EXAMINATION OF FERTILITY MEASURES FROM THE 1992 AND 2000 MALAWI DEMOGRAPH AND HEALTH SURVEYS, *A REVIEW OF DECLINING FERTILITY*

Signed by candidate

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ABSTRACT

This thesis examines fertility measures from the 1992 and 2000 Malawi Demographic Health Surveys (DHS). There is evidence that fertility decline in Malawi has begun. This project further explores the associated change (if any) in family formation in response to the recorded fall in fertility.

Cohort-period fertility rates, parity progression ratios and projected B60s are calculated in order to provide additional information on changes in women's preference for larger family sizes. These techniques have been selected to provide additional insight into the changing behaviour of women with regard to preference for larger family sizes. The cumulated cohort-period rates in the 2000 DHS show evidence of falling fertility. Declining trends at higher births orders are observed in the 2000 DHS among younger age groups, indicating recent fall in fertility. However, there is minimal evidence of declining fertility in the 1992 DHS or among rural-based women in general. In a scenario where fertility has started declining, a broadened approach to its measurement, such as the use of B60s, assists in providing information for evaluating previous fertility estimates and determining future directions in Malawi fertility.

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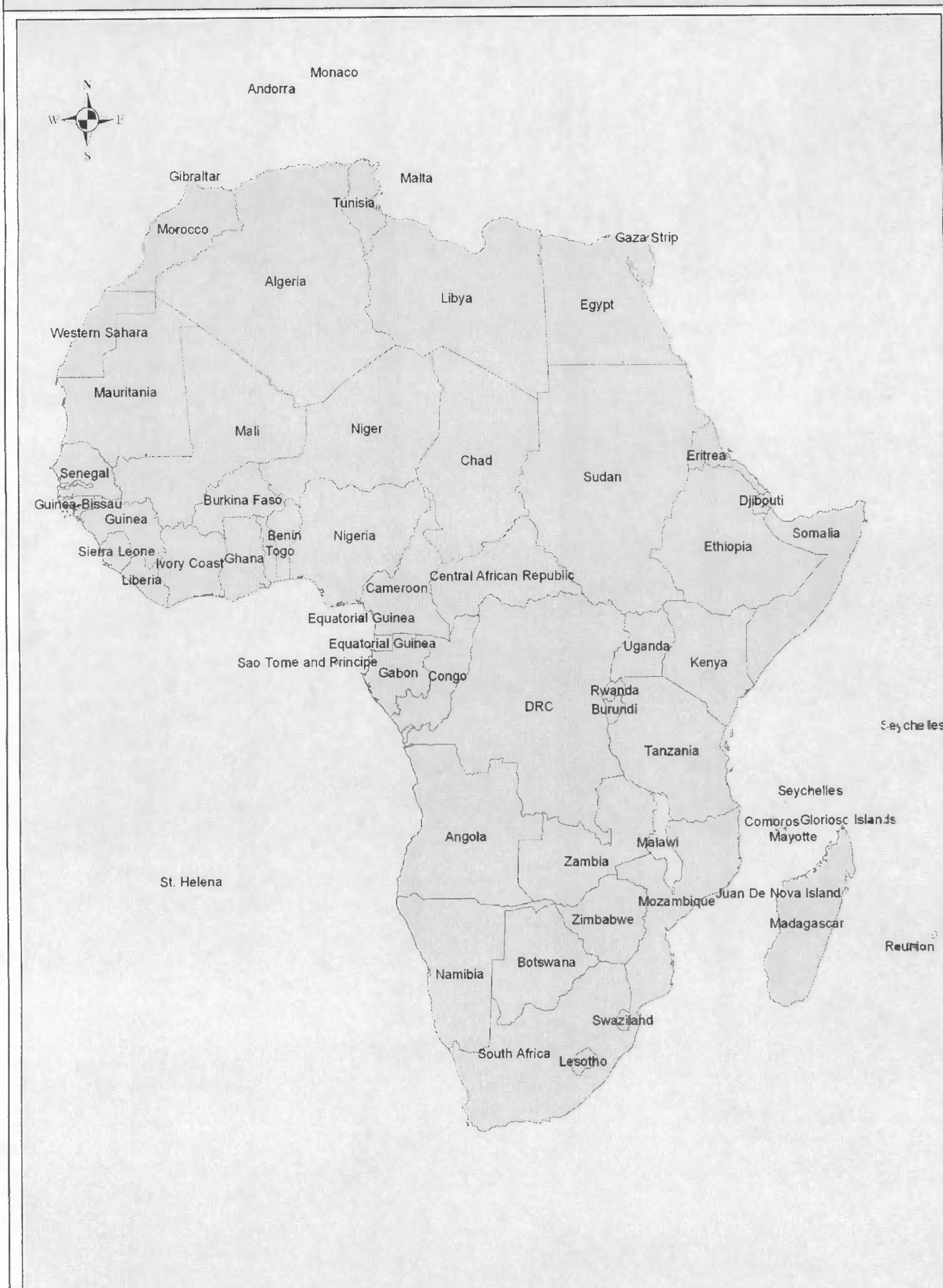


