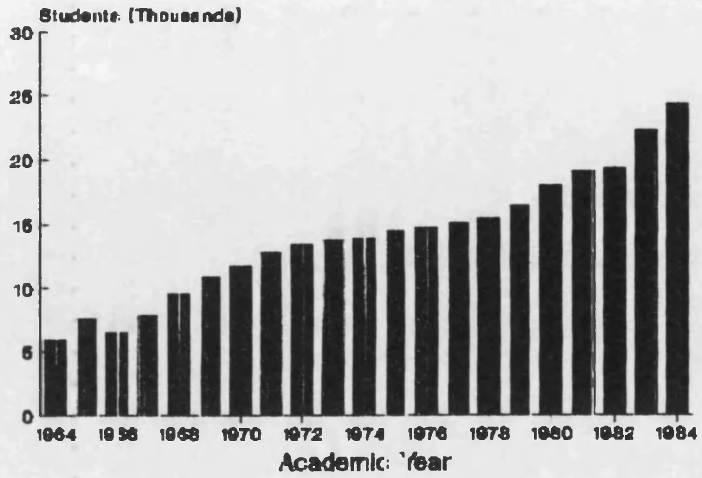


Fig 6.7 Number of University Students (1964 - 1984)

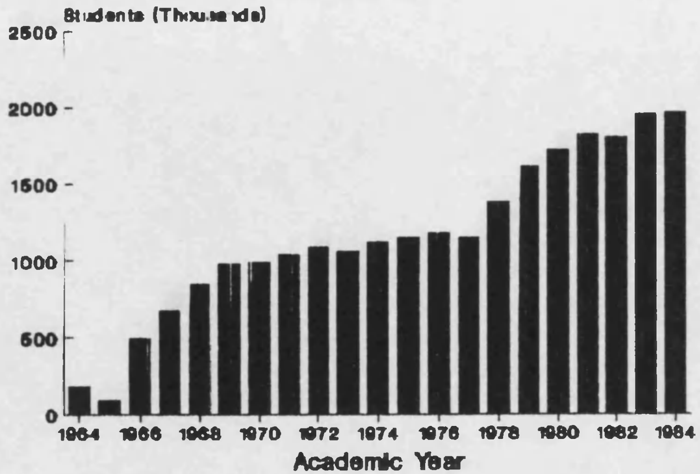
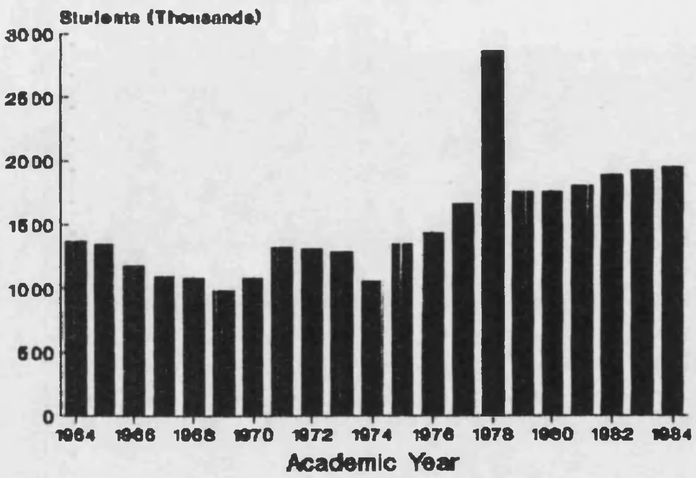


Fig 6.8 Number of Students at Teacher Training Colleges: TTC (1964 - 1984)



The number of students enroled at Teacher Training Colleges (TTC) show the smallest overall increase. This may be a reflection of the failure to attract more people to join the teaching profession possibly as a result of the low "status" ascribed to the profession. The available data indicate that in the immediate post-independence period (1964 to 1969) there was a slight decline in the number of people joining the TTC. This could be the consequence of the availability of employment in other sectors of the economy following independence in 1964. The "spurious" increase in 1979 in the number of students at TTC could be explained by the opening up of a new TTC at Mzuzu and the subsequent decline in the following year could be due to closure of some mission-run TTC.

Examining the changes in the number of pupils in primary schools and the number of students in TTC one notices that during the period under review the former grew at a faster rate than the latter. Tentatively, this indicates that there were more "additional pupils" than "additional teachers" entering the education system in Malawi, thus putting more pressure on the existing teachers.

It was stated in 1973-80 Education Plan that one of the government′s objectives was to raise the primary school enrolment ratio from 33.5 percent to 50 percent by 1980. This was to be achieved in two phases: the first phase ranging from 1970/73 to 1976/77 had a target enrolment ratio of 40 percent and the second phase from

1976/77 to 1980/81 aimed at a target ratio of 50 percent. The secondary school enrolment ratio was to rise from 3 percent to about 15 percent of the appropriate age group.

Gross Enrolment Ratios (GER) for both primary and secondary sectors were calculated. These are presented in Table 6.8 and illustrated in figures 6.9 and 6.10. GER calculated in this way is likely to be an over-estimate. This arises from the observation that the enrolment figures employed in the ratio include persons aged below 6 and above 13 years[4]. The effect of this is expected to be high in the earlier periods. The somewhat high ratios for these years can partly be attributed to this bias. The estimated GER for primary sector indicate that the targets set by the government were more than realized during the specified time periods whereas the secondary school enrolment ratio was far from being realised.

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4 Fuller (1988:12) for instance concludes that "The overall primary enrolment remains at about 40 percent".

Table 6.8

Population aged 6-13 and 14-17 and GER for Primary and Secondary Schools 1964 - 1984

Year	Population aged 6-13 (1)	Population aged 14-17 (2)	Gross Enrolment Ratio Primary (3)	Gross Enrolment Ratio Secondary (4)
1964	837,276	288,395	43.0	2.1
1965	892,613	307,455	37.8	2.5
1966	921,639	317,453	31.0	2.1
1967	948,602	326,740	31.4	2.4
1968	976,355	336,300	34.2	2.8
1969	1,004,919	346,138	33.2	3.2
1970	1,034,319	356,265	32.2	3.3
1971	1,064,579	366,688	34.1	3.5
1972	1,095,724	377,416	39.3	3.6
1973	1,127,781	388,457	42.7	3.5
1974	1,160,775	399,822	46.3	3.5
1975	1,194,735	411,519	51.2	3.5
1976	1,229,688	423,559	52.2	3.5
1977	1,265,664	435,950	52.5	3.5
1978	1,312,573	452,108	51.5	3.4
1979	1,361,221	468,864	51.9	3.5
1980	1,411,671	486,242	55.2	3.7
1981	1,463,992	504,263	55.3	3.8
1982	1,518,252	522,953	58.2	3.7
1983	1,574,522	542,335	55.2	4.1
1984	1,632,878	562,435	51.9	4.3

Source: Calculated by author.

Notes: See Table 6.2 above. To obtain the primary and secondary school-going population the projected "total" population was split into various five year age groups using the "standard" age distribution presented in Chapter III. Then the Carrier and Hobcraft(1971) method was applied to obtain the population aged 6-13 and 14-17 which are assumed to correspond to primary and secondary school-going population.

$$(3) = \frac{(1) \text{ in Table 6.7}}{(1) \text{ in Table 6.8}}$$

$$(4) = \frac{(2) \text{ in Table 6.7}}{(2) \text{ in Table 6.8}}$$

Fig 6.9 GER (Primary): 1964-1984

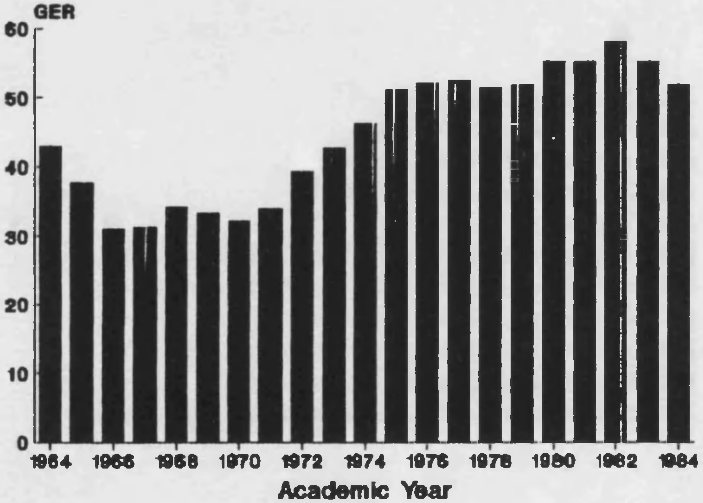
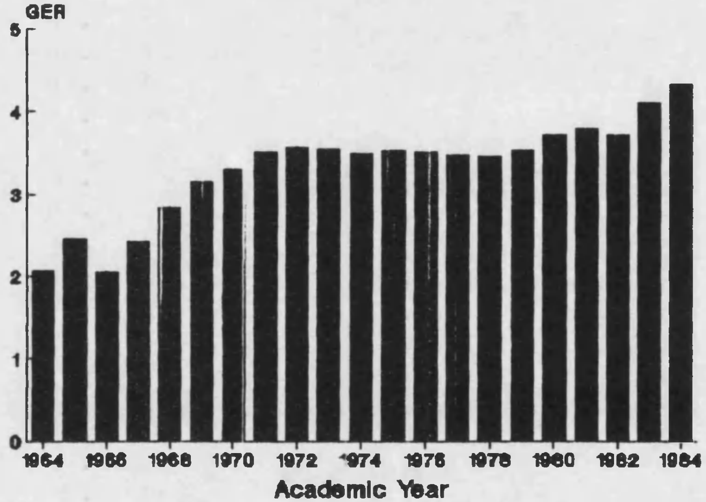


Fig 6.10 GER (Secondary): 1964-1984



When we examine the teacher-pupil ratio, however, the worsening of the primary sector as suggested earlier in the section is clearly illustrated. Teacher-pupil Ratio show a relative decline from 71.1 pupils per teacher in 1964 to 47 pupils per teacher in 1973. Thereafter it shows a steady increase reaching an average value of 60 pupils per teacher in the eighties. The 1973-1980 Education Plan aimed at lowering the teacher-pupil ratio from 1:45 in 1973 to 1:42 by 1980 (MOE,1973,3). Therefore this analysis indicates that the goal was far from being realized.

The secondary sector indicate a lowering of teacher-pupil ratio from a value in excess of 30 pupils per teacher to an average value of 20 pupils per teacher by the mid-seventies. And this ratio has been maintained ever since (the slight fluctuations can be interpreted in terms of errors in the reported statistics and the method used to calculate the teacher-pupil ratio).

Another way of examining the teacher-pupil situation is to compare the "actual" and "expected" number of teachers; given the desired pupil/teacher ratio. Unless otherwise stated, the desired teacher-pupil ratio used in this exercise refers to those ratios promoted by the expert group invited to study the education situation in Malawi and recommended changes for the system (USAID,1964). In carrying out this exercise it was assumed that: (i) between 1964 and 1980 the desired teacher-pupil ratio was 1:45; (ii) after 1980 the desired teacher-pupil ratio was 1:42 as championed by 1973

Education Plan. For secondary schools, the desired pupil/teacher ratio of 1:25 was used for the entire period 1964 to 1984.

Given the above assumption the expected number of teachers for the whole twenty year period were calculated by dividing the total number of enrolment in each education category by the desired pupil teacher ratio. The results of this exercise are given in columns (2) and (4) of Table 6.9. The expected number of primary school teachers is greater than the actual number of primary school teachers (see columns (1) and (3) of Table 6.9) for all academic years. This indicates that the primary sector has been characterised by a shortage of teachers. One consequence of this shortage is increased workload for the existing teachers in the system. There is also a suggestion that the inadequacy of primary school teachers must have worsened during the period under review. For instance the expected number of teachers exceeded the actual number of teachers by 2,973 in 1964. This difference was reduced to 650 in 1967 and increased to 4,019 in 1977 and to 6,188 in 1983 (see Table 6.9 below).

The secondary sector however indicate that the USAID recommendation was more than satisfied by 1967. This conclusion is reached following the observation that only the expected number of teachers for the academic year 1964, 1965 and 1966 exceed the actual number of teachers.

Table 6.9

Number of Teachers and Pupil-Teacher Ratio in Primary and Secondary Schools (for Selected years (1964 - 1984)

	Number of Teachers				Pupil/Teacher Ratio ++	
	Primary		Secondary			
Year*	A	E++	A	E++	Primary	Secondary
	(1)	(2)	(3)	(4)	(5)	(6)
1964	5,064	7,996	182	238	71.1	32.7
1965	5,212	7,505	185	303	64.8	40.9
1966	5,945	6,357	219	262	48.1	29.9
1967	6,229	6,610	348	317	47.8	22.8
1968	6,769	7,419	416	381	49.3	22.9
1973	10,287	10,701	-	-	46.8	-
1975	10,524	13,593	697	580	58.1	20.8
1976	10,588	14,260	748	593	60.6	19.8
1977	10,735	14,754	705	606	61.8	21.5
1978	11,115	15,016	737	622	60.8	21.1
1981	12,540	17,997	834	764	64.6	22.9
1982	13,120	19,610	932	775	67.3	20.8
1983	14,499	19,308	1,072	890	59.9	20.8
1984	14,932	18,828	1,150	974	56.7	21.2

Source: See Table 6.7 above.

Notes: (i) A stands for actual number of teachers as reported in various sources. E stands for the expected number of teachers as calculated by this author using particular assumptions regarding teacher-pupil ratio.

(ii) $(5) = \frac{(1) \text{ in Table 6.7}}{(1) \text{ in Table 6.9}}$

(iii) $(6) = \frac{(2) \text{ in Table 6.7}}{(2) \text{ in Table 6.9}}$

(iv) * unfortunately, it has been impossible to assemble relevant statistics for the period 1969 to 1972 and 1979 to 1980.

The observed changes in the GER reflects, among other things, the process of social and economic changes that have taken place in Malawi since 1964. The primary school GER indicate a decline in the ratio between 1964 and 1967 followed by a slight increase in 1968 and then a decline in 1969 and 1970. Beginning 1971 GER reveal a tendency to rise with certain fluctuations observed in 1978 and 1979. In general terms, the greatest increase appear to have taken place during the period 1970 to 1976.

This is attributable to the fact that in the immediate post independence period the government was busy informing the general public about the "self help" spirit whereby each community in general and each individual in particular was required to assist "developing Malawi" by participating in such activities as building schools, roads and bridges and asking the government, through the appropriate ministry or department, to assists in the provision of resources (teachers, experts, books, guidance and materials). It could be argued that by 1970 most people were in a position to understand the aims and the working of this concept and were thus able to take part in the programme[5].

The secondary school GER shows a steady rise from 1966 to 1972 and then a near constancy in the mid and late 1970s followed by a rise after 1979. This pattern

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5 Similar programmes exist in other developing countries. For example in Kenya such projects are reffered to as "Harambee" and the schools: "Harambee School".

could be explained in terms of the programme aimed at building a day secondary school in each district which was pronounced complete with the opening of Mwanza Secondary School in 19756. The rise in the early 1980s is related to the closure of some mission-run TTCs and the opening of secondary schools in their place (for example Saint Johns and William Murry Secondary Schools in Lilongwe District) and also to the building of additional secondary schools under the IDA program.

6.6 Agriculture: Cash Crops

The evolution of cash crops in Malawi is important in understanding the dynamics of population change in the country for three reasons. Firstly, as we have already stated in chapter II, agriculture supports more than 85 per cent of the population and almost half of all those in gainful employment are engaged in agriculture.

Secondly, and coming from the first, Malawi being an agricultural country, any discussion about social and economic development must include a discussion about the changes taking place in the agricultural sector of the economy. This stems from the fact that changes in agriculture will affect such factors as the health status of the population, the amount of disposable income an individual has and the settlement pattern of the

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6 In 1964 the following secondary schools were opened: Kasungu, Ntcheu, Mponela (Dowa), Ntcheu, Chiradzulu and Nsanje. Mulanje, Thyolo, Mzimba, Mchinji, Rumphi, Bandawe Secondary Schools were opened in 1965. 1967 saw the opening of Umbwi (in Dedza), Salima, Ntchisi, Chitipa and Chilumba (in Karonga) Secondary Schools and Balaka (in Machinga) and Chikwawa Secondary Schools were opened in the following year.

population.

At same time changes in other sectors of the economy are very much related to agricultural development. The increase in agricultural production suggests improvements in such sectors as employment opportunities, transport, communications and social services. It has been mentioned above, for instance, that the growth of the health sector is related to agricultural sector. Moreover some of the big plantations such as Nchalo and Dwangwa Sugar Estates provide clinic facilities for its employers which are also used by the local population. Also with the aim of easing the transportation of such inputs as fertilizer and seeds and agricultural products, the construction of roads has followed agricultural establishments.

Thirdly, cash crop production has long been associated with population growth particularly through its influence on migration. It has already been pointed out in Chapter II that, among other things, the immigration of the Sena into the Lower shire is associated with the emergence of the cotton industry in the area. In addition the large-scale immigration of the Lomwe into Southern Malawi and the resultant high population density in the region is connected with the emergence of the tea industry (Clarke,1987), and the development of Mzuzu (now the city of Mzuzu) is also associated with the establishment of tung estate in the district7. Guta(1985) noted that the sugar factory at Nchalo in Chikwawa district has contributed to population

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7 See <u>This Is Malawi</u>, May 1982, p.15.

growth in the area.

The importance of cash crops in determining demographic variables is further influenced by the prevailing government policy at the time. The colonial economic policy was based on the belief that the economic prospects of Malawi rest in the hands of the colonial settlers who were to be given the "good" arable land to develop and the African population was there as a reservoir of "cheap" labour. This policy not only gave rise to, or at least increased the pace of, the migratory stream to and from the neighbouring countries but also made Malawi attractive to immigrants from the neighbouring Mozambique.

Furthermore, it can be argued that more Malawians have been encouraged to remain in the country by the principle that the wealth of the country lies in the soil and that there is more money in agriculture than in labour migration. This message has frequently been made by political leaders at public rallies and has been part of the government's efforts to discourage labour migration to the urban centres and neighbouring countries.

The above presentation suggests that, given the resource-base of the country, agriculture is the driving force of all social, demographic and economic change in Malawi.

Two crops are important in this respect: tea and tobacco. Although the choice of these crops was arbitrary they represent the colonial and post-colonial dichotomy:

tea was the major foreign exchange earner during the colonial period and has since been replaced by tobacco in independent Malawi.

Table 6.10 presents the percentage share of agricultural products in the total domestic exports for selected years. According to this table more than 60 percent of all domestic exports consists of tobacco and tea. The increasing share of tobacco in the total domestic exports is also reflected. In 1964 tobacco comprised of 38 percent of the total domestics export in Malawi. This percentage rose to 47 percent in 1972 and then to 53 percent in 1984. Similar values for tea are 30 percent, 23 percent and 26 percent for 1964, 1972 and 1984 respectively. These values indicate that the percentage share of tea has declined over the years. Given the current wave of anti-smoking campaign pioneered by western countries, Malawi's dependence on tobacco should be conscientiously examined.

Table 6.10

Percentage share of agricultural products in total domestic exports for Malawi (selected years)

Crops/ agricultural products	1964	1968	1972	1976	1980	1984
Tobacco	37.7	32.3	47.3	46.0	46.8	52.7
Tea	29.8	29.7	22.8	18.7	13.8	25.9
Sugar	-	-	0.7	16.5	16.1	6.6
Groundnuts	9.9	14.1	13.5	7.9	7.4	0.3
Beans, Peas etc	6.8	2.6	2.3	1.1	0.8	1.5
Rice	0.6	0.3	2.1	1.1	1.4	0.2
Cotton	8.6	3.9	4.9	1.6	2.1	0.7
Tung Oil	1.9	0.7	0.2	0.2	0.1	0.1
Coffee	0.3	0.3	0.2	0.2	0.2	1.0
Cassava	0.5	4.2	1.6	0.0	0.2	0.0
Maize	2.1	10.1	2.5	-	-	6.7
Hides and Skins	0.4	0.5	0.5	0.2	0.3	0.3
Cattle Cake	0.6	0.9	0.8	0.1	0.3	0.0
OTHER	0.5	0.2	0.7	6.3	10.4	4.1
TOTAL	100	100	100	100	100	100

Source: various Statistical Yearbooks.

Tea

Tea was introduced in Malawi at the turn of the century. Until independence, however, production of the crop was exclusively monopolized by foreign companies owned by European planters. Since independence the government has encouraged and assisted African small producers to grow this cash crop, particularly those residing within the vicinity of large plantations and processing plants. This resulted into the formation of the Smallholder Tea Authority in 1967. Table 6.11 and Figure 6.11 present total production of tea during the period 1964 - 1984. Tea production shows a steady increase throughout the period. It increased from 12 million in 1964 to 23 million in 1973 and then to 37.5 million in 1984. This represents nearly a three-fold increase. Similar increases are also noted in Tea exports. Although the monetary value of the crop is affected by the rate of inflation, it nonetheless indicate a growth from 6.6 million Kwacha in 1964 to 13.7 million Kwacha in 1973 to 115.1 million Kwacha in 1984.