CHAPTER ONE: Introduction

In Malawi, recent fertility estimates have been derived from nationally representative surveys, namely the Malawi Demographic and Health Survey (MDHS) of 1992 and 2000. Before the publication of the 2000 survey results, it was difficult to identify a clear trend of fertility in Malawi. Before both 1992 and 2000 surveys, a decline in fertility was observed which was later on followed by measurements showing a rising fertility trend (Cleland, Onuoha and Timaeus 1994). Thus, for the past few decades since the 1980s, the levels and patterns of fertility change in the country could not be reliably established. However, the most recent DHS indicates that fertility in Malawi has declined again from an average of 6.7 children per woman in the 1992 survey to 6.3 children in 2000 (MDHS 2000). Earlier studies and reports dating back to 1966 (Cohen 1993) have shown increasing or constant trends in fertility. It is likely, then, that fertility in Malawi has only recently begun to fall in the last 10 years. As a result, it is important to analyze the 1992 and 2000 surveys more thoroughly in order to see if they support the hypothesis of declining fertility in the country as well as to determine the reasons for these trends.

1.1 Scope of the study and problem statement

This thesis focuses on examining fertility estimates for the previous decade in Malawi and ascertaining the direction of change in fertility. The 1992 and 2000 MDHS data are analyzed to confirm the extent of the decline in fertility as measured by the two surveys. The study presents total fertility rates, as well as cohort period fertility rates, parity progression ratios, projected parity progression ratios and B60s. In doing so, it broadens our understanding and interpretation of fertility levels and trends in Malawi.

Before the 2000 MDHS survey, comparison of fertility trends was undermined by the limited number of national surveys (Kirk and Pillet 1998). A comparison of the 1992 MDHS and 1984 Family Formation Survey is also difficult because of different methodologies applied in the data collection procedures. In respect of the 1992 and 2000 MDHS, however, similar questionnaires were used, similar groups of women were targeted, and the same reference period (of three years) of women's child-bearing experience before the survey was used. As a result, an examination of fertility measures using the two recent MDHS surveys is of importance in reviewing previous estimates and to determine future trends. The use of B60s on birth histories of individual women of reproductive ages (15 to 49) in Malawi is a relatively new approach to the analysis of fertility and the approach has not previously been applied to Malawian data.

Although the recent MDHSs provide evidence of fertility decline, what has not yet been established is the underlying changes in behaviour for women for preferred smaller family sizes. The traditional explanation, which relies on changing trends and patterns as depicted by conventional measures of fertility, is often limited in its application. In Malawi, the indirect and advanced techniques, such as the B60s, have not been applied before and these measures will be a focus of reviewing recent estimates of fertility decline.

1.2 Importance and objectives of the project

One of the strategies of empowering women and alleviating poverty is fertility regulation. For a developing nation like Malawi, it is important to monitor trends in fertility by linking these to other health and socio-economic indicators. The relevance of this study can, therefore, be summarized in terms of the main goal and in relation to various specific objectives to be achieved.

Briefly, the main goal of this thesis is to provide alternative and detailed explanations for fertility decline in the country using 1992 and 2000 Malawi Demographic and Health Surveys. Within this framework, the project has three specific objectives.

The first of these is to verify existing evidence for the reality of fertility decline as measured in the 1992 and 2000 MDHS. This will be done by examining the direction of fertility change over the recent decades based on selected fertility measurements of total fertility rates and age specific fertility rates.

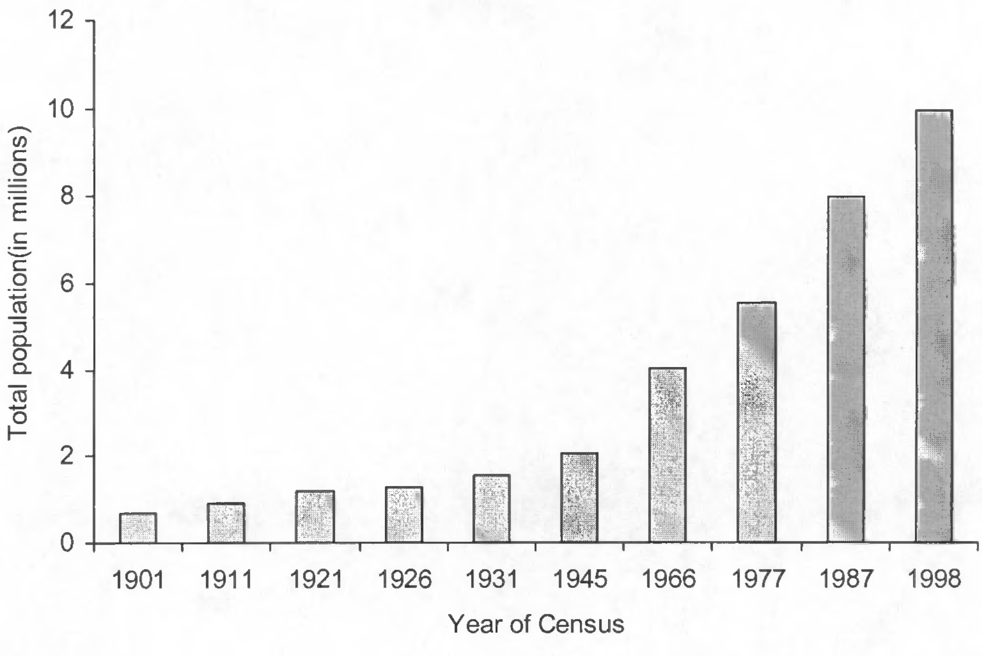
The second objective is to investigate patterns of family formation by using parity progression ratios, cohort-period fertility rates, projected parity progression ratios and projected B60s.

Finally, the thesis applies alternative and advanced demographic techniques to MDHS data in order to broaden understanding of the effects of fertility decline on family formation among women by selected characteristics such as age groups and place of residence.

CHAPTER TWO: Background Information and Literature Review

Before reviewing the existing literature on the issue of fertility, it is necessary to give an overview of the demographic characteristics of the country. Malawi has a history of high population growth rates, high levels of fertility as well as high infant mortality rates and low life expectancy for both men and women. Furthermore, as can be seen from Table 2.1 below, the inter-census growth rate increased from 2.9 percent in 1977 to 3.2 percent in 1987, before falling to 2.0 percent in 1998. This fall can most probably be attributed to declining fertility and rising mortality as a result of HIV/AIDS (Cohen 1998).

Figure 2.1 Malawi total population from 1901 to 1998 censuses



Source: Table A: Malawi population and Housing Census: Analytical Report, 2002

Between the 1977 and 1987 censuses, the decline in total fertility was negligible, i.e. from 7.6 children per woman to 7.4. Consequently, the population of the country has grown fast as depicted in Figure 2.1 above. The remarkable feature of the data presented in Table 2.1 is the reported decline in the total fertility rate from 7.4 (in 1987) to 6.2 (in 1998). A 10 percent decline in fertility is conventionally considered as significant enough for the population to be regarded as experiencing the onset of fertility decline (Cohen 1993). Hence the 6 percent decline in fertility recorded between the 1992 and 2000 Demographic and Health Surveys can only be considered as a marker for sustained decline in fertility if trends preceding 1992 would support evidence of consistent downward rates.