Fig 6.10(c) Total Value of Tea

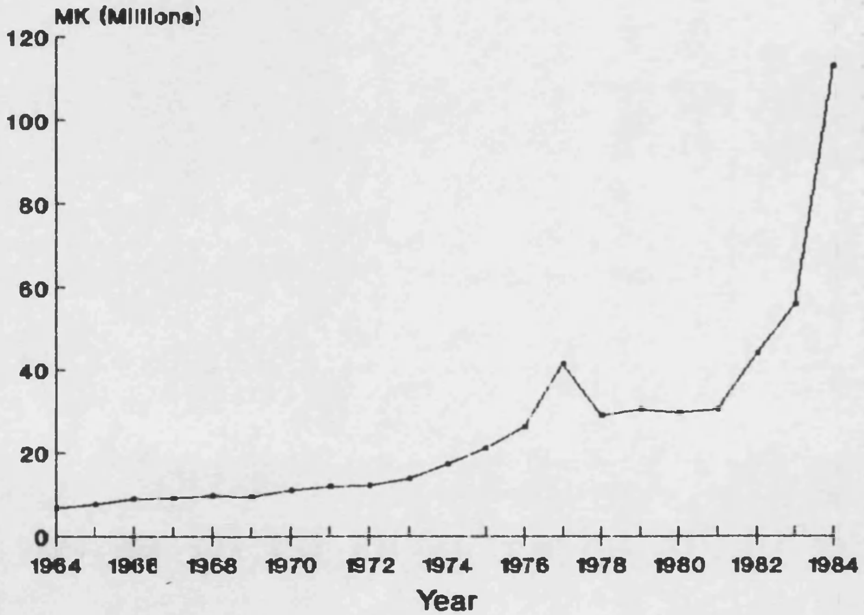

Fig 6.10a Tea Production

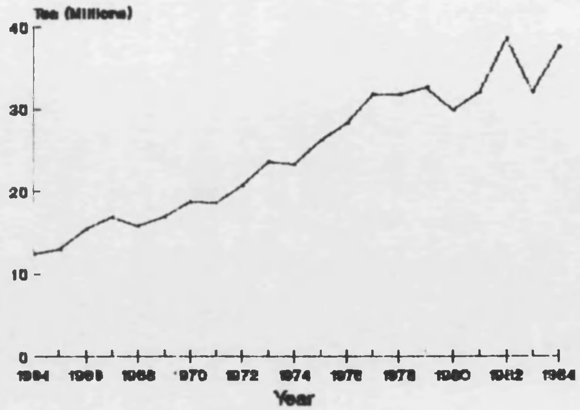

Fig 6.10b Tea Export

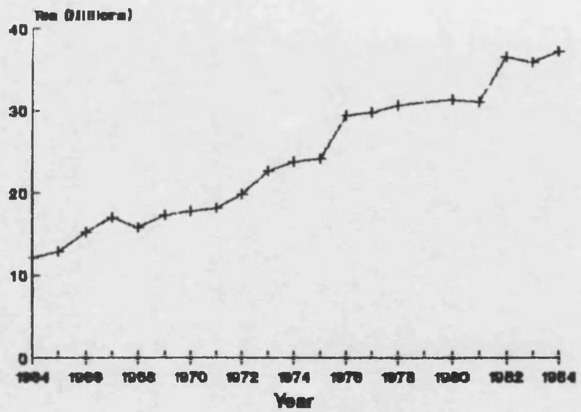

Table 6.11

Tea Production, Export and Value

Year	Production	Export	Value (MK)
			(millions)
1964	12.4	12.1	6.6
1965	13.0	12.9	7.6
1966	15.4	15.2	8.9
1967	16.8	17.0	9.0
1968	15.8	15.8	9.7
1969	16.9	17.3	9.5
1970	18.7	17.7	10.9
1971	18.6	18.2	11.9
1972	20.6	19.9	12.0
1973	23.6	22.6	13.7
1974	23.3	23.8	17.2
1975	26.2	24.2	21.1
1976	28.3	29.4	26.4
1977	31.7	29.8	41.6
1978	31.7	30.6	29.1
1979	32.6	31.0	30.6
1980	29.9	31.3	29.8
1981	32.0	31.0	30.6
1982	38.5	36.4	44.2
1983	32.0	35.8	55.9
1984	37.5	37.1	113.1

Source: NSO(1978, 1987)

Tobacco

Just like tea, tobacco was introduced in Malawi in late 1870s by European planters. Initially, tobacco production was limited to the Southern Region especially the Shire highlands districts of Zomba, Blantyre and Chiradzulu. Beginning mid 1920s tobacco production was introduced to the African population of the Central Region and since then it has remained the major cash crop of the area.

Table 6.12 and figure 6.12 presents tobacco production for each variety grown in Malawi and total monetqry value of tobacco for the period 1964-1984. As seen from the table there are four types of tobacco grown in Malawi: Flue-cured, Fire-cured, Burley, Sun-air and Oriental. The production of all types show a rising trend overtime with sun-air and oriental types showing the largest and smallest increase, respectively.

Table 6.12 also indicates the growing importance of flue-cure and sun-air tobacco. Whereas in 1964 1.2 milliom tonnes of flue-cured tobacco were produced, production of this crop rose to 10.5 million tonnes in 1974 and to 55.4 million tonnes in 1984. Similarly, the production of sun-air tobacco increased from 2.1 million tonnes in 1964 to 5.7 and 51.7 million tonnes in 1974 and 1984, respectively. Although the production of the other varieties of tobacco display an increase the rate of increase is somewhat lower.

The changes in both Tea and Tobacco industries suggest some improvements in the economic structure of Malawi, in particular the growth of GNP as indicated above. This further imply an increase in the amount of disposable income for people directly engaged in agriculture and in the overall standard of living of the population in Malawi in general. A higher standard of living is usually associated with a better personal hygiene and thus lower mortality. The small changes noticed in these variables correlates pretty well with the observed changes in both mortality and fertility.

Fig 6.12(a) Total Value of Tobacco

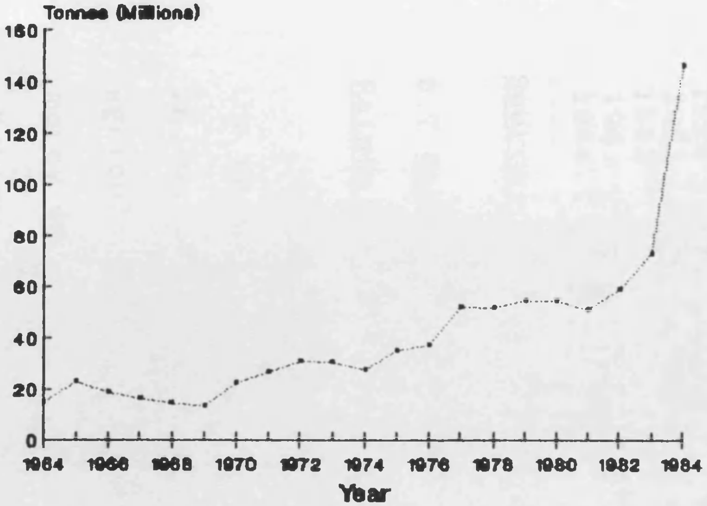

Fig 6.12(b) Tobacco Production
(Flue-cured, Fire-cured, Sun-air)

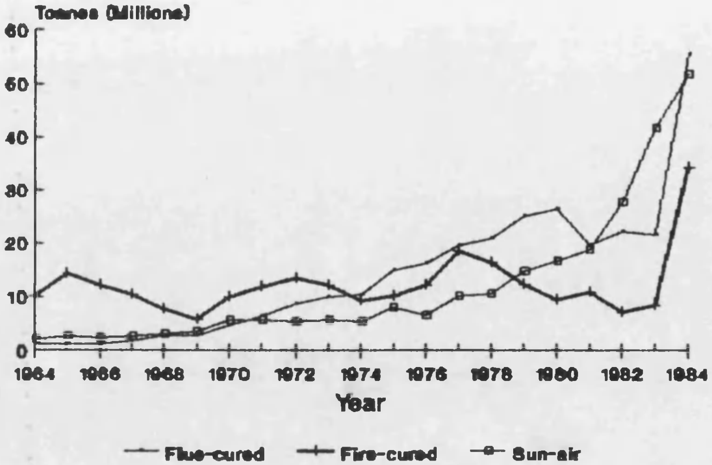

Fig 6.12(c) Tobacco Production
(Burley)

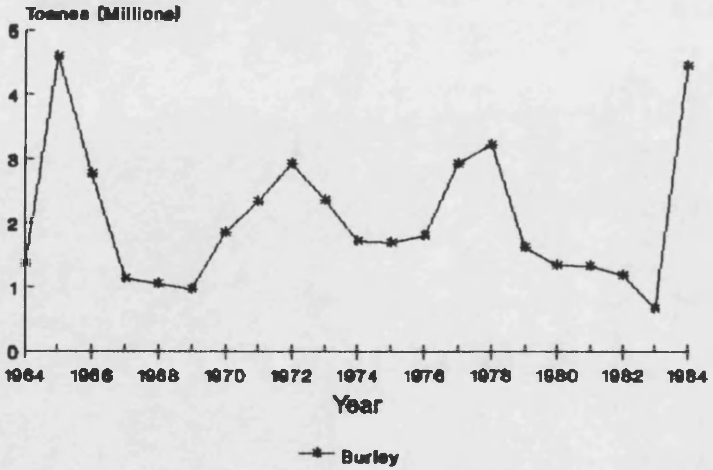

Fig 6.12d Tobacco Production
(Oriental)

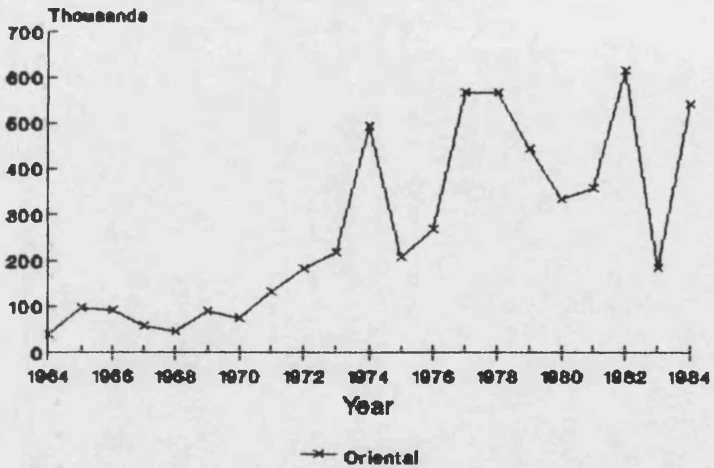

Table 6.12

Tobacco Production and Export Value

(millions)

Year	Flue-cured	Fire-cured	Burley	Sun-air	Oriental	Total Value of Export (MK)
1964	1.2	10.2	1.4	2.1	0.039	14.9
1965	1.2	14.9	4.6	2.6	0.096	22.8
1966	1.2	12.1	2.8	2.4	0.091	18.6
1967	1.8	10.5	1.1	2.7	0.058	16.2
1968	2.7	7.6	1.1	3.0	0.045	14.5
1969	2.8	5.9	1.0	3.5	0.089	13.2
1970	4.7	10.0	1.8	5.7	0.074	22.3
1971	6.4	11.9	2.3	5.7	0.131	26.4
1972	8.6	13.4	2.9	5.5	0.183	30.7
1973	10.0	12.2	2.4	5.7	0.218	30.5
1974	10.5	9.2	1.7	5.7	0.493	27.3
1975	14.9	10.1	1.7	8.0	0.209	34.9
1976	16.2	12.1	1.8	6.6	0.268	37.0
1977	19.6	18.6	2.9	10.2	0.568	51.8
1978	20.8	16.4	3.2	10.6	0.568	51.6
1979	25.1	12.3	1.6	14.9	0.445	54.3
1980	26.3	9.5	1.3	16.9	0.335	54.1
1981	19.7	10.8	1.3	18.8	0.358	51.0
1982	22.1	7.1	1.2	27.6	0.615	58.6
1983	21.7	8.4	0.7	41.5	0.184	72.4
1984	55.4	34.2	4.5	51.7	0.152	146.4

Source: various Statistical Yearbooks

6.7 Other sectors

Rainfall

Another factor that becomes important in examining the nature and pattern of social and economic conditions in Malawi is the incidence of rainfall. Being an agricultural country, the economy of Malawi is at the mercy of nature, especially rainfall. As we have seen in chapter II above, the fall in GNP in 1979 is primarily attributed to the bad climatic conditions, in particular the failure of rainfall, that led to drought in certain places.

Table 6.13 below presents the incidence of rainfall for the two decades following independence. These are illustrated in Figure 6.13. One should, however, be careful in interpreting the table and the graph as it is difficult to determine the reliability of the data particularly for the earlier periods. The table is based on rainfall recordings supplied by various recording centres which are scattered throughout the country and range from educational institutions, agricultural research centres, civil aviation authorities to meteorological stations. Therefore the degree of sophistication and the quality and reliability of the recordings vary from one recording centre to another. In addition the number of recording centres decreases as one goes back in the past.

The figure show that there are variations in the amount of rainfall from one year to another. These variations may be real or a consequence of the quality of data. The 1973/74 period shows the highest incidence of rainfall. This coincides with the 1973 Cholera epidemic in Malawi. Thus suggesting that the former may have helped the spread of the latter. The decline in the amount of rainfall in 1979/80 is indeed noticeable.

Fig 6.14 Rainfall 1964 - 1984 (Malawi)

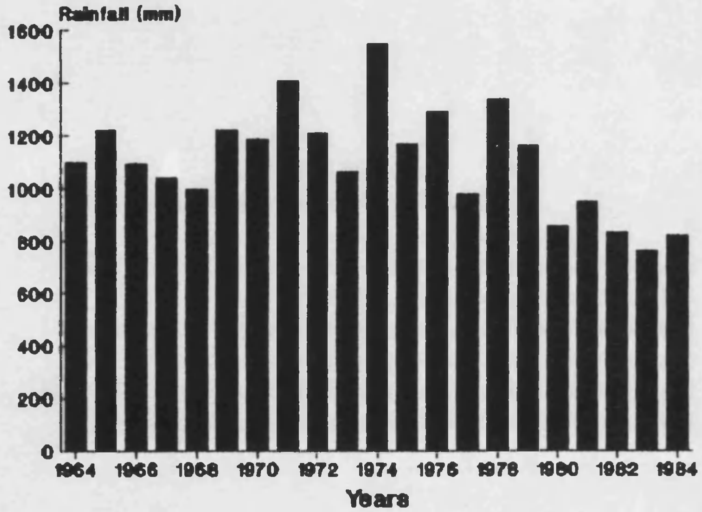

Fig 6.15 Rainfall 1964 - 1984 (Chileka)

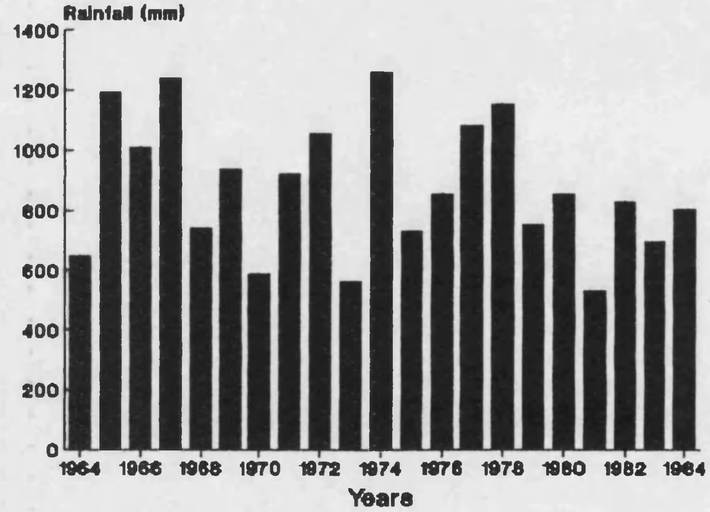

Table 6.13

Amount of Rainfall for Malawi and Chileka (1964 - 1984)

(in millilitre)

Year	Malawi	Chileka
1964	1,099.2	650.3
1965	1,221.2	1,193.7
1966	1,096.4	1,008.6
1967	1,039.2	1,239.6
1968	998.8	739.3
1969	1,222.2	937.0
1970	1,190.2	587.0
1971	1,414.2	922.0
1972	1,212.0	1,054.0
1973	1,061.5	559.0
1974	1,551.2	1,260.0
1975	1,169.0	729.0
1976	1,295.8	856.0
1977	981.2	1,082.5
1978	1,340.6	1,153.4
1979	1,164.4	750.3
1980	857.6	852.7
1981	952.3	531.5
1982	835.0	828.6
1983	762.4	692.4
1984	823.6	802.6

Source: Malawi Statistical Yearbooks

Transport

One of the factors that has received much attention in the post-independence period, is road development projects. From the very beginning, in 1964, it was recognized that one of the major obstacle the country was facing was the poor communication and transportation network. Consequently to achieve the desired objective of a high standard of living it was felt necessary to embark on a major road upgrading and construction programme. In this respect, the Lake-shore road, which was officially opened in 1972 and consisted of several sections (some of which are Chiweta-Jenda Road, Salima-Benga Road) can be isolated as the single most important road project.

Related to the road development programme is the construction of bridges over various rivers in the country; the most notable being Kamuzu bridge over Shire river. It should be noted that in certain instances, however isolated, bridges have directly helped to reduce mortality by curtailing deaths which were caused by such accidents as people being washed away by water. The most noted accident took place in 1960s when the ferry at Liwonde collapsed killing several people (DIO,1986,p.10). Although the number of people killed in such incidents is relatively small the construction of bridges reduced the risk of mortality from such accidents.

Being a land locked country, the need to improve the accessibility to the Mozambican sea ports led to the building of the Nacala Railway which was officially opened in 1970. One consequence of this project was the growth of Liwonde Township which was designed to handle the traffic on this line. The railway terminus at Salima was later extended to Lilongwe in 1979 and then Mchinji which is on the Malawi-Zambia Border in 1982.

These improvements in the transport system in Malawi meant that agricultural products from both the Northern and Central Regions could easily and cheaply be transported to the Auction Floors at Limbe or Lilongwe. The reduction of transport costs implies an increase in the amount of income available to individual farmers. Apart from domestic uses (clothing, food, medicines, fees) the increased income could then be used to buy such agricultural inputs as fertilizers, seeds and machinery (tractors).

In addition the improvements in the transport system meant that people could now travel easily from one corner of the country to another. Firstly, this may not only lead to distortions in the distribution of the ethnic groups as presented in figure 2.1 in chapter II but also to the dilution of the culture of the people in the area of in-migration. The latter implies that explaining things in terms of ethnic differentials, as done in chapter V when analyzing fertility differentials in Malawi, may not be as simple as we have treated the subject in this study.

Secondly, as a result of the improvement in the transport system food could be transported from areas of surplus to areas where food is in short supply. Laslet(1984) mentions how Maize from the Northern Region was carried to Lilongwe in the Central Region and an editorial in This is Malawi commenting on the Kacheche-Chiweta Road noted that "it is now easy to transport vegetables ... to various parts of the Northern Region because of the all-weather roads found there these days"8.

Thirdly, it could be suggested that medical supplies could also be easily transported to the "peripheral" health units (say from Central hospitals to District hospitals and from the latter to the rural hospitals). The referral of patients to a hospital up the hierarchy

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8 This is Malawi, October 1980, p. 14.

may also take place without major problems. Therefore, the changes in the transport infrastructure suggest that a certain amount of deaths might have been prevented in this way; thus leading to a decline in mortality as indicated in chapter IV above.

Water Supply

Another aspect of the economy which is related to a better quality of life is the provision of clean water. The importance of a clean water supply was well stated by a government official at the opening of a workshop on rural water supplies.

> Malawi believes that the development of rural areas will not achieve its full meaning unless water is provided to rural communities in order to eliminate the incidence of such enteric diseases as Cholera, dysentery and diarrhoea. When left unchecked these diseases have claimed a lot of lives and thus impede economic development.
> (This is Malawi, September 1980, p. 16).

To make sure that most people are provided with clean water, the government, with the help of various donor agencies such as USAID, Christian Services of Malawi (CSM) and WENELA, embarked on and continued (i) drilling and maintaining bore-holes and (ii) installing piped-water projects for the rural communities. Table 6.14 shows the number of projects initiated between 1968 and 1981. According to this table, an estimated population of 726,000, representing over 10 percent of the rural population in Malawi, were to be served with piped water.

> At present an estimated population of 2.5 million are getting their water from the 55 rural piped schemes now in operation in the country. In all, the schemes have over 5,000 km of piping with more than 8,000 taps.

Of the 55 completed, 19 have been funded by USAID which is also financing 13 new ones and two augmentation schemes under the Promotion of Health Intervention for Child Survival (PHICS) project which started in 1989 and is expected to come to an end in 1995[9].

The availability of clean water supply implies, among other things, a reduction in the prevalence of water-borne infectious and parasitic diseases. This is likely to lead to a reduction in the level of mortality as indicated in Chapter IV. This point should not however be over-exaggerated as a recent study by Lindskog and Lundqvist(1989) has demonstrated that whereas the provision of clean water is in itself a good thing, the handling of such water after being taken from the source should not be underrated and should thus be emphasized in the programmes.

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9 "55 piped projects benefit 2.5 people" by Isaac Chirwa in Malawi News January 19-25 1991, p. 5.

Table 6.14

Rural Piped Water Projects in Malawi: 1964 - 1984

	Project	District	Design Population	No. of Taps	Construct Period
1	Chingale	Zomba	5,000	35	1968-69
2	Chambe	Mulanje	30,000	180	1969-70
3	Migowi	Mulanje	6,000	45	1969-71
4	Chilinga	Mulanje	2,000	14	1971-72
5	Ng'onga	Rumphi	2,000	20	1971-73
6	Muhuju	Rumphi	1,000	21	1972-73
7	Chinkwezule	Machinga	700	7	1973-74
8	Ighembe	Karonga	4,000	36	1973-74
9	Mulanje West	Mulanje	75,000	460	1972-75
10	Luzi	Mzimba/ Rumphi	8,000	42	1974-75
11	Chinunkha	Chitipa	4,000	51	1974-75
12	Chilumba	Karonga	4,000	29	1974-75
13	Chilobwe	Ntcheu	1,200	12	1974-75
14	Phalombe	Mulanje	90,000	578	1973-77
15	Dedza	Dedza	1,400	10	1975-76
16	Mchinji	Mchinji	20,000	116	1974-76
17	Chagwa	Machinga	7,000	95	1975-76
18	Kalitsiro	Ntcheu	1,000	9	1976-77
19	Lifani	Zomba/ Machinga	20,000	140	1975-77
20	Hewe	Rumphi	8,000	42	1975-77
21	Nkhamanga	Rumphi	12,000	120	1976-78
22	Lizulu	Ntcheu	6,000	25	1976-78
23	Ntonda	Ntcheu	25,000	140	1977-79
24	Lingamasa	Mangochi	12,000	48	1977-79
25	Namitambo	Chiradzulu/ Mulanje	50,000	350	1976-80
26	Sombani	Mulanje	40,000	300	1977-80
27	Zomba (Domasi)	Zomba	100,000	700	1977-80
28	Luwazi	Mzimba	8,000	54	1978-79
29	Mulanje South	Mulanje	45,000	394	1979-81
30	Karonga	Karonga	30,000	250	1979-81
31	Kawinga	machinga	60,000		1979-82
32	Nthalire	Chitipa	3,000		1979-80
33	Dombole	Ntcheu	16,000		1979-81
34	Mwanza Valley	Chikwawa	20,000		1979-81
35	Livulezi	Ntcheu	10,000		1979-81

Source: Glennie (1983), DOI(1978)

Table 6.14

Number of Boreholes Successfully Drilled and Number of Boreholes Maintained for Rural Communities: Malawi

Year	Number of Borehole Successfully Drilled	Boreholes Maintained for Rural Communities
1964	30	1,181
1965	93	1,260
1966	91	1,450
1967	89	1,525
1968	209	1,615
1969	237	1,796
1970	467	2,196
1971	459	2,555
1972	316	2,784
1973	214	2,985
1974	150	3,044
1975	324	3,299
1976	306	3,504
1977	309	3,900
1978	263	3,655
1979	209	3,533
1980	115	4,053
1981	163	4,549
1982	237	4,344
1983	115	5,235
1984	132	5,383

Source: Malawi Statistical Yearbooks 1973, 1979 and 1986.

Summary

Regardless of however else economic development is defined, it is seen as a means of attaining a higher standard of living, and not a goal in itself. However, the overdue emphasis given to it in the development plans of Malawi appear to suggest that the opposite is indeed true.

This emphasis has meant that there is little examination of the means and alternatives available for attaining the goals stated in the development plans. More specifically, to a demographer, this means that little attention is paid to demographic variables. As a result of this population growth exerts some negative influences, in so far as the stated goals are concerned. This chapter has demonstrated the changes that have occurred in various sectors of the economy of Malawi. We have seen that much has indeed been achieved in such sectors as education, health and agriculture.

The analysis in this chapter has shown that most sectors of the economy have witnessed tremendous improvements during the period under review. This has partly stemmed from enormous investments that has taken place in the economy. However, this said, the rate of development was not achieved without difficulties and disappointments. The major disappointment appear to have been not meeting the targets set in the development plans. The major factor for this failure was the rapid rate of population growth. This has been illustrated using examples drawn from such sectors like education and health. For instance, it has been demonstrated that the number of children coming into the education system was growing faster than the provision educational facilities.

CHAPTER VII

CONCLUSION

> Students of African affairs, in particular those concerned with population problems, are handicapped by the lack of statistical data which restricts their work to a hypothetical and generally speculative nature. Julien Conde (1971,221).

The three main objectives of this study have been to describe the dynamics of population change in Malawi, to trace the inter-relationships between demographic change and finally, social and economic development and to instigate interest in studying the subject further.

The first objective has been examined in three substantive chapters: Chapters III, IV and V. The second objective was tackled in two ways. Firstly, throughout the study the interrelations between demographic parameters and social and economic development have been expounded. Secondly, a separate chapter (Chapter VI) attempted to explore further the possible interactions between the two stated phenomena by examining the changes that have taken place in selected sectors of the economy.

The major findings of each section have already been given at the end of each chapter and throughout the inquiry, areas requiring further investigation have also been presented. This chapter therefore aims at bringing together the various aspects that have been raised in the study.

In general, the study of African demography has, in the last three decades, assumed great significance. This came about as a result of the development of indirect estimation procedures, the improvement in both quality and quantity of demographic data, and the emergence of debates concerning the threat of unprecedented rate of population growth. As a result of these developments, some African countries have conducted studies to explore the dynamics of population growth vis-a-vis social and economic progress. The main objective of this inquiry is therefore to study the above-named aspects in Malawi.

Given the quality and quantity of demographic data available in Malawi, the problems inherent in a study of this nature are enormous. Wherever possible these have been presented together with the probable sources of error. Admittedly, the data utilized were often incomplete and sometimes difficult to reconcile. As a result of this handicap, most of the analysis presented in this study have tended to be theoretical and somewhat speculative and remains to be verified as more data of high quality becomes available. Nonetheless, the data have in most cases confirmed assumptions, suggested trends and above all provided a picture of the demographic situation in Malawi.

It was realized from the beginning that some researchers might argue that the inquiry should have been postponed until such a date when sufficient data is available. There are several dangers in following this course of action. Firstly, it has been argued in Chapter I that the standard of what constitutes good data changes over time. Moreover, it was felt that if such rigorous requirements are imposed, new studies will not appear as regularly as in some other disciplines. Secondly, there is sufficient evidence to suggest that research interest and priorities vary from one decade to another. Some researchers have noted a "dearth of interest in mortality during the 1960s and early 1970s, when interest in fertility was undoubtedly dominant, and the resurgence of work on mortality in the past 10 years or so" (Hobcraft,1984,p.64). Therefore the very nature of academic research is such that certain aspects of the discipline are relegated to a secondary position. This seems to have been the case with the population of Malawi. For instance, although it has long been observed that the level of mortality is very high, very few demographers were compelled to study this aspect of the demography of Malawi. Consequently an investigation of this nature was considered necessary in order to define what needs to be done in the field of population studies in Malawi.

Some of the available indirect procedures were applied to the Malawian database in order to calculate plausible measures of fertility, mortality and other demographic parameters (like age pattern of fertility and age structure). This proved to be a rather costly exercise particularly in the absence of "independent" estimates with which to compare the estimates obtained using indirect procedures. The application of more than one technique gave rise to the additional problem of trying to select which set of estimates to accept as representing the demographic situation in Malawi.

Furthermore, the use of several procedures proved valuable in certain aspects. It acted as a means of evaluating the performance of these procedures using Malawian data. This is necessary in view that as some researchers are engaged in improving on the old and formulating new estimation procedures, the difficulties encountered by such countries as Malawi should also be taken into account.

In this respect it has been demonstrated the procedures developed by Rele and Carrier and Hobcraft, though simple and unsophisticated, can provide plausible measures of fertility at a relatively cheap cost. Since the parameters of the methods were derived from model populations based on the original UN and Brass African model life tables, respectively, it can therefore be recommended that experimentation with the other and more recent model stable populations may prove fruitful.

Furthermore, given that estimates of demographic parameters for the pre-independence period are absent, simple techniques like Rele and Carrier and Hobcraft methods may yield acceptable estimates. It can be suggested that if the age distribution for the colonial period can be reconstructed and CWR and CAR calculated, the two procedures can be employed with less difficulties.

A number of characteristic features of the population of Malawi have been described in the course of this study and some of these have interesting policy implications. Firstly, it has been demonstrated that the population of Malawi has a young age structure and is in fact becoming younger over time. The young population structure indicates, among other things, potential for further population growth. The current child spacing program is limited to mothers attending ante-natal clinics and single women and men are exclusively excluded. As efforts are being made to make child spacing services available and easily accessible to the wider population, especially rural areas, and as current discussions and debates appear to drift from child spacing to a more broader notion of family planning[1], priority should also be given to family or sex education primarily directed at the young population of both sexes, since the reproductive behaviour of the future generations will depend on them. Therefore some preliminary discussions focusing on how and when to include such type of education in the existing school curriculum should be initiated.

Secondly, both mortality and fertility are very high by international standards. This observation is consistent with low levels of such social and economic indicators as education, income and urbanization and reinforces the above-described observation that further population growth is expected in future. The fact that mortality is still high suggest that subsequent decline is possible. At the same time high mortality signals the

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1 See for example "Child Spacing as a Development Tool" by John Mapira in <u>This in Malawi</u>, June 1988, pp. 6-7 and "Child Spacing ... is there any need for it here?" by Anthony Chamveka in <u>This is Malawi</u>, April 1990, pp. 20-21.

prevalence of social and cultural factors that discourage small family norms. Additionally, the observed level of social and economic development in Malawi, combined with the absence of any organized form of family planning, suggest that fertility decline will not commence in the near foreseeable future.

Thirdly, although the level of mortality is still high mortality has declined during the period under review. The slow nature of the development process in Malawi (reflected in this study by the slow pace of urbanization, proportion literate and GDP growth) can be held responsible for the observed slow rate of mortality decline. The fact that the same disease pattern seem to prevail throughout the period under review conforms to the observation made in the other developing countries that mortality decline in these countries have taken place as a result of the importation of medical technologies from the developed countries in the absence of any drastic changes in the social and environmental conditions. This further indicate that future decline in mortality are likely to take place if the latter variables are altered and "general" education will play a very significant role in order to achieve this objective.

Fourthly, there is no evidence to suggest that fertility is declining. Although fertility appears to have remained constant, it is still probable that it may have increased in the past. But if it did, the rate of increase must have been very small. The factors responsible for this probable increase have not been well documented. However, it has been suggested that they include changes in marital variables such as a small but consistent increase in age at marriage and a reduction in widowhood, breast-feeding patterns and migration.

Fifthly, the combination of declining mortality and constant fertility gave rise to the rapid population growth Malawi experienced during the twenty year period 1964 to 1984. Since fertility appears to have remained almost constant and on assumption that international migration is negligible mortality can be said to be the major determinant of population growth during this period.

Lastly, a survey of social and economic development in Malawi revealed that in terms of absolute numbers more has been achieved in such sectors as health, education and agriculture. But if demographic variables are included in the analysis it becomes clear that the rate of population growth has hindered some of the above-mentioned improvements. Therefore, it can be suggested that in order to derive maximum benefit from the development process taking place in Malawi, the population variable should form an integral part of the planning process in the country. Hence, the setting up of a Population Secretariat within the DEPD, whose main task is to investigate the most suitable means of integrating demographic variable into social and economic planning, is commendable.

Further Research

After meditating on the various aspects of the population of Malawi, as this study has endeavoured to do, one discover that much more remains unexplained than one would desire. The study itself has put forward several hypotheses which were not adequately substantiated and therefore require detailed examination in future. For example, although the observed inter-district fertility differentials has been associated with the historical and traditional distribution of ethnic groups in Malawi, a complete examination of fertility differentials by ethnic groups remain to be conducted. Such a study should also try to explain whether or not fertility differentials exist between matrilineal and patrilineal societies. The same could be said of mortality differentials. In general terms there is need to conduct an inquiry that examines the social and cultural context of the Malawian society before and during the process of modernization and their relationship to demographic process.

In trying to explain the inconsistency and deficiency in the existing demographic data, migration (both internal and international) emerged to be an interesting subject of study which may also prove relevant in studying the determinants of population growth in Malawi. Since a review of the literature on the subject has revealed that most of what is known about migration in Malawi has come from historians, geographers and sociologists, demographers should be argued to join these groups of researchers.

Within this area, future inquiries should emphasize the characteristics of the migrants, the adaptability of migrants to their new environment and the social, economic and demographic consequences of migration on the "sending" and "receiving" areas. Emphasis should also be given to permanent migration as opposed to temporary labour migration and "family migration" as opposed to migration of just "able bodied men". Historical evidence suggest that a good proportion of Malawian migrant workers permanently settle in their work place and there exist a high likelihood that women and, in some cases, children accompanied or joined their husbands or fathers2.

Postscript

It may be helpful to end on a more reassuring note. Since the mid-eighties, concern and attitude regarding the observed demographic phenomena in Malawi has become more intense and statements expressing such concern have been made quite frequently by both academics and decision and policy makers (UNFPA,1987; OPC-DEPD,1987). In view of the absence of similar statements in the preceding two decades one can only hope that such concerns were built up over nearly two decades of thinking and behind-the-scene discussions. On the physical aspects the above-mentioned changes in policy emphasis as regards population have culminated in the establishment of such institutions as the Demographic Training and Research Unit in the University of Malawi and the Population

2 Consider for example the origin of "Chioda".

Secretariat within the DEPD. The common aim of these two institutions is to promote the understanding of and conduct research into the various aspects of the population of Malawi.

The establishment of the Faculty of Medicine in the University of Malawi is also a welcome project. The medical school will, among other things, not only reduce the shortage of Malawian doctors but also participate in various medical and demographic research. The final result of all these appear to be a reduction of morbidity and mortality (and eventually fertility).

The outbreak of the AIDS epidemic may further change the scenario suggested in this thesis[3]. This can happen in a number of ways: two of which require our attention. Firstly, a number of researchers have commented on the possibility of a rise in mortality and the inevitable decline in population[4]. This may counter our efforts to small family norms and introduce family planning. Secondly, given the current emphasis on educating the people about how they can prevent the spread of the disease, in particular the use of condoms, contraceptive usage may increase faster than anticipated and fertility decline may start sooner rather than lat er.

It seems appropriate to end this study by quoting one Scottish missionary, Dr David Livingstone, who has influenced almost everything that has taken place in

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3 For additional information about Aids epidemic in Malawi see Reeve (1989).

4 See for example Finincial Times dated 15 August 1991 "AIDS could end African Population Explosion".

Malawi. Of particular interest is the speech he made in the Senate House, University of Cambridge on friday, 14th December 1857.

> I beg to direct your attention to Africa;-
> I know that in a few years I shall be cut off in that country, which is now open: do not let it be shut again! I go back to Africa to try and make an open path for commerce and christianity; do you carry out the work which I have begun. I LEAVE IT WITH YOU!

This study is therefore a modest way of opening up the demography of Malawi. It remains our hope that the path will not be shut again.

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Appendix I(a)

Topics enumerated in censuses conducted during the colonial period

		1911	1921	1926	1931	1945
1.	Age in three broad groups	-	x	x	x	x
2.	Sex	x	x	x	x	x
3.	Marital status	-	x	x	x	x
4.	Tribe	-	x	x	x	x
5.	Religion	x	x	x	x	-
6.	Infirmity	x	x	x	x	x
7.	Residence on private estates	-	x	x	x	x
8.	Military statistics	x	x	x	x	x
9.	Literacy					
	(in English	-	-	-	x	x
	(in vernacular)	-	-	-	-	x
	(in Arabic)	-	-	-	-	x
10.	Absentees (Malawians abroad)	-	-	-	-	x

Notes: (i) - data note collected
x data available.
(ii) These notes are also relevant for Appendix I(b) below.

Appendix I(b)

Topics enumerated in censuses and surveys conducted after independence in 1964

Census/Survey	Year of				
	1966	1970-72	1977	1982	1984
1. Name of household (hh) members	x	x	x	x	x
2. Relation to the head of hh	x	x	x	x	x
3. Sex	x	x	x	x	x
4. Race	x	x	-	-	-
5. Year of birth	x	x	-	-	-
6. Age in completed years	-	-	x	x	x
7. Place of birth	x	-	x	-	-
8. Previous residence (1 year)	-	-	x	-	-
9. Marital status	-	x	x	x	x
10. Survival status of the Father	-	x	x	-	-
11. Survival status of the Mother	-	x	x	x	-
12. Eldest child of the Mother	-	-	-	x	-
13. Deaths in the last 12 months	-	x	x	x	x
14. Births in the last 12 months	-	x	x	x	x
15. Language understood	x	-	-	-	-
16. Radio in working condition	-	x	-	-	-
17. Source of drinking water	-	x	-	-	-
18. School attendance	x	x	-	-	-
19. Highest level of education	x	x	x	-	x
20. Number of wives per man	-	x	-	-	-
21. Children ever born	-	x	x	x	x
22. Children ever born by sex	-	-	-	x	x
23. Children surviving	-	x	x	x	x
24. Children surviving by sex	-	-	-	x	x
25. Children dead	-	-	-	-	x
26. Children dead by sex	-	-	-	-	x
27. Residence of children	x	-	-	-	-
28. Age at first marriage	-	x	-	-	x
29. Activity status	x	-	x	-	-
30. Industry	-	-	x	-	-
31. Occupational status	-	-	x	-	-
32 Source of income	-	-	-	-	-
33. Number of relatives abroad	x	-	-	-	-
34. Worked abroad	-	x	-	-	-
35. Year since last return	-	x	-	-	-
37. Details about last pregnancy	-	-	-	-	x
38. Use of contraceptives	-	-	-	-	x
39. Attitude towards family size	-	-	-	-	x
40. Marriage history	-	-	-	-	x
41. Birth history	-	-	-	-	x

Appendix 11

Integrated Rural Development Projects and National Rural Development Programme (NRDP)*

With the financial assistance from the World Bank, Malawi was the one of the earliest countries in Sub-Saharan Africa to adopt a rural development strategy. Under this programme, a number of large scale agricultural projects were set up on experimental basis. These programmes included the following: Lilongwe Land Development Programme (LLDP), Salima Lakeshore Development Project, Shire valley Agricultural Consolidated Project and Karonga-Chitipa Development Project. The main objective of these projects was/is to improve the general standard of living of smallholder farmer by increasing the productivity of such crops as maize, groundnuts, tobacco and cotton through rural transformation which involves the provision of the necessary infrastructure: roads, boreholes, market and service centers and credit facilities.

These projects culminated into the adoption of the National Rural Development Programme (NRDP) in 1977. For successful implementation of the NRDP, the Ministry of Agriculture divided the country into eight Agricultural Development Divisions (ADD), each of which is divided into Rural Development Projects (RDP) which are further sub divided into Extension Planning Areas (EPA). The following are the name of the ADDs:

	ADD	Districts covered
1.	Karonga	Karonga and Chitipa.
2.	Mzuzu	Mzimba, Nkhata Bay and Rumphi.
3.	Kasungu	Kasungu, Dowa, Ntchisi, Mchinji.
4.	Lilongwe	Lilongwe, Dedza and Ntcheu.
5.	Salima	Salima, Nkhota kota and Mangochi.
6.	Liwonde	Machinga, Mangochi, and Zomba.
7.	Blantyre	Blantyre, Mwanza, Chiradzulu, Mulanje and Thyolo.
8.	Ngabu	Chikwawa and Nsanje.

With the exception of Salima ADD which includes parts of Mangochi district, ADD boundaries in general do not cross regional boundaries.

* For details about the project see Ministry of Agriculture(1984)National Rural Development Programme, Extension Aids Branch, Lilongwe.