Table 2.1 Selected demographic indicators from Malawi 1977, 1987 and 1998 censuses

Index	Year		
	1977	**1987**	**1998**
Population	5,547,460	7,988,507	9,933,868
Inter- census growth rate	2.9 per cent	3.2 per cent	2.0 per cent
Urban population	8.5 per cent	10.7 per cent	14.0 per cent
Total fertility rate	7.6 per woman	7.4 per woman	6.2 per woman
Infant Mortality rate	165 per 1000	159 per 1000	121 per 1000
Life Expectancy: M	39.2	41.4	40.0
F	42.4	44.6	44.0

Source: MDHS 2000

Given that Malawi is one of the developing nations of the world and has low average income, if a family has too many children and if these are born too quickly after each other, they will be at higher risk of dying from malnutrition and other related diseases (Malawi 1996). Based on the negative association of health indicators and large family sizes, the levels of infant mortality in Malawi are among the highest in the world (Kirk and Pillet 1998). Similarly, the levels of fertility in Malawi are ranked among the highest of its neighbouring Sub-Saharan African countries and even one of the highest in the world (Cohen 1993). Since 1966, however, major variations have been measured and reported in fertility, not only in respect of estimated levels of fertility, but also with regard to the methods applied, data sources used and the measures used to calculate fertility.

Table 2.2 Summarized estimates of fertility in Malawi

Author & date of Publication	Data Source and Methodology	Year of estimate	Measures of Fertility			
			TFR	CEB (45-49	CBR /1000	Median BI
Cohen (1993)	Census 1987; stable population Theory	1966	7.3			
Malawi (1984)	Census 1977; method of adjustment not stated	1977	7.6	6.9	48.3	
Kalipeni (1997)	Census 1977 Quotes/discussion	1977	7.6		48	
Althus (1994)	Family Formation Survey 1984: Quotes	1984	7.6			
Malawi (1993)	Census 1987: Gompertz Relational	1987	7.4	7.1	41.2	
	model fitted to mean parities of younger women	1987	5.7			
Kalipeni (1997)	Census 1987 data Quotes/discussion	1987	6.73		41	
Cohen (1993)	Census 1987 data: Quotation of unadjusted data	1987	5.7			
Cohen (1993)	Census 1987 data: P/F adjustment	1987	8.0			
Malawi (1994)	MDHS data on birth histories	1992	6.7	7.3	42.9	32.7
Althus (1994)	Quotes from 1992 MDHS	1992	6.7			
Kirk and Pillet	MDHS 1992, WRA,15-34:					
(1998)	0-3 years preceding survey	1990	4.8			
	4-7 years preceding survey	1986	5.1			
	8-11 years preceding survey	1982	5.6			
	12-15 years preceding survey	1978	5.8			
Malawi (1997)	KAP Survey; Estimates based on CPR	1996	NA	4.6	NA	
Malawi (2002)	Census 1998 Relational Gompertz			6.7	37.9	
	model		6.5			
	Census 1998 Arriaga technique	1998	6.2			
	Census 1998 Brass P/F ratio		6.7			
	Census 1998 Unadjusted		4.8			
Malawi (2001)	MDHS data on birth histories	2000	6.3	6.9	45.5	33.8

Key:

MDHS:	Malawi Demographic and Health Survey
MKAPHS:	Malawi Knowledge Attitude and Practice Health Survey
CPR:	Contraceptive Prevalence Rate
WRA:	Women of Reproductive Age
FFS:	Family Formation Survey
P/F:	Parity (from children ever born) compared against estimated current fertility
CEB:	Children Ever Born
CBR:	Crude Birth Rate
BI:	Birth Intervals

Gora Mboup and Tulshi Saha (1998) have summarized the most common measures of fertility as follows:

> The total fertility rate (TFR) is a widely used measure that adjusts for differences due to age distributions... the mean number of children ever born represents the child bearing experience of a real cohort and reflects both current and past fertility behaviour. The median age at first birth (MAFB), parity progression ratio (PPR) and birth interval (BI) are used to

> evaluate changes in fertility in terms of the onset of reproduction, spacing of births, and termination of childbearing. (Mboup and Saha, 1998:2)

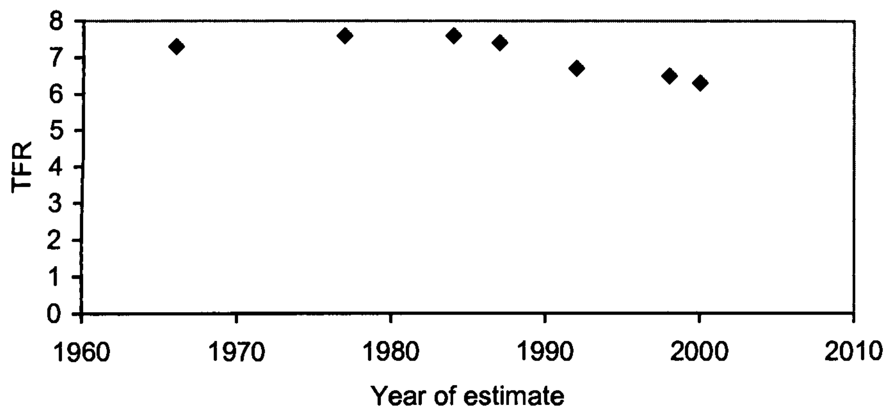
Table 2.2 above summarizes the estimated levels of fertility in the country from different censuses and surveys. The main measures, being the TFR (total fertility rate) and the CEB (children ever born) will be discussed in sections 2.2 and 2.3 respectively. In addition, Parity Progression Ratios, which have been previously applied by Mboup and Tulshi Saha (1998) to evaluate changes in fertility, are discussed in Section 2.4.

2.1 Time trends in fertility

The earliest estimate of fertility, based on the 1966 census data using stable population theory, suggests a fertility level of 7.3 children per woman (Malawi 1984). In subsequent years, measurements of TFR have been on the higher side when the data source is a national survey and on the lower side when the estimates are derived from censuses. Fertility estimates derived from data actually reported by respondents appear lower than those estimated using techniques to adjust for under-reporting, ranging from 7.6 in the 1977 Census to 4.8 in the 1998 Census. By contrast, the 1992 MDHS estimated the level of fertility to be 6.7 children per woman, while the census estimates in 1987 (five years earlier) produced a lower estimate of 5.7 children per woman. A possible reason for these apparent discrepancies is that the census data do not incorporate questions to check the consistency in the number of children ever born reported by respondents, which often leads to errors of omission (in reported births) passing unnoticed. Nonetheless, despite variations in levels from different data sources, one interpretation still holds: there appears to be a downward trend in fertility levels from the late 1980s to the present.

Figure 2.2 below illustrates the trend in total fertility, taking into account only those methods that compensate for underreporting. The trend from the late 1980s depicts a sustained fertility decline up to the year 2000. That is a fall from total fertility rate of 7.4 in 1987 to 6.4 in 2000.

Figure 2.2 Estimated TFR by year of estimate



Source: Data from Table 2.2

Moreover different results can be obtained depending on the methodology applied to the census data. For example, the Analytical Report on the 1998 census (Malawi 2002) indicates a TFR of 4.8 based on the unadjusted census data. Three different methods were used to estimate TFR in the Analytical Report. The Relational Gompertz method seems the most appropriate, because it adjusts the reported ASFRs with a standard parity schedule to be consistent with mean parities. Furthermore, the method has been consistently used in the previous fertility estimates in the country (Malawi 2002).

Applying the Relational Gompertz method to the 1998 census data, gives a TFR of 6.5. The Brass P/F method and Arriaga techniques estimated fertility at 6.73 and 6.24 respectively (Malawi 2002) and, in respect of the 2000 MDHS, using data on birth histories, gave an estimate of 6.3 children per woman. This suggests that, in recent years at least, the fertility decline has been slow or even non-existent.