Appendix III

Table A3.1

Estimates of Malawians Employed Abroad (Migrant Workers) by Different "Authorities" 1945 - 1985

Year (1)	Coleman (2)	Milazi (3)	Whiteside (4)	Malawi Government (5)	(6)
1945	100,000	139,000	-	-	-
1946	110,000	121,000	61,005	-	-
1947	120,000	143,000	-	-	-
1948	130,000	140,000	-	-	-
1949	138,000	146,000	-	-	-
1950	143,000	143,000	-	-	-
1951	148,000	148,000	63,655	-	-
1952	160,000	153,100	-	-	-
1953	170,000	159,000	-	-	-
1954	180,000	-	-	-	-
1955	185,000	-	-	-	-
1956	190,000	-	-	-	-
1957	195,000	-	-	-	-
1958	200,000	-	-	-	-
1959	210,000	-	-	-	-
1960	220,000	-	62,623	-	-
1961	230,000	-	-	-	-
1962	220,000	-	-	-	-
1963	240,000	-	-	-	-
1964	260,000	-	-	35,620	34,099
1965	280,000	-	-	43,802	41,603
1966	266,000	-	-	28,756	28,879
1967	-	-	-	45,669	39,538
1968	-	-	-	52,426	35,036
1969	-	-	69,417	53,184	40,992
1970	-	-	106,640	90,642	61,662
1971	-	-	109,185	99,849	65,951
1972	-	-	131,231	123,845	81,628
1973	-	-	139,714	123,251	76,227
1974	-	-	137,676	68,448	31,605
1975	-	-	39,308	2,711	**
1976	-	-	12,761	**	**
1977	-	-	12,412	17,443	18,206
1978	-	-	38,525	17,891	16,431
1979	-	-	35,803	19,128	17,873
1980	-	-	32,319	14,236	11,230
1981	-	-	30,602	15,156	13,230
1982	-	-	27,558	16,049	13,982
1983	-	-	29,622	15,785	13,144
1984	-	-	29,268	18,180	16,232
1985	-	-	30,144	19,621	17,415

1. Coleman, G.(1979:28) 2. Milazi, D.(1984:32)
3. Whiteside, A.(1988:15) 4. Statistical Yearbooks (1972-1986)

NOTES:

(i). Coleman estimates refers to "Number of Malawians Abroad" and therefore these may include recent migrants and those who migrated sometime in the past and are for all practical purposes "permanently settled" in their new "homes": permanent migrants.

(ii). Milazi estimates "Nyasaland emigration into neighboring countries". These are similar to Coleman estimates. However note the difference in the estimates in some of the years.

(iii). Whiteside estimates refers to the "Distribution of Foreign Blacks in South". These might include migrant workers who were "attested" by the Malawi Government [see (iv) and (v)], or those migrant workers who went to South Africa on their own and thus were not attested by the Malawi Government, or those who left Malawi sometime in the past and never went back home: permanent migration.

(iv). MG estimates refers to Malawians employed in the mines of South Africa under contract with the employment agencies: Wenela and Employment Bureau of Africa Limited. Therefore these figures excludes those who left Malawi on their own and are working in other sectors of the South African economy. Column (5) refers to number of people on contract as at end of year and column (6) refers to number of people attested per year.

(v). Attested persons are those who have been contracted and attested for by a Labour Officer, Malawi Government.

(vi). In 1974 people were attested up to April and attesting resumed from June 1977.

(vii). - indicates that estimates are not available from the "appropriate" source.

(viii). ** estimates not available since at this time recruitment of migrant labour was banned as a result of an airplane accident in 1974.

Table A3.1 reveal among other things that migration statistics vary from one source to another. Three factors can be suggested to account for the observed differences in migration estimates. Firstly, different researchers employ different definition (this point has been illustrated in the notes above). Secondly, there are differences in the "base" population (whether they are based on the sending country - Malawi - or receiving countries (Zambia, South Africa - or the employment agency). Thirdly, there is the crucial factor of deciding when a person ceases to be a migrant. To some extent this is affected by whether or not "permanent migrants" are included. According to Sergio Ricca (1989,8) Malawi regards a foreigner as an immigrant after six months of stay in the country. In the same way one may regard an absentee as an emigrant (emigration being the opposite of immigration) if he is away from home for more than six months. However since most emigrants are "migrant workers" who are usually on contract for at least 24 months, a two year limit may be the most appropriate to use.

Appendix IV

Estimates of e(0) calculated using Myburgh formulae[1]

Myburgh(1956) presented the following formulae for estimating e(0) in statistically under-developed countries:

$$e(0) = \frac{S[t]}{C[t]} . (101.2 - 273.5Wo) - C'$$

where S[t] is the total number of children alive at the time of enumeration;

C[t] is the total number of CEB;

Wo is the population of the children born during the 12 months preceding the enumeration;

C′ ia a parameter which varies with age of the oldest women under consideration taking the value of (i) 12.6 if women aged 15-34 are considered, (ii) 15.1 if women aged 15-39 are considered, (iii) 17.6 if women aged 15-44 are considered, (iv) 20.1 if women aged 15-49 are considered and (v) 20.2 if women aged 15 years and over are considered.

The values of e(0) estimated using Myburgh formulae are subject to two sources of errors:

(i) omission of children ever born which is likely to result in over-stating the ratio S[t]/C[t];

(ii) the number of children born during the last 12 months are likely to be over-reported than children ever born since the events took place in the most recent past. In this case Wo will aslo be over-stated.

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1 Myburgh, C.A.L.(1956) "Estimating the Fertility and Mortality of African Population from the Total number of Children Ever Born and the Number Still Living" Population Studies X(2):193-206.

These errors are likely to have compensating effects on e(0) estimates thus one can assume negligible effect on the final estimates. Applying this formulae to Malawian data set the following estimates were obtained:

	1972	1977	1982	1984
15-34	36.4	39.8	40.4	38.0
15-39	36.2	39.3	40.4	40.1
15-44	35.5	37.8	39.1	39.7
15-49	33.5	36.0	37.2	38.4
Mean	35.4	38.2	39.3	39.1

Appendix V

Provision of health facilities in Malawi: An Extract from HANSARD[2]

Minister of Health:
Mr. Speaker, Sir, I would like to inform the Honorable Member for Nkhata Bay South that although the population of the twin island of Likoma and Chizumulu is only just over eleven thousand, the isolated position of the islands justifies the provision of a primary health center with twenty maternity beds and six general beds in accordance with the National Health Plan. The Anglican Mission Hospital at Likoma Island already has ten maternity beds and twenty five other beds and there is an under five clinic. There is also a dispensary at Chizumulu Island. Since these health facilities already exist for the people of the twin islands of Likoma and Chizumulu, the provision of a larger hospital on Likoma Island would not, therefore, be justified at least at this stage in the development of our health services.

Mr. Speaker: Any supplementary question?

MP Nkhata Bay South:
Yes. Is the Honorable Minister aware that the hospital which is at Likoma and Chizumulu Island is for payment. The people who have no money find it very difficult to go and receive their treatment. What help would the Minister suggest to our brothers and sisters at Likoma?

Minister of Health:
I think there the Honorable Member for Nkhata Bay South should know that whether the hospital is put there by the mission or any other organization, still that is under my Ministry. Therefore, it is better that I consider other places where to establish hospitals because at the island they are already served at least.

Mr. Speaker: Any supplementary question?

MP Nkhata Bay South:
Mr. Speaker, Sir, is the Minister aware that the hospital is there for the benefit of the people, what action will he take for the people who have got no money and are failing to receive their treatment?

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2 Malawi Parliament (1977) HANSARD: Official Verbatim Report of the Thirteenth Session: Second Meetings of Parliament, Seventh day 16th March 1977.

The Minister of Labor:
Mr. Speaker, Sir, I think the Minister of Health has made it quite clear to the Honorable Member that whether it is a hospital where patients are required to pay or not, the problem is still with his Ministry and he is going to look into it. ...

Mr. Speaker:
I think his question is that the people would like to enjoy the benefits of free medical attention ... ... just as other people are given. .....

The Minister of Labor:
Mr Speaker, Sir, as far as I am aware, there is no such thing which we call free medical attention in this country. Whether people are getting free medical attention at any Government Hospitals, Government or the ordinary tax payer is paying money for the services that he is getting so that it is only free theoretically but in practice, someone else has got to foot the bill directly or indirectly, so there is no question of free medical attention in that case.(...)

Mr. Speaker: Any other ...

Minister of Finance:
Mr Speaker, Sir, to supplement what the two Ministers have already said, I would also go further to say that these services are not entirely free because Government subsidies the services at the mission hospitals. But mission hospitals of course would like to get a little bit more for the services they give in addition to Government subsidy and, as the Honorable Minister of Health has already indicated, Government is at present looking at all the facilities provided by the Government all over the country and well, when funds are available, I see no reason why the Honorable Minister of Health cannot recommend to Government that some services as provided in other districts are also provided at Likoma and Chizumulu Islands.
At the same time, Mr Speaker, Sir, well, Likoma and Chizumulu Islands come under the ambit of the district of Nkhata Bay and, therefore, if there is a Government Hospital at Nkhata Bay, whether it´s on the mainland or on the island, it´s all the same. Government is providing hospital facilities to the district. (...) We are not looking at an island, we are looking at a district: has the district, Mr Speaker, Sir, got some Government medical facilities? If it has, then it is all right. (...) (...)

Appendix VI

A Test for Fertility Control

Throughout this study, it has been assumed that fertility in Malawi is "natural". Henry defined natural fertility as fertility in the absence of any deliberate effort to limit the number of live births. Thus "spacing" behavior currently encouraged by the government through the newly established child spacing program is compatible with this definition.

In this section an attempt will be made to show that fertility in Malawi is indeed natural. In particular a more elaborate examination of the age pattern of fertility has been carried out with the purpose of determining whether the population of Malawi can indeed be said to be natural. Two conventional methods of establishing whether or not a population is natural have been carried out. The first routine involved the examination of the Parity Progression Ratios (PPR) and the second procedure involved comparing observed Age Specific Marital Rates (ASFMR) and similar values calculated for natural populations.

Method 1

The nature and pattern of the Parity Progression Ratios3 as depicted Table A6.1 and figure A6.1 suggest that the three regions of Malawi do not deliberately control their fertility. The data in Table A6.1 however indicate the aggregate experience of women in each of the

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3 PPR refers to the proportion of women having x children who move on to have the (x+1)the child.

regions and thus do not reveal the childbearing behavior of the individual districts and ethnic groups found in them.

Table A6.1 also reveal that at each birth order more women in the Center go on to have the next birth than women in the north or in the South . The PPR for Southern Region are below corresponding values for Northern Region for all births up to birth order five after which the ratios for the latter become the lowest. Two points can be raised from this observation. Firstly, in the case of Southern Region either relatively more women (or couples) decide not to have children or more women are inhibited from having children at each birth order. In a Malawian society, the former is unlikely since there is some evidence that children are everywhere cherished. Accordingly the latter looks probable and as we shall try to argue later on this may be due to the existence of certain diseases.

Secondly, after birth order five, Northern Region has the lowest PPRs. This may be due to polygamy. Without wanting to take part in the existing debate concerning the relationship between polygamy and fertility, as a result of the absence of necessary data, but if we only accept that polygamy leads to low fertility, it can be argued that in Northern Region, men are likely to take a second wife when the first wife has borne him at least five children. In theory, by this time, the first wife will be in her mid thirties, and may have started experiencing problems with childbearing due to the declining fecundity (with age) and the onset of menopause.

Furthermore, this may arise from the fact that in some cases the second wife is the younger sister of the first one. This situation is likely to take place after the first wife has given birth to five children since the husband may be allowed (or asked) to take on the younger sister after he has proved to be a "good" in-law: a thing that may take sometime.

Since women become older at an early age compared to men, and men would like to go out with (and eventually marry) a younger woman, it seems just logical that for those men who would like to get another wife do so when their first is in her mid thirties.

The age pattern of the PPR as described above seem related to the age pattern of fertility as reflected by the ASFR curve (figures 5.1 to 5.4 in section 5.3). As we have seen in the preceding sections, the ASFR below age group 35-39 for Southern Region are lower than corresponding rates for Northern and Central Regions. After this age group the rates for Northern Region becomes the lowest.

Table A6.1a

Parity Progression Ratios by Region

Birth Order	Region		
	North	Center	South
0	0.967	0.971	0.954
1	0.971	0.974	0.952
2	0.963	0.963	0.938
3	0.943	0.952	0.920
4	0.918	0.931	0.900
5	0.878	0.904	0.874
6	0.822	0.869	0.842
7	0.752	0.825	0.809
8	0.657	0.766	0.757

Table A6.1b

Parity Progression Ratios : Malawi 1977, 1982 and 1984

Birth Order	Year of Enumeration		
	1977	1982	1984
0	0.962	0.975	0.984
1	0.926	0.966	0.956
2	0.950	0.958	0.959
3	0.935	0.944	0.943
4	0.915	0.928	0.939
5	0.887	0.902	0.872
6	0.851	0.877	0.827
7	0.809	0.826	0.771
8	0.750	0.767	0.671
9		0.707	

Method II

In examining the existence of deliberate fertility control Age Specific Marital fertility rates (ASMFR) were calculated from the reported ASFR and proportion married for women aged 15-49 years. These are given in Table A5.2 below. For a variety of reasons the rate for age group 15-19 years are usually in error. These include selectivity effects arising from the smallness of the number of women belonging to this age group, and consequently their births, to "teenaged sub-fecundity" and pre-marital conceptions (Knodell:1977). As a result of age group 15-19 was removed for further analysis.

In a natural fertility population, the age pattern of marital fertility declines rather slowly, and drops sharply at ages above 35-39, whereas in a society where fertility is controlled fertility declines rapidly at earlier ages and is already low by the time women reach their thirties (Knodell:1977). The ASMFR for the country are plotted along with the standard marital schedules, n(a), (Coale and Trussell:1974) (see also figures A6.2). The curves are concave in shape suggesting that fertility is indeed natural.

Table A6.2

"Derived" Age Specific Marital Fertility Rates: Malawi - 1977

Age Group	1972	1977	1982	1984
15-19	0.430	0.280	0.324	0.410
20-24	0.334	0.331	0.355	0.412
25-29	0.341	0.311	0.325	0.381
30-34	0.271	0.273	0.280	0.312
35-39	0.251	0.224	0.217	0.251
40-44	0.130	0.150	0.136	0.155
45-49	0.108	0.086	0.078	0.119
TMFR =	9.321	8.271	8.576	10.197

Source: Calculated from the reported ASFR and proportion married.

However, merely studying the nature and pattern of decline of ASMFR after a particular age group is not sensitive enough. A more sensitive measure of fertility control was proposed by Coale and Trussell(1974) which involves calculating m, the index of fertility control. Coale and Trussel hypothesized that in any population, the ratio of marital fertility r(a) to natural fertility n(a) can be expressed as:

$$\frac{r(a)}{n(a)} = M \exp[m.v(a)]$$

where v(a) expresses the age pattern of volu(n)tary control of fertility. m measures the departure of an actual fertility schedule from the hypothetical natural fertility schedule. A negative value of m represents marital fertility in excess of the hypothetical standard whereas a positive value indicates a reduction of marital fertility below the natural fertility. A value of zero signifies no deviation from the natural fertility. These values were calculated for the country using the data in Table A6.2b. M is the ratio of the Least square approach was used to fit the model and Table A6.2b presents the values of the parameters obtained.

Table A6.2b

Estimated values of M and m for Coale and Trussell fertility schedule: Malawi 1972-1984

	M	m	Mean square error
1972	0.734	-0.033	0.003
1977	0.685	-0.115	0.006
1982	0.742	-0.002	0.004
1984	0.861	+0.013	0.005

Coale and Trussell(1975) further suggested that any value of m less than 0.2 is indicative of absence of fertility control. Table A6.2b shows that the value of m for Malawi is less than 0.2 for all the four sources considered. In absence of any other data, this can be taken as a solid "demographic" proof that the population of Malawi is natural. Coale and Trussel(1975) further suggest that the values of m calculated from the model should be regarded rather tentatively particularly those having mean square error greater than 0.01 which indicates "a terribe fit" while a value of 0.005 would indicate a "medocre fit".

Fig A5.4 Reported ASMFR: Malawi

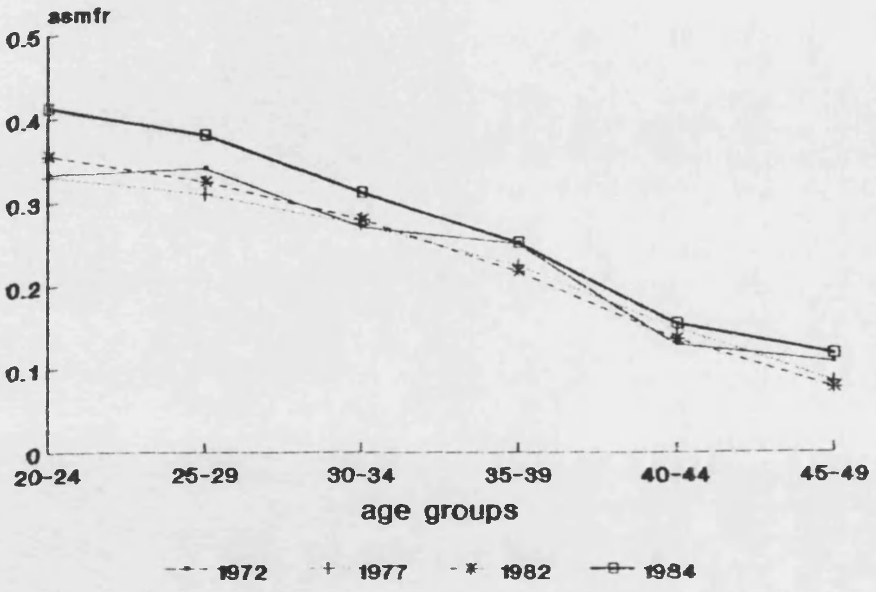


Fig A5.5 Index values of Reported ASMFR
(age group 20-24 = 100)

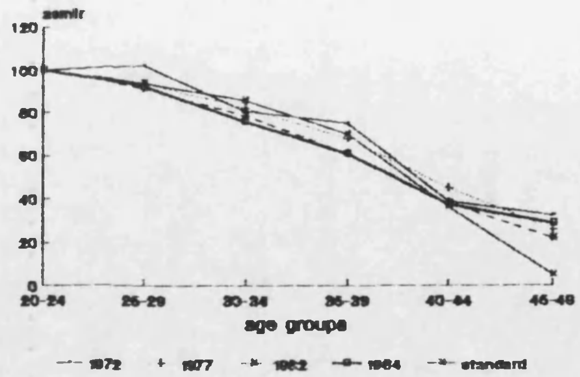
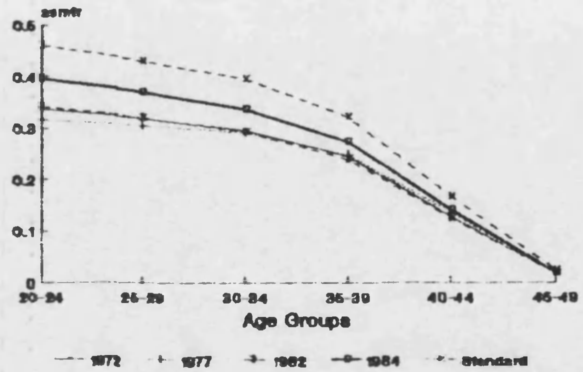


Fig A5.6 Fitted Coale-Trussel Marital
Fertility



SUPPLEMENTARY TABLES

Table S1.1

Population Distribution and Density for Malawi, Regions and Districts (1966-1987)

	Population (in percent)			Population Density*		
	1966	1977	1987	1966	1977	1987
Malawi	100.0	100.0	100.0	43	59	85
Northern Region	12.3	11.7	11.4	18	24	34
Chitipa	1.5	1.3	1.2	14	17	23
Karonga	1.9	1.9	1.8	23	32	44
NKhata Bay	2.1	1.9	1.7	21	26	33
Rumphi	1.2	1.1	1.2	10	13	20
Mzimba	5.7	5.4	5.4	22	29	41
Central Region	36.5	38.6	39.0	41	60	88
Kasungu	2.4	3.5	4.0	12	25	41
NKhota kota	1.6	1.7	2.0	15	22	37
Ntchisi	1.7	1.6	1.5	40	53	73
Dowa	4.5	4.5	4.0	61	83	107
Salima	2.1	2.4	2.4	39	59	84
Lilongwe	12.3	12.7	12.4	81	114	160
Mchinji	2.1	2.9	3.1	25	47	74
Dedza	5.7	5.4	5.1	64	82	113
Ntcheu	4.1	4.1	4.5	48	66	105
Southern Region	51.2	49.7	49.6	65	87	125
Mangochi	5.8	5.5	6.2	37	48	79
Machinga	5.6	6.2	6.4	38	57	86
Zomba	7.0	6.4	5.5	109	137	170
Chiradzulu	3.5	3.2	2.6	185	230	275
Blantyre	5.9	7.4	7.4	118	203	292
Mwanza	1.0	1.3	1.5	18	31	53
Thyolo	6.4	5.8	5.4	150	188	252
Mulanje	9.9	8.6	8.0	116	138	185
Chikwawa	3.6	3.5	4.0	31	41	67
Nsanje	2.5	2.0	2.5	52	56	104

* square kilometer

Table S1.2

Percentage Increase and Inter-censal Growth for Malawi, Regions and Districts (1966 - 1987)

	Percentage Increase		Growth Rate	
	1966/77	1977/87	1966/77	1977/87
Malawi	37.3	43.9	2.9	3.6
Northern Region	30.4	39.8	2.4	3.4
Chitipa	21.5	33.9	1.8	2.9
Karonga	37.6	37.6	2.9	3.2
NKhata Bay	26.1	28.6	2.1	2.5
Rumphi	33.9	51.6	2.7	4.2
Mzimba	31.2	43.5	2.5	3.6
Central Region	45.3	45.4	3.4	3.7
Kasungu	99.5	66.0	6.3	5.1
NKhota kota	50.0	66.5	3.7	5.1
Ntchisi	31.0	38.0	2.5	3.2
Dowa	36.0	30.1	2.8	2.6
Salima	52.8	42.3	3.9	3.5
Lilongwe	41.2	40.1	3.1	3.4
Mchinji	86.2	56.2	5.6	4.5
Dedza	29.2	37.8	2.3	3.2
Ntcheu	37.5	58.8	2.9	4.6
Southern Region	33.3	43.7	2.6	3.6
Mangochi	29.9	64.0	2.4	4.9
Machinga	50.9	50.5	3.7	4.1
Zomba	24.8	24.4	2.0	2.2
Chiradzulu	23.9	19.6	1.9	1.8
Blantyre	72.0	44.1	4.9	3.7
Mwanza	70.1	69.8	4.8	5.3
Thyolo	25.5	34.0	2.1	2.9
Mulanje	19.7	33.7	1.6	2.9
Chikwawa	31.9	64.5	2.5	5.0
Nsanje	7.4	85.1	0.7	6.2

Table S2.1

Total Land Area and type in Malawi

	AREA*	A	B	C	D
Malawi	94,274	9,274	13,559	9,019	42,418
Northern Region	26,930	4,012	4,493	16,84	16,741
Chitipa	4,290	59	981	84	3,166
Karonga	3,355	780	166	127	2,282
Nkhata Bay	4,088	52	21	415	3,600
Rumphi	4,767	290	426	64	3,987
Mzimba	10,430	2,831	2,889	994	3,706
Central Region	35,592	10,306	7,650	3,635	14,001
Kasungu	7,878	370	3,251	573	3,684
Nkhota Kota	4,259	207	643	732	2,677
Ntchisi	1,655	214	530	81	830
Dowa	2,998	1,232	368	636	762
Salima	2,239	1,189	0	480	570
Lilongwe	6,159	3,652	1,168	64	1,275
Mchinji	3,356	116	1,571	398	1,271
Dedza	3,624	1,497	119	16	1,992
Ntcheu	3,424	1,829	0	655	940
Southern Region	31,752	14,960	1,416	3,700	11,676
Mangochi	6,272	2,925	610	191	2,446
Machinga	5,964	2,246	207	1,002	1,909
Zomba	2,580	1,805	0	170	605
Chiradzulu	767	713	0	0	54
Blantyre	2,012	660	88	617	647
Mwanza	2,295	1,053	211	357	674
Mulanje	1,715	332	0	586	797
Thyolo	3,450	2,173	0	327	950
Chikwawa	4,755	1,821	68	450	2,416
Nsanje	1,942	632	232	0	1,078

Source: OPC-TCP (1987) National Physical Development Plan Vol. I - Policy Document

Notes:
A refers to High Agricultural Potential
B refers to Medium Agricultural Potential
C refers to Low agricultural Potential
D refers to Marginal and Unsuitable area.
* area is in square kilometer

Table S2.2

Percentage of area type over total area
for Malawi, Regions and District

	TOTAL	A	B	C	D
Malawi	100.0	31.1	14.4	9.6	45.0
Northern Region	100.0	14.9	16.7	6.3	62.2
Chitipa	100.0	1.4	22.9	2.0	73.8
Karonga	100.0	23.2	4.9	3.8	68.0
Nkhata Bay	100.0	1.3	0.5	10.2	88.1
Rumphi	100.0	6.1	8.9	1.3	83.6
Mzimba	100.0	27.1	27.7	9.5	35.5
Central Region	100.0	29.0	21.5	10.2	39.3
Kasungu	100.0	4.7	41.3	7.3	46.8
Nkhota Kota	100.0	4.9	15.1	17.2	62.9
Ntchisi	100.0	12.9	32.0	4.9	50.2
Dowa	100.0	41.1	12.3	21.2	25.4
Salima	100.0	53.1	0.0	21.4	25.5
Lilongwe	100.0	59.3	19.0	1.0	20.7
Mchinji	100.0	3.5	46.8	11.9	37.9
Dedza	100.0	41.3	3.3	0.4	55.0
Ntcheu	100.0	53.4	0.0	19.1	27.5
Southern Region	100.0	47.1	4.5	11.7	36.8
Mangochi	100.0	46.6	9.7	3.0	39.0
Machinga	100.0	37.7	3.5	16.8	32.0
Zomba	100.0	70.0	0.0	6.6	23.4
Chiradzulu	100.0	93.0	0.0	0.0	7.0
Blantyre	100.0	32.8	4.4	30.7	32.2
Mwanza	100.0	45.9	9.2	15.6	29.4
Mulanje	100.0	19.4	0.0	34.2	46.5
Thyolo	100.0	63.0	0.0	9.5	27.5
Chikwawa	100.0	38.3	1.4	9.5	50.8
Nsanje	100.0	32.5	11.9	0.0	55.5

Source and notes: See Table S2.1 above.

Table S2.C

Percentage of Land in each Region and District over Total Land Area in the country by type

	TOTAL	A	B	C	D
Malawi	100.0	100.0	100.0	100.0	100.0
Northern Region	28.6	13.7	33.1	18.7	39.5
Chitipa	4.6	0.2	7.2	0.9	7.5
Karonga	3.6	2.7	1.2	1.4	5.4
Nkhata Bay	4.3	0.2	0.2	4.6	8.5
Rumphi	5.1	1.0	3.1	0.7	9.4
Mzimba	11.1	9.7	21.3	11.0	8.7
Central Region	37.8	35.2	56.4	40.3	33.0
Kasungu	8.4	1.3	24.0	6.4	8.7
Nkhota Kota	4.5	0.7	4.7	8.1	6.3
Ntchisi	1.8	0.7	3.9	0.9	2.0
Dowa	3.2	4.2	2.7	7.1	1.8
Salima	2.4	4.1	0.0	5.3	1.3
Lilongwe	6.5	12.5	8.6	0.7	3.0
Mchinji	3.6	0.4	11.6	4.4	3.0
Dedza	3.8	5.1	0.9	0.2	4.7
Ntcheu	3.6	6.2	0.0	7.3	2.2
Southern Region	33.7	51.1	10.4	41.0	27.5
Mangochi	6.7	10.0	4.5	2.1	5.8
Machinga	6.3	7.7	1.5	11.1	4.5
Zomba	2.7	6.2	0.0	1.9	1.4
Chiradzulu	0.8	2.4	0.0	0.0	0.1
Blantyre	2.1	2.3	0.6	6.8	1.5
Mwanza	2.4	3.6	1.6	4.0	1.6
Mulanje	1.8	1.1	0.0	6.5	1.9
Thyolo	3.7	7.4	0.0	3.6	2.2
Chikwawa	5.0	6.2	0.5	5.0	5.7
Nsanje	2.1	2.2	1.7	0.0	2.5

Source and notes: See Table S2.1 above.

Table S2.2

A Table Showing Urban Population in Malawi for the three most recent censuses: 1966, 1977, 1987

	Urban Population			Changes in urban Population	
	1966	1977	1987	1966-77	1977-87
Malawi	189,607	470,658	859,141	281,051	388,483
Northern Region	18,307	44,716	90,475	26,409	45,759
Chitipa	1,429	3,110	5,233	1,681	2,123
Karonga	1,128	12,051	19,630	10,923	7,579
Nkhata Bay	1,188	4,048	6,492	2,860	2,444
Rumphi	1,916	4,003	7,147	2,087	3,144
Mzimba	12,646	21,504	5,1973	8,858	30,469
Central Region	32,824	137,859	306,032	105,035	168,173
Kasungu	1,628	6,488	10,848	4,860	4,360
Nkhota Kota	1,117	10,316	12,149	9,199	1,833
Ntchisi	1,218	1,654	3,060	436	1,406
Dowa	2,862	5,321	8,313	2,459	2,992
Salima	2,307	4,712	10,606	2,405	5,894
Lilongwe	19,425	98,718	233,973	79,293	135,255
Mchinji	831	1,957	4,542	1,126	2,585
Dedza	2,318	5,578	16,735	3,260	11,157
Ntcheu	1,118	3,115	5,806	1,997	2,691
Southern Region	138,476	288,083	462,634	149,607	174,551
Mangochi	2,767	5,999	22,197	3,232	16,198
Machinga	2,049	10,067	18,679	8,018	8,612
Zomba	19,666	24,234	42,878	4,568	18,644
Chiradzulu	609	689	1,456	80	767
Blantyre	109,461	219,011	331,588	109,550	112,577
Mwanza	692	2,354	4,710	1,662	2,356
Mulanje	2,221	7,237	8,985	5,016	1,748
Thyolo	1,428	4,208	12,077	2,780	7,869
Chikwawa	902	7,884	10,022	6,982	2,138
Nsanje	1,373	6,400	10,042	5,027	3,642

SOURCE: Census reports.

Table S2.3

The Percentage Distribution of the main Ethnic Groups in Malawi (1921 - 1945)

	1921 Census		1926 Census	
Rank	Ethnic Group	Percentage	Ethnic Group	Percentage
1	Chewa	21.8	Chewa	21.6
2	Ngoni	20.5	Ngoni	19.2
3	Mang'anja	18.2	Yao	15.5
4	Yao	15.4	Lomwe	14.9
5	Lomwe	10.1	Ngoni	13.7
6	Tumbuka	6.3	Tumbuka	5.4
7	Tonga	3.9	Tonga	4.0
8	Chikunda	1.8	Sena	3.1
9	Nkhonde	1.6	Nkhonde	1.8
10	Wemba**	0.2	Others	0.4
11	Swahili	0.2	Wemba**	0.3
12	Others	0.0	Swahili	0.02

	1931 Census		1945 Census	
Rank	Ethnic Group	Percentage	Ethnic Group	Percentage
1	Chewa	23.2	Chewa	28.2
2	Mang'anja	17.2	Lomwe	18.6
3	Yao	15.4	Mang'anja	15.3
4	Lomwe	14.7	Yao	13.8
5	Ngoni	13.6	Ngoni	9.5
6	Tumbuka	6.9	Tumbuka	5.6
7	Tonga	3.5	Sena	3.6
8	Sena	3.0	Nkhonde	3.0
9	Nkhonde	1.9	Tonga	2.5
10	Wemba**	0.4	Wemba**	0.1
11	Others	0.2	Swahili	0.02
12	Swahili	0.02	Others	0.02

Source: appropriate census report.

Notes: (1) ** according to 1945 census report this ethnic groups included other groups from Northern Rhodesian (now Zambia) for instance the Nsenga.

Table S3.1

Percentage Distribution by five year Age Groups
for Malawi, Regions and Districts: (Male) 1966

Country, Region and District	AGE GROUP 0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65+
Malawi	19.1	15.5	11.4	10.3	7.1	6.7	5.3	5.6	6.6	4.4	2.9	2.5	1.7	4.3
Northern Region	19.9	16.2	12.6	10.4	7.3	5.7	5.0	4.1	3.1	3.5	3.1	2.7	2.2	4.2
Chitipa	21.4	17.5	13.2	10.6	7.0	5.2	5.1	3.8	3.2	3.4	2.8	2.1	1.6	3.0
Karonga	18.1	15.7	11.7	10.1	8.4	6.3	5.9	4.6	3.4	4.1	3.6	2.7	2.0	3.3
Nkhata Bay	18.5	16.1	13.1	10.8	6.7	5.2	4.4	3.7	3.0	3.4	3.3	3.3	2.8	5.7
Rumphi	19.6	16.1	14.1	11.7	7.1	4.9	4.9	3.7	3.0	3.1	3.1	2.7	2.3	3.9
Mzimba	20.7	16.2	12.3	10.1	7.3	6.0	4.9	4.2	3.1	3.3	2.9	2.6	2.1	4.3
Central Region	20.0	15.5	11.7	10.0	7.1	6.7	5.4	5.4	3.3	4.1	2.5	2.3	1.5	4.4
Kasungu	20.1	16.3	12.6	9.9	7.0	6.1	5.1	4.7	3.2	3.9	2.9	2.4	1.7	4.0
Nkhota Kota	20.2	15.5	10.5	9.1	6.4	6.4	5.2	5.2	3.1	4.4	3.2	3.4	2.3	5.2
Ntchisi	20.4	15.3	12.4	10.1	6.9	6.4	5.8	5.3	3.3	3.8	2.3	2.1	1.8	4.2
Dowa	20.6	15.1	11.1	10.1	7.3	6.9	6.0	5.9	3.2	4.3	2.3	2.3	1.3	3.7
Salima	19.1	14.9	10.2	9.0	6.4	7.2	5.9	6.1	3.9	4.5	2.8	3.3	1.9	5.0
Lilongwe	19.5	14.4	11.1	10.4	8.3	7.7	5.9	5.9	3.4	4.3	2.3	1.9	1.3	3.3
Nchinji	19.4	16.9	12.6	10.0	7.0	6.1	5.0	4.7	3.0	3.6	2.3	1.6	0.9	7.0
Dedza	20.8	16.5	11.8	9.6	6.2	6.2	4.7	5.2	3.4	4.0	2.3	2.0	1.8	6.0
Ntcheu	20.0	17.2	13.8	10.3	5.4	4.8	4.4	4.5	3.2	3.7	3.2	3.1	1.8	4.8
Southern Region	18.4	15.3	10.9	9.9	7.0	6.9	5.2	6.0	4.0	4.7	3.1	2.6	1.8	4.2
Mangochi	20.3	17.5	9.8	8.3	6.0	6.5	4.5	5.3	3.6	5.5	3.1	2.7	1.9	5.1
Machinga	19.6	17.2	11.1	9.2	6.0	6.2	4.2	5.6	3.8	4.6	3.2	2.8	1.9	4.7
Zomba	16.6	15.0	10.8	10.3	7.5	7.4	5.7	6.2	4.0	4.7	3.3	2.8	1.7	4.3
Chiradzulu	18.5	15.9	12.8	11.0	6.1	5.8	4.8	5.3	3.5	4.0	3.5	2.7	1.6	4.6
Blantyre	16.6	13.3	9.9	10.5	9.5	9.1	6.8	6.6	4.3	4.1	2.7	2.1	1.4	3.2
Mwanza														
Thyolo	18.9	14.6	11.0	10.3	7.7	7.2	5.1	5.9	4.0	4.4	2.9	2.4	1.9	3.8
Mulanje	18.7	15.5	11.6	10.2	6.3	6.1	4.9	5.8	3.9	5.1	3.4	2.6	2.0	4.0
Chikwawa	18.4	14.0	10.6	9.6	7.4	6.9	5.4	7.0	4.8	5.1	2.7	2.6	1.9	3.8
Nsanje	19.0	14.8	10.8	9.0	5.1	5.0	5.1	6.5	3.9	5.8	3.4	3.3	2.3	6.0

TABLE S3.2

Percentage Distribution by five year Age Groups
for Malawi, Regions and Districts: (Female) 1966

Country, Region and District	AGE GROUP 0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65+
Malawi	18.0	14.2	9.9	9.9	8.4	8.2	6.2	6.3	4.0	4.6	2.7	2.3	1.6	3.7
Northern Region	17.6	14.1	11.0	9.9	8.4	6.9	6.1	5.3	4.0	4.6	3.3	2.8	2.0	4.1
Chitipa	19.2	15.3	11.8	10.4	8.6	6.8	5.9	5.4	3.6	3.9	2.7	2.1	1.5	2.9
Karonga	16.8	14.0	11.0	9.2	9.1	7.9	7.2	5.4	3.8	4.6	3.5	2.5	1.8	3.1
Nkhata Bay	16.1	13.8	10.7	9.5	7.6	6.1	5.9	5.4	4.2	5.7	3.9	3.2	2.6	5.3
Rumphi	16.7	14.2	12.1	10.5	8.3	6.5	6.2	5.1	3.9	4.1	3.4	2.8	2.1	4.2
Mzimba	18.2	13.9	10.6	10.0	8.4	7.1	5.8	5.1	4.1	4.5	3.2	2.8	1.9	4.3
Central Region	18.4	14.1	9.9	9.5	8.7	8.5	6.2	6.1	3.8	4.8	2.5	2.2	1.5	4.1
Kasungu	18.1	14.7	10.7	9.6	8.6	8.0	5.9	5.8	3.7	4.5	2.9	2.4	1.7	3.4
Nkhota Kota	17.9	13.1	8.6	8.3	8.3	8.5	6.6	6.6	3.8	5.5	3.4	3.2	2.2	4.1
Ntchisi	18.8	14.0	10.4	10.1	8.7	7.8	6.2	5.4	3.9	4.1	2.6	2.1	1.6	4.4
Dowa	19.8	14.4	9.7	9.8	8.6	8.7	6.4	6.2	3.5	4.6	2.3	2.0	1.1	3.0
Salima	17.0	13.2	8.4	9.0	8.2	9.6	6.8	6.9	4.4	4.9	2.5	3.1	1.9	4.3
Lilongwe	19.2	14.0	9.9	9.5	9.5	9.2	6.4	6.3	3.5	4.5	2.1	1.9	1.2	3.4
Nchinji	18.3	15.3	10.8	10.0	8.4	7.3	5.4	5.0	3.4	3.7	2.2	1.6	1.1	7.6
Dedza	18.1	14.2	9.7	9.3	8.4	8.4	5.8	6.3	4.1	4.3	2.3	2.2	1.9	4.5
Ntcheu	16.5	13.8	10.9	9.5	7.6	7.2	6.3	5.5	4.2	4.5	3.9	3.0	1.8	5.3
Southern Region	17.7	14.3	9.7	10.1	8.2	8.3	6.2	6.7	4.2	4.7	2.7	2.3	1.5	3.4
Mangochi	17.3	13.9	7.2	9.3	7.6	9.7	6.2	7.0	4.3	6.2	2.7	2.7	1.7	4.3
Machinga	17.3	14.4	8.8	10.0	8.0	8.4	6.0	7.1	4.4	5.0	2.9	2.5	1.5	3.7
Zomba	16.7	14.7	10.2	10.4	8.4	7.8	6.3	6.5	4.1	4.4	3.1	2.4	1.5	3.6
Chiradzulu	17.0	14.8	10.7	10.3	8.0	7.8	6.3	6.2	3.9	4.1	3.5	2.3	1.4	3.8
Blantyre	18.2	14.2	10.4	10.4	9.1	8.2	6.5	6.0	4.3	3.6	2.4	2.0	1.3	3.3
Mwanza														
Thyolo	19.2	14.6	10.5	10.5	8.6	8.1	5.8	6.3	3.9	4.2	2.3	2.0	1.4	2.8
Mulanje	18.0	14.6	10.2	10.6	8.0	7.9	6.1	6.8	4.1	4.8	2.7	2.0	1.5	2.8
Chikwawa	17.8	13.6	9.8	9.6	8.2	9.2	6.0	7.6	4.7	4.7	2.3	2.2	1.6	2.6
Nsanje	17.7	13.4	9.5	9.1	7.0	7.2	7.2	7.3	4.3	6.1	2.8	2.7	1.8	4.0

TABLE S3.3

Percentage Distribution by five year Age Groups
for Malawi, Regions and Districts: (Male) 1977