TFR estimates may also vary depending on the quality of reporting by the relevant age group of women and the duration of the recall period. Thus, for example, Kirk and Pillet

(1998) estimated fertility levels among women aged 15 to 34 years at various points in the 15 years before the 1992 MDHS survey (Table 2.1). The results show that estimates are lower for younger cohorts but are higher further back in time. From these data, one might be drawn to the conclusion that fertility rates among younger women are falling steadily.

Another issue is the extent to which the measured decline represents the reality at national level. The conclusion by Cohen (1998) indicates that there are differences in fertility rates between rural and urban areas and the decline in fertility rates is only significant among women residing in urban areas. That is a decline in fertility, in urban areas from 5.51 to 4.5 children per woman between 1992 and 2000, whereas in rural areas it was from 6.88 to 6.7 children per woman in the same period.

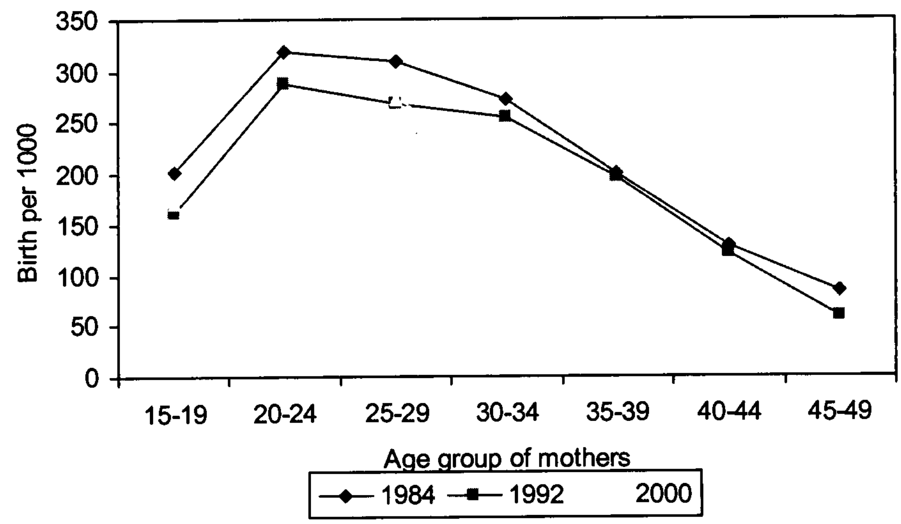
The 2000 MDHS has summarized the recent fall in fertility from an average of 6.7 children per woman in the 1992 survey to 6.3 children in 2000, by observing that fertility has fallen by approximately 6 percent. Even though fertility differentials by residence or social economic status are not the main area of emphasis for this project, it is worth pointing out that in Malawi, rural and urban trends are quite different. Both surveys (1992 and 2000) allow rural and urban fertility to be assessed separately. However, in view of the high proportion of rural people in Malawi, the 6 percent decline in 2000 should not only be interpreted at national level without reference to differentials in place of residence.

Garenne and Joseph (2002) suggest that the onset of fertility decline among rural residents often lags behind the urban sector. From a review of 1992 MDHS data, they established that fertility in urban areas had started declining as early as 1982, a trend that was followed two years later in the rural areas. They estimate that the decline in the fertility of urban residents was about 3.3 percent per annum while in rural areas it was estimated at 2 percent (Garenne and Joseph, 2002). These results show that in the early 1980s the urban and rural rates were not significantly different, and even the two years lag until the start of decline might be unimportant. The recent MDHS findings do however show an even wider variation between rural and urban women, which indicates that the accelerated decline in recent fertility is more applicable to urban than rural areas (Garenne and Joseph 2002).

2.2 Changes in age specific fertility rate (ASFR)

Changing ASFRs over time can be examined to get a sense of the age-pattern of fertility decline. However, under conditions of declining fertility, any changing age distribution of fertility will most probably be swamped by the overall decline in fertility. So as to investigate the changes (if any) in the age-distribution of fertility, it is necessary to standardise the TFRs from different surveys (usually to a TFR of one). This allows the age distribution of fertility to be assessed in isolation from changes in the level of fertility.