Country, Region and District	0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65+
Malawi	19.8	15.3	11.0	9.8	7.3	7.6	5.4	4.9	3.5	3.9	2.5	2.4	1.8	4.6
Northern Region	19.5	16.2	12.8	11.0	7.2	5.9	4.5	4.3	3.4	3.4	2.4	2.3	2.0	4.9
Chitipa	19.8	18.5	14.7	11.0	5.8	4.7	3.5	4.0	3.4	3.4	2.3	2.3	2.0	4.5
Karonga	19.8	16.2	12.0	10.7	7.0	5.8	4.7	4.6	4.0	3.9	2.6	2.5	2.1	4.1
Nkhata Bay	18.6	15.9	13.2	11.5	7.5	6.0	4.1	3.9	3.2	3.2	2.3	2.4	2.3	6.0
Rumphi	19.8	16.9	13.6	11.6	6.7	5.1	4.1	4.1	3.4	3.1	2.3	2.4	2.1	4.7
Mzimba	19.5	15.6	12.4	10.8	7.7	6.4	4.9	4.5	3.3	3.4	2.4	2.2	1.9	4.9
Central Region	20.3	14.7	10.6	9.7	7.6	7.9	5.7	5.2	3.7	4.0	2.3	2.4	1.6	4.2
Kasungu	18.2	13.3	10.3	11.6	9.8	9.0	6.2	5.5	3.6	3.5	2.1	2.1	1.5	3.3
Nkhota Kota	20.4	15.2	10.3	9.0	7.3	7.5	5.7	5.3	3.8	4.1	2.4	2.3	1.8	5.0
Ntchisi	20.9	14.7	11.1	10.1	7.4	7.0	5.3	4.6	3.7	3.9	2.3	2.5	1.5	4.9
Dowa	20.6	14.6	11.1	10.4	7.4	7.2	5.3	5.1	3.6	4.1	2.3	2.4	1.5	4.2
Salima	20.3	15.1	9.4	8.5	6.6	7.9	6.1	5.4	4.1	4.5	2.8	2.3	2.0	5.1
Lilongwe	20.2	14.2	10.1	9.6	8.1	8.5	6.2	5.5	3.8	4.1	2.3	2.3	1.4	3.5
Nchinji	18.9	14.4	11.3	11.3	9.0	8.3	5.7	4.9	3.3	3.5	1.9	2.1	1.2	4.3
Dedza	22.6	16.3	9.8	7.6	6.0	7.3	5.4	5.2	3.8	4.3	2.6	2.6	1.7	5.0
Ntcheu	20.1	15.6	13.2	10.0	6.1	6.5	4.6	4.4	3.5	3.9	2.4	2.8	2.0	5.0
Southern Region	19.4	15.5	10.9	9.5	7.0	7.8	5.4	4.8	3.5	4.0	2.6	2.5	2.0	4.8
Mangochi	20.3	17.2	10.1	8.0	6.0	7.5	5.3	4.7	3.5	3.9	2.7	2.4	2.2	6.1
Machinga	20.8	17.0	10.6	8.9	6.1	7.0	4.8	4.3	3.3	4.1	2.7	2.6	2.3	5.4
Zomba	18.2	14.6	11.0	10.5	7.4	7.8	5.4	4.9	3.6	4.0	2.6	2.6	2.1	5.0
Chiradzulu	19.1	15.4	12.8	11.0	6.7	7.0	4.7	4.2	3.3	3.7	2.5	2.5	2.2	4.7
Blantyre	17.4	13.1	10.1	10.0	9.8	10.1	6.9	5.9	4.1	3.9	2.3	2.0	1.3	2.7
Mwanza	19.8	16.2	13.1	10.3	6.2	7.1	4.7	4.5	3.1	3.5	2.5	2.6	1.6	4.5
Thyolo	19.7	15.5	11.5	9.7	6.8	7.8	5.4	4.8	3.3	3.9	2.6	2.3	1.8	4.8
Mulanje	20.5	16.0	11.3	9.3	6.1	7.3	5.0	4.5	3.2	3.9	2.5	2.7	2.2	5.3
Chikwawa	19.5	16.1	9.9	8.9	7.5	7.9	5.4	5.0	3.4	4.5	2.8	2.8	1.9	4.3
Nsanje	20.2	16.1	10.1	8.1	5.0	6.7	4.8	4.6	3.3	4.9	3.2	3.3	2.7	6.9

TABLE S3.4

Percentage Distribution by five year Age Groups
for Malawi, Regions and Districts: (Female) 1977

Country, Region and District	AGE GROUP 0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65+
Malawi	19.2	14.5	9.6	9.7	8.8	8.1	5.6	5.1	3.8	3.9	2.8	2.3	1.9	4.4
Northern Region	18.1	14.5	11.2	10.9	8.1	6.6	5.4	4.9	4.0	3.9	3.0	2.6	2.1	4.6
Chitipa	18.2	16.6	12.7	11.0	7.0	6.5	5.0	4.9	3.8	3.6	2.6	2.1	2.0	3.8
Karonga	18.4	14.6	10.8	10.9	8.3	7.0	6.0	5.3	4.2	4.1	2.7	2.3	1.9	3.5
Nkhata Bay	17.3	14.3	11.2	10.6	8.0	6.2	5.1	4.5	4.0	4.3	3.2	3.0	2.8	5.6
Rumphi	18.1	14.9	12.0	10.4	8.0	6.1	5.2	4.7	4.1	3.8	3.1	2.6	1.9	5.0
Mzimba	18.3	14.0	10.8	11.0	8.4	6.7	5.4	4.9	4.0	3.7	3.2	2.6	2.1	4.7
Central Region	20.2	14.4	9.4	9.5	8.8	8.0	5.7	5.3	3.8	3.8	2.7	2.2	1.8	4.3
Kasungu	20.5	14.3	9.7	10.6	9.5	7.8	5.9	5.0	3.6	3.3	2.4	2.0	1.7	3.3
Nkhota Kota	20.1	14.6	8.9	9.3	8.3	7.8	5.7	5.1	3.8	4.0	2.8	2.4	2.0	4.8
Ntchisi	20.5	14.0	9.3	10.1	8.2	7.6	5.6	5.5	4.0	3.6	2.7	2.2	1.8	4.9
Dowa	20.7	14.3	9.5	9.9	8.5	7.7	5.5	5.4	3.9	3.9	2.6	2.1	1.7	4.0
Salima	19.6	14.4	7.9	8.6	8.3	8.5	6.3	5.5	4.0	4.2	3.0	2.2	1.9	5.4
Lilongwe	20.7	14.6	9.4	9.4	9.2	8.5	6.1	5.4	3.8	3.7	2.4	2.0	1.5	3.3
Nchinji	20.8	15.1	9.7	9.9	9.1	7.8	5.3	4.7	3.4	3.3	2.3	1.9	1.5	5.2
Dedza	20.1	14.4	8.6	9.0	8.5	7.8	5.6	5.3	3.9	4.0	3.1	2.4	1.9	5.3
Ntcheu	17.9	13.7	10.5	9.8	8.1	7.1	5.2	4.9	4.2	4.5	3.1	3.0	2.5	5.5
Southern Region	18.7	14.6	9.5	9.6	9.1	8.6	5.6	4.9	3.7	4.1	2.9	2.3	2.0	4.4
Mangochi	18.0	14.2	7.5	8.8	8.7	8.7	5.9	5.4	4.3	4.3	3.2	2.4	2.3	6.1
Machinga	18.5	14.8	8.3	9.3	8.5	8.5	5.6	5.2	4.1	4.5	3.2	2.5	2.2	4.9
Zomba	17.8	13.9	9.5	10.3	9.3	8.4	5.6	4.9	3.7	4.2	3.0	2.5	2.1	4.7
Chiradzulu	17.4	14.1	10.5	9.9	8.9	8.1	5.2	5.2	4.2	4.1	3.0	2.5	2.3	4.4
Blantyre	19.2	14.7	11.4	10.4	10.4	9.0	5.5	4.7	3.4	3.0	2.2	1.7	1.3	2.9
Mwanza	18.5	14.6	10.9	10.0	8.5	8.0	5.3	4.7	3.8	3.7	2.8	2.6	1.8	4.7
Thyolo	19.3	15.1	10.4	9.8	9.3	8.5	5.4	4.6	3.2	3.8	2.6	2.0	1.7	4.2
Mulanje	19.1	14.3	9.5	9.7	9.1	8.8	5.4	4.7	3.4	4.2	2.9	2.5	2.0	4.2
Chikwawa	19.6	15.6	8.3	8.9	8.8	8.6	6.0	5.2	3.8	4.4	2.9	2.4	1.8	3.6
Nsanje	19.0	15.3	8.5	8.4	7.2	8.1	5.5	5.2	4.2	4.8	3.5	3.0	2.3	5.1

Table S3.5

Percentage Distribution by five year Age Groups
for Malawi: 1966 - 1984

Male

	0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65+
1966	18.0	14.2	9.9	9.9	8.4	8.2	6.2	6.3	4.0	4.6	2.7	2.3	1.6	3.7
1972	17.1	14.8	13.6	9.3	7.4	5.8	5.8	4.7	4.7	3.7	3.5	2.8	6.5	
1977	19.8	15.3	11.0	9.8	7.3	7.6	5.4	4.9	3.5	3.9	2.5	2.4	1.8	4.6
1982	19.9	16.5	12.1	9.1	7.5	6.4	5.8	4.2	3.7	3.0	2.8	1.9	2.1	4.8
1984	19.3	17.5	13.6	9.3	7.0	5.6	5.4	4.7	3.6	2.6	2.3	2.4	2.1	4.5

Female

	0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65+
1966	19.1	15.5	11.4	10.3	7.1	6.7	5.3	5.6	6.6	4.4	2.9	2.5	1.7	4.3
1972	15.7	13.7	12.2	9.1	9.8	6.6	7.0	5.3	5.4	3.8	3.5	2.1	5.5	
1977	19.2	14.5	9.6	9.7	8.8	8.1	5.6	5.1	3.8	3.9	2.8	2.3	1.9	4.4
1982	18.7	15.9	10.6	9.4	8.8	7.2	6.1	4.7	3.7	3.2	2.9	2.3	2.2	4.1
1984	17.7	16.5	12.2	8.1	8.4	6.9	5.9	5.3	3.2	3.0	3.9	2.5	2.3	4.0

Table S3.6

Sex Ratios by five year age groups for
Malawi, Regions and Districts: 1966

Country, Region and District	AGE GROUP 0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65+
Malawi	95.8	97.9	102.9	91.4	76.2	73.3	76.6	79.7	81.7	85.0	95.6	97.2	100.2	103.0
Northern Region	96.4	98.4	98.1	90.0	74.6	70.4	69.8	66.5	67.1	63.7	79.8	83.6	92.7	86.5
Chitipa	99.1	101.5	99.4	90.0	72.4	67.9	75.6	62.6	78.8	78.4	93.2	88.6	95.8	91.2
Karonga	95.3	99.0	94.2	96.5	81.8	70.7	72.1	75.1	79.2	78.0	91.5	96.5	100.7	91.6
Nkhata Bay	96.1	98.2	102.1	95.9	73.6	71.3	63.1	57.3	60.0	49.1	71.9	86.6	90.3	89.7
Rumphi	96.7	93.6	96.4	91.8	70.6	62.3	64.7	60.0	62.3	64.1	75.1	80.3	88.6	76.2
Mzimba	96.0	98.3	98.0	85.5	73.6	72.1	71.0	69.4	64.3	62.3	77.1	78.4	91.7	85.0
Central Region	95.7	96.9	103.9	93.3	72.5	69.5	77.2	79.0	78.1	81.0	88.1	89.9	89.4	95.1
Kasungu	97.1	96.3	102.4	90.5	70.4	65.8	75.0	70.4	74.1	75.3	89.5	89.1	87.0	102.6
Nkhota Kota	96.9	101.6	105.4	94.5	66.2	64.6	68.6	68.0	71.3	68.6	79.9	90.2	89.5	108.4
Ntchisi	94.9	95.6	104.2	87.2	68.8	72.2	81.7	85.6	73.9	82.5	79.6	84.8	93.2	82.7
Dowa	95.3	95.7	104.0	93.8	77.9	72.3	86.1	86.5	84.7	85.9	95.1	103.0	107.1	112.7
Salima	94.7	94.5	102.1	83.5	65.5	63.1	72.4	74.5	74.8	77.4	95.1	91.6	84.1	98.2
Lilongwe	95.3	96.4	105.9	102.6	82.4	77.6	86.4	88.2	90.8	89.1	101.6	96.0	103.4	91.5
Nchinji	95.3	99.7	105.3	90.3	74.7	75.3	84.3	84.5	78.9	88.4	95.4	89.4	70.2	82.9
Dedza	95.7	97.0	101.8	85.7	61.3	61.7	67.4	68.9	69.7	77.1	84.1	77.7	75.6	112.2
Ntcheu	97.8	99.9	101.9	86.9	56.8	53.7	56.5	65.2	61.1	65.8	66.7	83.0	81.5	73.5
Southern Region	95.8	98.5	103.5	90.4	79.5	76.9	77.7	82.8	87.6	92.9	105.4	106.6	110.6	115.1
Mangochi	94.0	101.6	108.5	71.6	62.9	53.7	57.8	61.3	67.7	71.3	92.8	82.2	87.8	95.0
Machinga	94.8	100.0	104.9	76.4	62.9	61.7	58.5	66.6	71.9	76.6	90.0	95.3	104.5	105.0
Zomba	96.9	99.5	103.6	96.5	86.6	92.5	87.6	92.7	95.2	104.5	106.5	112.6	110.5	115.1
Chiradzulu	96.5	95.9	105.5	95.3	68.0	66.5	66.9	75.7	78.4	87.1	88.2	102.6	101.1	109.0
Blantyre	96.7	98.8	100.8	106.4	110.2	117.1	110.6	115.6	106.5	117.8	116.4	112.5	112.3	103.5
Mwanza														
Thyolo	96.2	97.8	102.9	96.0	87.1	86.0	85.6	92.1	98.7	103.9	123.0	116.3	133.1	132.4
Mulanje	95.4	97.7	103.5	88.4	71.8	71.1	73.5	78.4	87.8	97.1	113.7	121.6	120.8	129.8
Chikwawa	96.9	96.0	101.7	94.3	84.3	70.1	84.0	85.6	96.2	101.4	106.6	107.8	110.9	134.6
Nsanje	94.0	97.2	99.9	87.1	63.5	60.8	62.4	78.3	78.9	83.0	107.8	108.3	108.8	132.6

Table S3.7

Sex Ratios by five year age groups for
Malawi, Regions and Districts: 1977

Country, Region and District	AGE GROUP 0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65+
	0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65+
Malawi	95.8	98.1	106.2	93.1	76.7	87.4	90.1	90.8	86.9	92.9	81.1	96.9	89.1	96.9
Northern Region	96.3	100.2	102.8	90.8	79.8	80.5	75.8	79.4	76.3	79.3	71.2	81.3	83.9	95.4
Chitipa	96.5	99.5	103.2	88.1	72.6	64.0	61.9	72.9	79.4	83.3	79.9	97.8	90.9	103.6
Karonga	96.7	99.5	99.5	88.6	74.9	75.1	70.1	77.7	85.9	85.2	85.7	99.7	98.5	102.7
Nkhata Bay	97.6	100.6	107.3	98.2	84.8	87.0	73.4	79.3	73.8	68.1	64.9	72.3	74.8	98.5
Rumphi	95.3	98.9	99.1	96.9	72.9	72.1	69.1	75.7	71.8	70.9	65.1	81.3	95.3	81.9
Mzimba	96.0	100.7	103.0	88.5	82.7	85.8	81.1	82.3	73.9	82.3	68.7	76.2	79.9	93.7
Central Region	95.5	97.1	107.7	97.0	82.3	93.6	94.7	94.3	91.3	99.4	82.3	100.7	84.6	91.8
Kasungu	95.4	100.0	113.2	117.3	110.3	123.1	112.2	116.4	106.6	114.7	92.1	113.2	92.6	107.4
Nkhota Kota	94.6	97.2	108.5	91.0	81.9	90.0	93.6	96.2	92.7	94.7	78.5	87.2	81.9	95.9
Ntchisi	94.2	96.3	110.5	92.3	83.1	85.3	86.3	77.8	86.2	100.6	78.5	103.7	76.9	90.8
Dowa	95.0	97.1	111.8	100.8	82.8	88.4	92.6	90.8	88.6	100.2	85.1	107.4	84.2	100.9
Salima	97.2	99.1	111.7	93.5	74.4	87.1	91.0	91.1	95.4	98.7	85.8	98.7	97.1	88.8
Lilongwe	95.7	95.8	105.3	100.7	86.2	98.1	100.6	100.0	98.4	109.3	90.6	109.9	95.0	104.4
Nchinji	94.5	99.0	120.4	118.3	103.0	110.9	110.9	107.4	100.0	110.2	87.1	112.1	86.4	85.0
Dedza	95.6	96.1	97.0	72.3	60.1	79.0	82.1	83.1	82.9	90.3	71.4	92.2	75.5	79.4
Ntcheu	96.1	97.8	107.2	87.2	64.1	77.6	75.8	78.4	70.1	73.9	67.4	80.0	68.7	76.7
Southern Region	96.0	98.3	106.0	90.9	71.8	84.2	89.9	90.6	86.1	91.3	82.8	98.1	93.6	101.1
Mangochi	95.0	102.4	112.9	76.0	58.8	72.5	75.3	73.3	68.9	76.9	71.0	84.8	78.7	84.7
Machinga	96.0	98.4	108.9	81.6	61.4	70.3	74.0	71.5	69.8	77.5	72.5	90.4	89.7	95.0
Zomba	94.7	97.3	107.5	94.7	73.5	85.5	88.6	92.1	90.0	88.8	81.7	96.1	92.8	99.1
Chiradzulu	95.1	94.7	105.8	96.6	65.5	74.4	78.0	71.0	67.8	79.3	71.1	85.0	84.5	92.4
Blantyre	98.3	96.9	96.0	104.5	102.9	121.5	136.1	137.5	132.6	140.8	114.3	123.5	110.0	101.0
Mwanza	95.4	99.3	107.0	92.7	65.5	79.5	79.7	86.7	74.1	84.1	80.1	87.4	84.0	86.6
Thyolo	97.5	97.9	105.9	94.8	70.0	87.7	96.6	99.8	96.3	96.9	95.0	108.0	98.7	110.2
Mulanje	95.4	99.5	105.8	85.6	60.0	73.4	82.2	86.5	84.2	84.3	76.4	96.1	97.0	112.3
Chikwawa	95.5	99.3	114.9	96.5	82.9	88.7	87.0	91.7	85.8	100.1	91.2	112.7	100.0	117.1
Nsanje	95.0	94.5	105.6	85.7	61.8	74.4	78.3	79.3	70.9	91.5	81.2	97.0	108.5	121.2

Table S3.8

Sex Ratios by five year age groups for
Malawi, Rural and Urban areas: 1972-1984

	Year of Survey	AGE GROUP 0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65+
	1972	96.8	96.7	98.8	91.3	67.0	78.4	74.8	80.2	77.0	87.8	88.5	118.9	105.9	
TOTAL	1977	95.8	98.1	106.2	93.1	76.6	87.4	90.1	90.8	86.9	92.9	81.1	96.9	89.1	96.9
	1982	98.2	95.1	104.7	88.4	78.5	81.9	87.0	82.9	91.8	85.5	88.0	75.9	89.9	107.3
	1984	99.5	97.1	100.9	105.0	75.1	73.7	84.0	80.9	102.9	80.2	53.3	88.0	82.8	102.2
	1972	96.4	109.0	99.4	89.7	65.1	74.2	67.7	74.3	71.5	82.3	83.0	114.6	196.8	
RURAL	1977	95.5	98.4	108.2	92.2	72.6	82.3	84.2	85.0	81.1	88.4	77.7	94.2	87.6	96.3
	1982	97.9	95.3	107.5	87.5	76.1	76.0	81.5	77.1	85.7	80.6	83.9	73.7	88.0	97.4
	1984	100.6	101.4	101.2	96.6	102.8	104.4	71.5	67.8	77.6	75.2	95.0	72.9	50.2	85.9
	1972	100.6	97.0	92.8	110.3	82.1	109.5	140.7	147.8	155.0	200.5	205.5	258.0	141.6	
URBAN	1977	99.5	94.5	86.5	102.9	113.8	139.0	157.9	169.0	179.5	187.1	159.2	165.3	134.5	120.0
	1982	100.9	93.3	82.7	96.5	97.2	133.9	141.3	156.7	189.0	183.0	196.7	141.6	151.8	114.1
	1984	89.5	87.5	87.9	100.7	88.6	108.6	99.1	115.0	133.4	132.6	182.5	190.1	104.9	129.3

Table S3.9

Age Ratios for Malawi, Regions
and District (Male): 1966

Country, Region and District	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59
Malawi	101.3	89.3	108.5	85.1	107.9	86.1	124.9	73.5	133.4	84.3	107.9
Northern Region	100.0	94.4	104.8	90.8	92.9	101.6	100.8	83.3	110.7	100.4	103.0
Chitipa	100.8	94.2	104.8	88.6	86.8	111.7	92.0	89.0	113.5	103.0	93.1
Karonga	105.6	90.6	100.5	102.3	88.7	107.6	99.0	79.2	115.8	106.0	96.4
Nkhata Bay	102.3	96.8	109.6	83.6	93.3	99.6	100.3	84.1	106.8	99.5	109.1
Rumphi	95.4	101.7	110.0	86.1	81.3	113.0	95.5	86.0	103.5	106.5	101.1
Mzimba	98.2	93.3	103.4	90.9	98.3	95.7	105.2	82.7	110.9	96.8	105.7
Central Region	97.6	91.7	106.6	85.3	106.9	89.1	124.4	69.8	140.7	78.4	113.3
Kasungu	99.3	96.2	101.7	86.2	101.2	93.7	114.7	73.3	128.5	92.4	104.3
Nkhota Kota	101.0	85.4	107.4	83.1	109.6	90.5	123.7	65.5	140.2	81.2	124.1
Ntchisi	93.1	97.9	105.0	82.8	102.2	98.4	116.1	72.5	136.3	78.8	101.7
Dowa	94.9	88.0	109.8	86.3	103.6	93.8	127.6	63.3	153.9	71.6	123.6
Salima	101.6	85.2	108.6	78.5	118.3	88.0	125.1	73.2	135.1	70.9	143.7
Lilongwe	94.0	89.9	106.8	92.2	107.9	86.5	127.6	66.8	150.2	73.5	108.5
Nchinji	105.9	93.5	102.3	86.6	101.9	93.4	116.8	71.5	137.3	87.4	103.7
Dedza	101.4	90.3	106.8	78.4	114.2	82.3	127.6	74.7	140.2	75.6	101.0
Ntcheu	101.7	100.6	107.0	71.3	97.5	95.6	117.6	78.7	113.9	95.5	122.3
Southern Region	104.4	86.4	110.8	83.7	112.1	81.4	130.1	74.1	133.8	84.7	106.1
Mangochi	116.8	75.8	105.2	80.8	124.0	75.7	132.1	67.0	161.9	76.6	109.5
Machinga	112.0	84.0	107.3	78.2	121.2	71.1	141.1	73.9	132.9	84.7	112.3
Zomba	109.1	85.4	113.2	84.3	112.3	83.8	127.5	73.5	128.2	89.5	110.3
Chiradzulu	102.1	94.6	117.0	72.4	107.3	85.7	128.3	74.2	117.3	102.6	105.4
Blantyre	100.3	83.2	108.2	97.0	111.5	87.2	118.0	81.1	116.1	86.2	106.2
Mwanza											
Thyolo	97.9	88.4	110.3	88.0	111.9	77.9	130.7	76.7	129.2	84.9	99.4
Mulanje	102.7	89.7	144.7	76.8	109.2	82.8	130.9	72.1	138.6	88.5	96.6
Chikwawa	96.2	90.0	107.0	89.6	107.4	77.9	136.5	80.4	135.1	69.5	144.1
Nsanje	99.6	90.6	113.5	72.3	98.3	89.3	143.8	63.4	158.5	74.9	117.0

Table S3.10

Age Ratios for Malawi, Regions and District (Female): 1966

Country, Region and District	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59
Malawi	101.8	82.6	107.7	92.9	112.3	85.6	123.1	73.7	137.1	78.5	108.0
Northern Region	98.7	91.3	102.3	99.8	95.8	99.9	104.2	80.9	126.6	89.6	104.3
Chitipa	98.6	91.7	102.6	99.4	94.2	96.9	112.8	78.3	123.0	90.5	98.9
Karonga	101.1	94.2	92.3	105.7	97.3	108.2	98.3	76.4	126.3	97.8	94.6
Nkhata Bay	102.6	92.3	103.1	97.9	90.4	102.2	108.1	74.4	143.0	86.6	99.8
Rumphi	98.5	97.9	102.8	98.2	88.9	107.0	101.5	85.3	110.2	100.2	101.1
Mzimba	96.6	88.5	105.4	98.8	98.9	95.6	103.5	85.0	124.4	86.0	111.5
Central Region	99.4	84.2	102.0	96.5	114.6	84.8	122.0	71.4	142.5	74.7	111.7
Kasungu	102.1	88.3	99.0	97.8	111.1	84.7	121.6	71.8	137.8	82.7	103.6
Nkhota Kota	99.0	80.1	97.8	99.5	114.1	87.2	126.7	62.7	154.0	77.8	115.1
Ntchisi	95.6	86.5	106.1	97.1	104.9	93.6	106.7	82.8	125.8	82.4	101.9
Dowa	97.4	80.4	107.4	92.7	116.6	85.1	126.4	64.4	159.2	68.7	118.9
Salima	104.5	75.1	109.3	87.5	128.6	82.6	123.0	74.2	143.3	61.8	141.7
Lilongwe	96.4	84.0	98.3	101.0	116.9	82.0	127.3	65.2	159.8	65.9	115.5
Nchinji	105.1	85.3	104.0	97.4	106.2	87.5	113.7	78.0	132.6	81.3	100.8
Dedza	102.2	82.1	103.2	95.1	118.0	79.1	126.6	77.5	136.0	69.4	104.3
Ntcheu	101.1	93.5	102.7	91.3	102.8	99.4	105.3	84.3	110.5	104.1	105.1
Southern Region	104.4	79.4	113.4	88.8	114.8	83.2	128.3	73.6	136.2	78.3	106.6
Mangochi	112.9	65.5	125.2	80.2	140.2	74.4	133.4	65.2	175.9	61.5	121.1
Machinga	109.9	72.4	119.3	86.7	119.8	77.7	135.9	72.8	137.2	77.9	111.8
Zomba	109.0	81.0	112.4	92.2	105.7	88.6	124.6	75.2	122.7	90.3	105.6
Chiradzulu	106.4	85.8	109.9	88.3	108.9	90.4	120.9	75.9	111.8	107.8	94.5
Blantyre	99.7	84.2	106.9	97.8	105.1	91.8	111.2	88.7	108.5	85.9	108.5
Mwanza											
Thyolo	98.6	83.4	110.0	92.6	112.5	80.7	128.9	75.2	133.8	74.5	108.4
Mulanje	103.4	81.2	116.4	86.6	111.4	83.9	132.3	70.8	140.2	81.2	92.2
Chikwawa	98.7	84.4	106.4	87.6	129.0	71.5	142.5	76.5	132.7	67.5	114.6
Nsanje	98.5	84.4	110.1	85.8	101.8	99.5	126.0	64.7	172.3	63.0	116.9

Table S3.11

Age Ratios for Malawi, Regions
and District (Male): 1977

Country, Region and District	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59
Malawi	99.4	87.8	106.8	83.9	119.9	86.5	109.8	79.9	131.3	77.4	112.9
Northern Region	100.4	94.5	109.4	85.6	101.2	87.5	109.4	88.4	117.1	83.7	106.2
Chitipa	107.5	99.9	106.9	73.6	101.4	80.7	116.7	90.9	118.9	81.7	107.7
Karonga	101.8	89.3	113.0	84.1	100.0	90.3	105.0	95.6	116.8	80.8	108.2
Nkhata Bay	99.9	96.6	111.0	85.6	103.4	82.5	107.7	90.2	115.6	82.4	105.3
Rumphi	101.2	95.7	114.1	80.4	93.8	89.5	109.0	95.1	107.8	83.6	111.4
Mzimba	98.0	93.8	107.3	89.7	102.1	89.1	110.1	83.2	119.3	85.9	104.4
Central Region	95.2	86.8	106.8	86.7	117.7	87.6	110.9	79.7	144.8	72.8	121.6
Kasungu	93.6	82.3	115.7	95.3	112.2	85.6	112.1	79.3	124.7	74.0	119.5
Nkhota Kota	98.9	85.1	102.6	88.1	116.4	88.4	111.7	81.0	132.3	74.5	109.9
Ntchisi	91.4	89.9	109.5	86.0	110.9	90.4	103.2	87.2	130.3	71.4	130.3
Dowa	91.9	89.0	112.7	83.9	112.7	86.6	114.4	78.4	138.4	71.8	125.4
Salima	102.2	79.1	107.1	80.1	125.1	91.4	106.2	82.4	130.6	81.8	98.3
Lilongwe	94.0	84.9	105.4	89.8	118.2	88.7	111.0	78.2	136.3	70.8	122.6
Nchinji	95.1	88.0	111.3	92.1	112.5	86.9	108.4	78.5	133.3	69.3	133.4
Dedza	100.5	82.4	95.9	80.9	127.3	86.8	113.1	79.7	134.9	74.6	122.9
Ntcheu	93.9	102.8	103.8	73.7	121.4	84.1	110.6	83.1	131.0	73.2	125.7
Southern Region	102.5	86.9	106.1	81.9	125.9	85.5	108.9	78.4	132.5	79.6	108.6
Mangochi	113.5	79.9	99.0	78.1	132.4	86.6	107.3	80.8	127.9	84.2	99.5
Machinga	108.2	81.9	106.5	76.9	127.6	85.5	106.1	79.4	134.9	80.5	104.9
Zomba	99.9	87.7	114.5	80.7	121.9	84.9	108.1	81.4	129.9	78.8	110.0
Chiradzulu	96.5	97.1	113.1	74.3	122.4	84.2	105.4	82.9	129.3	79.5	106.1
Blantyre	95.6	87.5	100.3	97.7	120.5	86.7	107.0	83.7	121.5	79.6	107.3
Mwanza	99.0	98.2	107.2	71.5	129.6	81.5	114.8	78.1	124.6	82.5	123.4
Thyolo	99.4	91.2	105.9	77.6	128.0	86.0	110.4	75.3	132.2	84.1	104.5
Mulanje	100.5	89.0	107.5	73.6	130.7	85.0	110.8	74.8	138.5	76.2	112.9
Chikwawa	109.8	79.1	102.1	89.6	122.0	84.1	113.8	70.4	148.5	75.1	121.3
Nsanje	106.4	83.2	107.3	67.6	136.9	84.8	113.8	70.0	150.1	78.2	109.7

Table S3.12

Age Ratios for Malawi, Regions and District (Female): 1977

Country, Region and District	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59
Malawi	100.6	79.5	105.5	99.0	112.3	85.2	107.4	84.4	119.3	90.0	98.4
Northern Region	99.0	88.4	112.2	93.2	97.8	93.6	103.9	91.9	109.5	94.1	99.9
Chitipa	107.3	92.0	111.9	80.2	108.0	88.3	111.1	88.6	113.5	90.7	93.2
Karonga	100.0	85.1	113.3	93.6	96.9	98.2	103.5	90.1	117.6	85.2	98.8
Nkhata Bay	100.7	89.7	110.7	95.0	95.5	94.2	99.9	90.3	118.4	88.7	101.1
Rumphi	99.1	94.7	104.4	96.8	93.0	95.5	101.2	97.4	104.8	96.5	104.9
Mzimba	95.9	86.9	114.1	94.9	97.7	92.6	104.4	92.7	103.8	99.7	100.2
Central Region	97.5	78.2	105.0	100.5	109.7	86.8	109.8	84.2	117.8	88.4	100.4
Kasungu	94.7	78.1	110.3	103.5	101.2	92.0	106.1	86.1	109.5	91.7	97.4
Nkhota Kota	100.6	74.3	107.8	97.4	112.0	87.3	108.2	83.5	121.1	87.2	100.7
Ntchisi	94.2	77.0	115.8	92.4	109.7	86.1	114.5	87.7	107.7	92.6	97.8
Dowa	94.8	78.5	109.7	96.7	110.5	83.6	114.5	83.9	120.4	86.6	98.9
Salima	104.5	68.7	105.9	97.3	117.0	89.0	108.1	81.6	120.7	94.2	89.7
Lilongwe	96.8	78.8	100.3	103.7	110.8	87.1	110.7	82.4	118.8	85.6	102.8
Nchinji	98.7	78.0	105.3	102.9	107.5	85.8	107.6	85.3	114.6	88.3	103.3
Dedza	100.3	73.9	104.3	101.6	110.9	85.2	112.2	82.8	116.3	95.1	97.3
Ntcheu	96.2	89.5	105.4	95.6	107.4	86.4	103.4	90.3	122.4	82.8	106.9
Southern Region	103.5	78.2	104.2	99.3	117.6	82.3	106.3	82.8	122.8	90.2	96.5
Mangochi	111.1	65.3	109.3	98.6	119.6	83.7	106.2	87.9	116.1	94.5	87.1
Machinga	109.9	69.1	110.8	95.4	120.5	81.8	107.1	84.5	123.6	91.1	92.3
Zomba	101.8	78.5	109.6	99.5	112.9	84.3	104.7	81.9	126.3	88.2	98.8
Chiradzulu	100.9	87.7	102.2	98.3	115.4	78.9	109.0	91.3	112.7	91.2	95.9
Blantyre	96.1	91.2	95.3	106.8	113.5	80.9	104.9	87.7	108.1	93.7	97.9
Mwanza	99.4	88.7	102.7	94.7	115.8	84.0	102.5	90.1	113.6	88.0	115.1
Thyolo	101.9	83.3	99.4	101.4	116.3	81.9	106.7	77.1	130.6	89.2	93.4
Mulanje	99.9	79.0	104.7	97.9	121.6	80.6	106.3	75.9	132.4	88.5	99.6
Chikwawa	111.9	67.7	100.2	100.2	116.3	86.8	107.4	78.3	130.8	86.1	101.8
Nsanje	110.7	72.0	107.0	87.7	126.9	82.6	107.7	84.1	124.0	90.1	104.0

Table S3.13

Age Ratios for Malawi, Rural, Urban
and selected cities: 1972-1984

Male

		5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54
	1972	97.0	112.2	89.2	97.4	87.8	110.9	90.3	110.4	90.7	107.4
	1977	99.4	87.8	106.8	83.9	119.9	86.5	109.8	79.9	131.3	77.4
TOTAL	1982	102.9	94.9	92.2	97.3	96.2	109.1	89.0	102.8	91.9	114.2
	1984	106.8	100.8	91.1	93.0	90.8	104.9	103.9	99.4	88.1	91.3
	1972	96.5	113.7	90.2	96.3	86.6	107.4	92.0	109.8	92.4	105.4
	1977	100.1	88.3	108.1	80.9	120.0	86.2	110.4	79.1	133.2	77.2
RURAL	1982	103.6	95.4	92.4	96.1	93.7	110.0	89.0	103.0	92.0	114.7
	1984	107.5	101.2	90.7	91.8	88.6	104.6	105.3	99.2	87.4	91.3
	1972	100.6	98.7	80.4	105.3	93.8	130.6	81.5	114.5	78.8	127.5
	1977	90.9	82.1	95.3	106.8	119.5	88.5	105.6	86.5	114.7	78.8
URBAN	1982	96.0	90.1	90.2	105.2	110.9	104.0	88.5	101.0	91.3	109.0
	1984	101.8	98.2	93.8	99.6	100.7	106.2	97.2	101.0	92.3	91.4
Blantyre City (1977 census)		89.8	81.8	93.1	109.6	119.4	89.1	104.7	86.6	115.2	79.1
Lilongwe City (1977 census)		90.2	95.1	90.7	114.1	113.1	80.6	102.3	84.3	105.6	89.1

Female

		5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54
	1972	97.9	107.4	82.6	125.0	78.6	117.4	85.4	119.5	84.3	120.0
	1977	100.6	79.5	105.5	99.0	112.3	85.2	107.4	84.4	119.3	90.0
TOTAL	1982	108.8	83.9	96.9	106.0	96.3	103.2	95.3	94.0	96.9	105.7
	1984	110.1	99.6	78.4	112.2	97.0	95.9	116.5	77.9	83.1	143.6
	1972	86.5	115.0	84.8	123.3	77.2	117.8	85.8	119.4	85.4	119.4
	1977	101.5	78.3	106.8	97.8	112.5	85.3	107.7	84.4	120.0	90.0
RURAL	1982	110.2	82.0	98.6	104.1	96.6	103.2	96.0	94.4	96.9	106.2
	1984	113.3	97.6	78.2	112.2	96.8	95.8	117.5	77.6	83.9	143.6
	1972	101.0	107.9	63.9	141.0	90.1	114.0	80.3	120.6	67.0	134.0
	1977	91.1	93.0	92.5	112.5	110.8	83.3	103.2	84.4	105.7	89.1
URBAN	1982	96.0	103.1	83.5	122.4	93.5	103.8	87.3	88.2	95.5	94.0
	1984	89.1	115.1	80.2	111.9	98.3	96.8	108.6	81.7	72.3	144.7
Blantyre City (1977 census)		88.9	73.6	96.7	112.0	121.9	94.9	74.8	106.2	111.0	77.8
Lilongwe City		90.1	88.9	90.0	120.5	105.9	87.5	99.5	82.4	102.5	82.9

Table S3.14

Overall Sex Ratio and Dependency Burden for Malawi Regions and Districts: 1966, 1977 and 1987

	SEX RATIO			DEPENDECY BURDEN		
	1966	1977	1987	1966	1977	1987
Malawi	90.0	93.0	94.6	92.1	96.8	100.6
Northern Region	85.3	89.7	94.4	98.3	103.3	101.0
Chitipa	88.6	88.8	90.6	107.9	118.6	113.2
Karonga	88.3	89.7	93.4	87.7	98.5	99.7
Nkhata Bay	83.8	90.9	96.0	97.4	103.7	98.6
Rumphi	82.6	87.1	95.2	100.3	109.7	100.5
Mzimba	84.6	90.1	95.0	99.6	100.3	99.7
Central Region	88.3	95.0	96.5	95.7	96.3	101.5
Kasungu	87.0	107.4	108.1	98.8	86.9	90.3
Nkhota Kota	86.0	93.8	100.7	89.5	98.7	97.2
Ntchisi	87.4	92.1	96.8	99.3	100.5	108.5
Dowa	91.4	95.6	97.0	94.4	98.4	102.9
Salima	84.1	94.0	95.1	84.5	94.6	97.9
Lilongwe	93.0	98.0	98.9	90.0	92.5	98.1
Nchinji	90.1	103.4	105.0	116.6	99.4	98.9
Dedza	84.2	85.2	86.3	101.7	103.6	113.0
Ntcheu	80.6	85.6	85.8	102.4	102.1	111.7
Southern Region	92.4	92.3	93.1	88.2	95.7	99.9
Mangochi	80.3	84.4	90.4	89.2	98.1	97.8
Machinga	83.6	85.5	89.1	92.4	99.8	104.3
Zomba	97.6	92.6	91.2	84.9	90.1	97.6
Chiradzulu	88.8	87.7	86.4	95.9	96.5	100.2
Blantyre	105.8	108.7	106.9	80.2	84.4	84.8
Mwanza		89.5	89.5		104.5	108.9
Thyolo	97.6	95.5	94.0	91.1	101.3	102.5
Mulanje	91.7	89.1	87.8	90.9	100.0	107.5
Chikwawa	93.7	96.4	99.3	82.7	94.4	102.2
Nsanje	87.6	89.3	93.1	90.0	101.8	109.7

Table S4.1

Mortality Estimates using Ladderman Formulae

Country/Region District*	CD(30-34)+	e(0)
Malawi	0.339	37.1
Northern region	0.237	45.0
Chitipa	0.230	45.6
Karonga	0.286	41.0
Rumphi	0.245	44.3
Mzimba	0.236	45.1
Nkhata Bay	0.296	40.2
Central Region	0.378	34.4
Kasungu	0.349	36.4
Nkhota Kota	0.336	37.3
Ntchisi	0.388	33.7
Dowa	0.385	33.9
Salima	0.384	34.0
Lilongwe	0.304	39.7
Mchinji	0.317	38.7
Dedza	0.348	36.4
Ntcheu	0.320	38.4
Southern Region	0.317	38.7
Mangochi	0.330	37.7
Machinga	0.329	37.8
Zomba	0.305	39.6
Chiradzulu	0.288	40.8
Blantyre	0.235	45.2
Mwanza	0.290	40.7
Mulanje	0.274	41.9
Thyolo	0.294	40.4
Chikwawa	0.354	36.0
Nsanje	0.340	37.0

Notes: + the proportion dead among children ever born to women aged 30-34.
* the district proportions were taken from Mbale(1984).

Table S4.1b

Mortality Estimates using Ladderman Formulae

	Year of Enumeration	CD(30-34)	e(0)
Total	1972	0.345	36.6
	1977	0.339	37.1
	1982	0.302	39.8
	1984	0.247	44.1
Rural	1972	0.356	35.9
	1977	0.349	36.4
	1982	0.314	38.9
	1984	0.264	42.7
Urban	1972	0.242	44.6
	1977	0.221	46.4
	1982	0.183	49.9
	1984	0.120	56.6

Table S4.1c

Estimates of IMR calculated by UN, NSO and MOH for Malawi 1930 to 2050

	UN(1)	NSO(2) SLOW DECLINE*		NSO(2) FAST DECLINE		MOH(3)
		M	F	M	F	
1930-35	-	371.4	319.9	-	-	-
1935-40	-	358.6	308.9	-	-	-
1940-45	-	330.9	284.8	-	-	-
1945-50	-	303.0	260.6	-	-	-
1950-55	212.0	277.7	238.7	-	-	-
1955-60	208.5	254.6	198.2	-	-	-
1960-65	205.0	233.4	200.2	-	-	189
1965-70	197.2	213.8	183.2	-	-	163
1970-75	189.9	195.6	167.4	-	-	144
1975-80	178.9	178.2	152.3	175.0	149.5	117
1980-85	164.9	162.3	138.5	153.1	130.6	105
1985-90	151.9	147.4	125.5	133.4	113.5	-
1990-95	139.6	133.4	113.5	115.8	98.2	-
1995-2000	128.0	120.6	102.3	99.6	83.9	-
2000-2005	116.8	-	-	-	-	-
2005-2010	106.0	-	-	-	-	-
2010-2015	95.6	-	-	-	-	-
2015-2020	85.5	-	-	-	-	-
2020-2025	75.8	-	-	-	-	-

Source: (1) UN(1982)
(2) NSO(1984b)
(3) MOH(1987b)

Note: * estimates for periods 1930-35, ..., 1970-75 were calculated by this author using (i) the assumption that e(0) changes by 2.5 years every five years, (ii) the estimated level of childhood and adulthood mortality as given by NSO(1984b).

Table S4.1d

Levels of Childhood (C) and Adulthood Mortality used to calculate life tables from which the above measures of IMR were obtained.

Period	C	A	Period	C	A
1972-77	8.3	10.5	1942-47	2.3	4.5
1967-72	7.3	9.5	1937-42	1.4	3.5
1962-67	6.3	8.5	1932-37	1.0	2.5
1957-62	5.3	7.5	1927-32	1.0	1.5
1952-57	4.3	6.5	< 1927	1.0	1.0
1947-52	3.3	5.5			

Table S4.1

Selected Life Table Measures for Malawi: 1972

	Male		Female		Both Sexes	
	l(x)	E(x)	l(x)	E(x)	l(x)	E(x)
0	100000	33.74	100000	34.66	100000	34.17
1-4	83573	39.31	87909	38.39	85793	38.78
5-9	62096	48.42	70208	43.71	66123	45.90
10-14	58009	46.66	64043	42.68	61027	44.52
15-19	57932	41.71	61830	39.12	59918	40.30
20-24	56355	37.81	56928	37.27	56636	37.49
25-29	55390	33.43	55626	33.08	55470	33.23
30-34	53092	29.77	53873	29.08	53479	29.37
35-39	51868	25.41	51812	25.13	51779	25.25
40-44	49868	21.33	49678	21.11	49707	21.20
45-49	46767	17.58	46388	17.43	46502	17.49
50-54	44462	13.36	43661	13.36	43975	13.35
55-59	41429	9.15	40401	9.24	40824	9.19
60++	38872	4.59	38411	4.58	38536	4.59

Table S4.2

Selected Life Table Measures for Malawi: 1977

	Male		Female		Both Sexes	
	l(x)	E(x)	l(x)	E(x)	l(x)	E(x)
0	100000	36.12	100000	39.14	100000	37.61
1-4	86319	40.80	88164	43.36	87261	42.06
5 - 9	59637	54.33	63266	55.87	61462	55.13
10 - 14	55233	53.47	59176	54.56	57208	54.04
15 - 19	53854	49.77	57699	50.89	55780	50.36
20 - 24	53062	45.48	56815	46.65	54942	46.09
25 - 29	52262	41.14	56040	42.26	54158	41.72
30 - 34	51683	36.57	55438	37.69	53568	37.15
35 - 39	50998	32.03	54789	33.10	52902	32.59
40 - 44	50357	27.40	54257	28.40	52316	27.93
45 - 49	49354	22.91	53518	23.76	51450	23.35
50 - 54	48380	18.32	52901	19.01	50653	18.68
55 - 59	46738	13.87	51896	14.33	49350	14.11
60 - 64	45266	9.24	51109	9.51	48204	9.38
65+	42808	6.40	49797	4.70	46311	4.67

Table S4.3

Selected Life Table Measures for Malawi: 1984

	Male		Female		Both Sexes	
	l(x)	E(x)	l(x)	E(x)	l(x)	E(x)
0	100000	37.68	100000	42.29	100000	40.00
1-4	81218	45.32	85398	48.47	83281	46.97
5 - 9	65652	51.73	70228	54.64	67902	53.29
10 - 14	61993	49.64	67860	51.46	64871	50.66
15 - 19	61535	44.99	66741	47.28	64097	46.25
20 - 24	60583	40.66	65877	42.87	63185	41.88
25 - 29	59235	36.52	64889	38.48	62040	37.60
30 - 34	57711	32.42	63213	34.44	60441	33.53
35 - 39	56338	28.15	60813	30.70	58536	29.54
40 - 44	55107	23.73	59821	26.17	57435	25.06
45 - 49	51396	20.26	57937	21.94	54573	21.24
50 - 54	48794	16.20	55073	17.95	51846	17.23
55 - 59	43824	12.76	52994	13.55	48709	13.18
60 - 64	40548	8.59	50936	9.00	45990	8.81
65+	35041	4.54	46202	4.66	40811	4.61

Table S4.4

Selected Life Table Measures for Northern Region: 1977

	Male		Female		Both Sexes	
	l(x)	E(x)	l(x)	E(x)	l(x)	E(x)
1-4	89092	44.87	90559	46.25	89842	45.58
5 - 9	67070	55.15	69700	55.67	68398	55.43
10 - 14	63818	52.83	66961	52.85	65395	52.86
15 - 19	62726	48.71	65638	48.86	64191	48.80
20 - 24	61940	44.29	64524	44.66	63237	44.50
25 - 29	60971	39.96	63340	40.45	62153	40.23
30 - 34	60089	35.51	62133	36.19	61095	35.89
35 - 39	59027	31.10	60945	31.85	59965	31.52
40 - 44	57814	26.70	59662	27.48	58716	27.13
45 - 49	55967	22.50	58307	23.06	57147	22.81
50 - 54	54671	17.97	57256	18.43	55987	18.23
55 - 59	52210	13.70	55515	13.93	53943	13.83
60 - 64	50389	9.11	53691	9.32	52122	9.22
65+	46449	4.67	50834	4.71	48749	4.69

Table S4.5

Selected Life Table Measures for Central Region: 1977

	Male		Female		Both Sexes	
	l(x)	E(x)	l(x)	E(x)	l(x)	E(x)
0	100000	33.54	100000	36.58	100000	35.06
1-4	86518	37.72	88522	40.28	87542	39.00
5 - 9	55196	54.32	58934	55.80	57076	55.07
10 - 14	50588	54.04	54723	54.90	52658	54.49
15 - 19	49330	50.36	53404	51.20	51368	50.79
20 - 24	48640	46.04	52617	46.93	50630	46.49
25 - 29	48084	41.54	51938	42.51	50011	42.04
30 - 34	47635	36.91	51405	37.92	49519	37.43
35 - 39	47084	32.31	50813	33.33	48948	32.84
40 - 44	46619	27.61	50405	28.58	48511	28.11
45 - 49	45871	23.02	49803	23.90	47837	23.47
50 - 54	44997	18.42	49291	19.12	47135	18.79
55 - 59	43607	13.92	48576	14.37	46101	14.15
60 - 64	42431	9.24	47936	9.52	45174	9.39
65+	40253	4.60	46946	4.67	43601	4.64

Table S4.6

Selected Life Table Measures for Southern Region: 1977

	Male		Female		Both Sexes	
	l(x)	E(x)	l(x)	E(x)	l(x)	E(x)
0	100000	37.14	100000	40.54	100000	38.85
1-4	85507	42.38	87298	45.40	86421	43.91
5 - 9	61836	54.07	65583	55.97	63719	55.05
10 - 14	57343	53.11	61292	54.71	59321	53.95
15 - 19	55784	49.52	59633	51.16	57712	50.38
20 - 24	54898	45.28	58718	46.92	56812	46.14
25 - 29	53907	41.07	57945	42.51	55947	41.82
30 - 34	53268	36.53	57391	37.90	55354	37.24
35 - 39	52533	32.01	56811	33.26	54697	32.65
40 - 44	51840	27.40	56334	28.52	54113	27.98
45 - 49	50782	22.92	55624	23.85	53236	23.40
50 - 54	49786	18.33	55015	19.09	52432	18.72
55 - 59	48110	13.88	53952	14.42	51077	14.15
60 - 64	46468	9.28	53311	9.56	49904	9.43
65+	44122	4.64	52145	4.72	48117	4.68

Table S4.7

Selected Life Table Measures for Malawi Rural: 1977

	Male		Female		Both Sexes	
	l(x)	E(x)	l(x)	E(x)	l(x)	E(x)
0	100000	34.91	100000	38.12	100000	36.50
1-4	85761	39.66	87744	42.40	86775	41.02
5-9	58102	53.78	61940	55.48	60034	54.67
10 - 14	53612	53.07	57742	54.33	55681	53.75
15 - 19	52222	49.42	56203	50.75	54218	50.13
20 - 24	51403	45.17	55290	46.55	53352	45.90
25 - 29	50525	40.91	54480	42.20	52515	41.60
30 - 34	49907	36.38	53852	37.66	51893	37.06
35 - 39	49171	31.89	53195	33.10	51200	32.53
40 - 44	48495	27.30	52662	28.41	50599	27.89
45 - 49	47446	22.85	51938	23.77	49724	23.34
50 - 54	46467	18.28	51342	19.02	48939	18.67
55 - 59	44822	13.86	50395	14.33	47672	14.10
60 - 64	43404	9.23	49645	9.51	46573	9.37
65+	41052	6.29	48405	4.68	44770	4.65

Table S4.8

Selected Life Table Measures for Malawi Rural: 1977

	Male		Female		Both Sexes	
	l(x)	E(x)	l(x)	E(x)	l(x)	E(x)
0	100000	52.30	100000	53.12	100000	52.75
1-4	92674	55.41	93150	56.01	92913	55.75
5-9	79934	60.02	81035	60.17	80484	60.15
10 - 14	77570	56.77	78917	56.72	78246	56.80
15 - 19	76551	52.49	78261	52.17	77420	52.37
20 - 24	76156	47.75	77846	47.44	77015	47.64
25 - 29	75902	42.90	77519	42.63	76727	42.81
30 - 34	75590	38.07	77298	37.74	76452	37.95
35 - 39	75293	33.21	76848	32.95	76096	33.12
40 - 44	74956	28.35	76423	28.12	75726	28.27
45 - 49	74400	23.54	75528	23.42	75047	23.50
50 - 54	73595	18.77	74582	18.69	74190	18.74
55 - 59	72313	14.06	72205	14.22	72483	14.12
60 - 64	70214	9.40	70612	9.49	70569	9.44
65+	66220	4.82	67315	4.83	66860	4.83

Table S4.10a

Lifetable for Malawi derived from Alpha and Beta values estimated by Blacker(1977)

	Male		Female		Both Sexes	
	l(x)	e(x)	l(x)	e(x)	l(x)	e(x)
0	100000	36.4	100000	38.4	100000	37.2
1-4	72716	48.9	75513	49.8	73889	49.2
5-9	62642	52.6	65677	53.1	63874	52.7
10-14	59405	50.3	62451	50.7	60629	50.4
15-19	58214	46.3	61256	46.6	59431	46.4
20-24	56312	42.8	59340	43.0	57516	42.8
25-29	53919	39.6	56915	39.8	55101	39.6
30-34	51652	36.2	54604	36.3	52807	36.2
35-39	49462	32.7	52359	32.8	50586	32.7
40-44	47190	29.2	50019	29.2	48278	29.1
45-49	44714	25.6	47454	25.6	45758	25.6
50-54	41883	22.2	44504	22.2	42870	22.1
55-59	38521	18.9	40979	18.9	39433	18.9
60-64	34583	15.8	36823	15.7	35398	15.7
65-69	29776	12.9	31714	12.8	30461	12.9
70-74	24313	10.3	25867	10.2	24838	10.2
75-79	18096	7.9	19181	7.9	18436	7.9
80-84	11691	5.9	12285	5.9	11848	5.9
85++	6051	4.1	6252	4.1	6076	4.1*

* e(85) = 3.725 + 0.0000625*l(80)

Table S4.11

Expectation of life for various B values

1972 MPCS

Age	0.6	0.7	0.8	0.9	1.0
25	44.0	40.7	37.8	35.2	33.0
35	36.7	33.7	31.1	28.8	26.9
40	32.9	30.0	27.6	25.5	23.9
45	29.2	26.5	24.2	22.3	20.6
50	25.5	23.0	20.9	19.1	17.6
55	22.0	19.7	17.8	16.2	14.8
60	18.7	16.6	14.9	13.4	12.3
65	15.7	13.8	12.3	11.0	10.0
70	13.0	11.3	10.0	8.9	8.1
75	10.7	9.4	8.3	7.4	6.6

1977 MPC

Age	0.6	0.7	0.8	0.9	1.0
25	39.0	36.4	34.1	32.0	30.1
35	32.0	29.7	27.7	25.9	24.3
40	28.2	26.3	24.4	22.8	21.3
45	24.9	22.9	21.2	19.7	18.4
50	21.5	19.6	18.1	16.7	15.6
55	18.3	16.6	15.2	14.0	13.0
60	15.3	13.8	12.5	11.5	10.6
65	12.6	11.3	10.2	9.3	8.6
70	10.2	9.1	8.2	7.5	6.9
75	8.4	7.5	6.7	6.1	5.6

1982 MDS

Age	0.6	0.7	0.8	0.9	1.0
25	46.8	43.3	40.3	37.6	35.3
35	38.9	35.8	33.0	30.7	28.6
40	35.0	32.0	29.4	27.1	25.2
45	31.0	28.2	25.7	23.6	21.8
50	27.2	24.5	22.2	20.3	18.6
55	23.5	21.0	18.9	17.1	15.6
60	20.0	17.6	15.7	14.1	12.8
65	16.7	14.6	12.9	11.6	10.1
70	13.8	12.0	10.5	9.3	8.4
75	11.4	9.6	8.6	7.6	6.2

Table S5.1a

The ratio of f1/f2 and mean of fertility Schedule used in the calculation of Brass interpolation factor

	f1/f2	m	m*
Malawi	0.4703	29.82	27.97
Northern Region	0.4176	29.41	28.14
Chitipa	0.3912	29.68	28.15
Karonga	0.4886	29.04	27.94
Rumphi	0.4947	29.02	28.00
Nkhata Bay	0.3387	29.82	28.62
Mzimba	0.4000	29.49	28.14
Central Region	0.4333	30.00	28.00
Kasungu	0.4776	29.98	28.01
Nkhota Kota	0.5066	29.78	27.86
Ntchisi	0.4495	29.78	27.84
Dowa	0.4057	30.04	28.08
Salima	0.4762	29.75	27.99
Lilongwe	0.4455	29.85	28.01
Mchinji	0.4665	30.27	28.04
Dedza	0.4662	30.04	27.90
Ntcheu	0.4067	29.66	28.14
Southern Region	0.5184	29.73	27.91
Mangochi	0.6199	29.48	27.68
Machinga	0.5754	29.63	27.80
Zomba	0.5512	29.14	27.86
Chiradzulu	0.4853	29.43	28.04
Blantyre	0.4903	29.71	28.02
Mwanza	0.3823	30.18	28.25
Thyolo	0.5238	30.09	27.89
Mulanje	0.5495	29.86	27.93
Chikwawa	0.5200	29.96	28.03
Nsanje	0.5000	29.53	27.93

Table S5.1b

The ratio of f1/f2 and mean of fertility Schedule used in the calculation of Brass interpolation factor

		f1/f2	m	m*
	1972	0.5275	30.01	28.60
Total	1977	0.4703	29.82	27.97
	1982	0.4873	29.45	28.19
	1984	0.4970	29.51	28.31
	1972	0.5313	30.08	28.67
Rural	1977	0.4738	29.81	28.23
	1982	0.4890	29.43	28.17
	1984	0.7108	29.88	28.25
	1972	0.5352	29.47	28.10
Urban	1977	0.4271	29.85	28.12
	1982	0.4639	29.40	28.34
	1984	0.4191	30.36	28.78

* m = 2.5 P3/P2 + 23.95 where P2 and P3 are the mean parities for respective age groups 20-24 and 25-29 (see UN:1967-24).

Table S5.2

Fertility Estimates Obtained From 1926 Population Count

(1)	(2)	(3)	(4)	(5)=(3)/(4)
Malawi	Malawi	2,159	13,644	6.32
Northern Region	Northern Region	409	2243	5.48
North Nyasa	Chitipa	100	576	5.76
	Karonga	-	-	-
West Nyasa	Nkhata Bay	100	580	5.80
Momberas	Rumphi	209	1,087	5.20
	Mzimba	-	-	-
Central Region	Central Region	750	4945	6.59
Kasungu**	Kasungu	200	990	4.95
Kota Kota	Nkhota Kota	50	277	5.54
	Ntchisi	-	-	-
Dowa**	Dowa	200	1811	9.06
	Salima			
Lilongwe	Lilongwe	100	606	6.06
Fort Manning	Mchinji	100	643	6.43
Dedza*	Dedza	-	-	-
Ncheu*	Ntcheu	-	-	-
Southern Region	Southern Region	1,000	6456	6.46
South Nyasa**	Mangochi	200	1207	6.04
Upper Shire**	Machinga	200	1418	7.09
Zomba	Zomba	100	679	6.79
Chiradzulu	Chiradzulu	100	718	7.18
Blantyre+	Blantyre	100	537	5.37
Central Shire	Mwanza			
Mlanje	Mulanje	100	637	6.37
Cholo	Thyolo	100	574	5.74
Chikwawa*	Chikwawa			
Lower Shire	Nsanje	100	686	6.86

Source: Columns (3) and (4) are obtained from NG(1926) whereas column (5) is calculated by the writer.

Notes: (3) number of women interviewed (sample size)
(4) total number of children ever born
(5) average number of children ever born to a woman (an estimate of completed family size).
(4) * the names of some districts and the district boundaries has since changed. This restricts us to examine the differentials at regional level only.

Table S6.1 Rankings of Government Expenditure (Development Account)

	A	B	C	D	E	F	G	H	I
1964	15	1	13	11	19	10	11	9	18
1965	16	2	3	5	15	11	5	7	19
1966	17	5	4	2	13	7	2	3	18
1967	18	5	6	3	13	7	3	2	14
1968	7	3	4	9	15	6	9	2	17
1969	17	3	11	9	13	8	9	2	16
1970	18	3	10	9	16	12	9	2	17
1971	18	6	7	8	16	13	8	1	17
1972	18	6	12	5	13	10	5	1	17
1973	17	6	11	3	7	10	3	1	16
1974	18	8	14	3	5	13	3	2	16
1975	18	10	14	3	7	9	3	2	17
1976	18	10	9	4	8	11	4	2	15
1977	18	4	3	8	12	9	8	2	15
1978	18	4	15	2	11	10	2	3	14
1979	17	6	11	2	10	13	2	3	15
1980	17	5	13	2	8	11	2	3	14
1981	17	4	12	3	10	13	3	2	14
1982	18	3	6	4	11	17	4	2	13
1983	12	4	3	5	7	14	5	1	13
1984	13	3	7	4	5	14	4	2	15

	J	K	L	M	O	P	Q	R	S	T
1964	6	5	14	16	17	7	2	3	8	20
1965	6	13	14	17	4	1	10	8	-	20
1966	6	14	15	19	8	1	9	11	-	16
1967	4	12	16	15	8	1	11	10	-	20
1968	5	13	14	12	18	1	11	10	-	-
1969	6	14	12	4	18	1	10	5	-	-
1970	7	14	11	4	7	1	13	5	-	-
1971	10	15	11	3	4	2	12	5	-	-
1972	9	16	8	3	4	2	11	14	-	-
1973	9	15	8	4	12	2	14	13	-	-
1974	4	15	10	6	9	1	11	17	-	-
1975	5	16	11	8	6	1	12	15	-	-
1976	7	17	13	6	3	1	14	16	-	-
1977	7	16	14	11	5	1	10	16	-	-
1978	9	16	12	13	5	1	6	17	-	-
1979	8	16	12	14	4	1	5	18	-	-
1980	9	15	10	18	7	1	6	16	-	-
1981	6	15	9	18	8	1	5	16	-	-
1982	7	14	8	16	12	1	5	15	-	-
1983	8	15	11	18	16	2	6	17	-	-
1984	8	16	12	17	11	1	6	18	-	-

1	P	=	Transport
3	H	=	Agriculture
4	T	=	Land and Water
5	B	=	Education
5	D	=	Government Buildings
5	G	=	Miscellaneous Services
7	J	=	Forestry
9	O	=	Power
9	C	=	Finance and Commerce
9	Q	=	Water Supplies
11	F	=	Housing
11	E	=	Health
12	M	=	New Capital
12	L	=	Veterinary Services
13	R	=	Works
14	K	=	Surveys
16	I	=	Fisheries
16	A	=	Community Services
17	S	=	1964 Development Plan