Figure 2.3 ASFR (per 1,000 women) for the three years preceding the survey



Source: MDHS 2000 Table 4.3

Note: The 1984 ASFR was from Family Formation Survey and is based on the four years prior to survey.

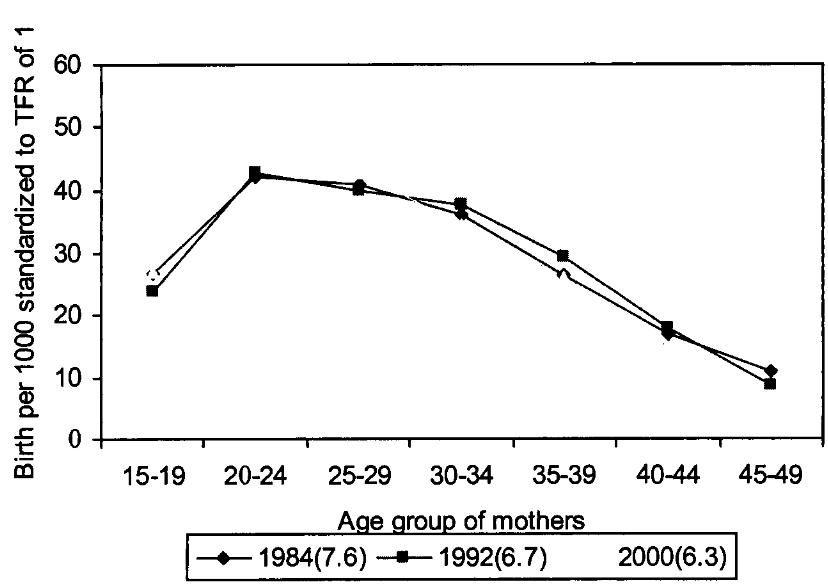
Table 2.3 ASFR (per 1,000 women) for the three years preceding the survey

Age	Year of Survey		
	1984	1992	2000
15-19	202	161	172
20-24	319	287	305
25-29	309	269	272
30-34	273	254	219
35-39	201	197	167
40-44	129	120	94
45-49	83	58	41

Source: Malawi DHS 2000 Table 4.3

The age specific fertility rates, without applying the standardization, from three surveys, are presented in Figure 2.3 above and in table format in Table 2.3. From the observed age pattern of fertility in Figure 2.3, it would be difficult to detect significant differences in the age patterns of fertility from the three surveys.

Figure 2.4 Standardised ASFR from recent surveys



Source: Own calculations from Table 2.3
Note: The figure in parentheses in the legend is the applicable TFR

An analysis of Figure 2.4 above reveals that the age pattern of fertility was remarkably consistent between the 1984 and 1992 surveys. However, the pattern shown by the 2000 survey suggests that fertility is increasingly being concentrated in the younger age groups, i.e. young women who are between 20 and 30 years old.

2.3 Changes in children ever born (CEB)

Estimates of the average number of children ever born to a mother have been estimated from census and surveys conducted over the years. Data on children ever born provide past or completed fertility estimates, which can be used to make a comparison with current or period fertility (Malawi 2000). In Table 2.4 below, results of children ever born per woman are compiled from the 1992 and 2000 MDHS and the 1998 census by place of residence.

Table 2.4 Fertility by place of residence

Residence	Year of survey	Total fertility Rate (3 years preceding the survey)	Mean number of children ever born
National	1992 DHS	6.7	7.3
	1998 Census	6.5	6.7
	2000 DHS	6.3	6.9
Urban	1992 DHS	5.5	7.4
	2000 DHS	4.5	5.9
Rural	1992 DHS	6.9	7.3
	2000 DHS	6.7	6.9

Source: Malawi national survey reports.
Note: Mean number of children ever born to women in 1992 was derived from age 45 to 49 and from age 40-49 in 2000 MDHS.

The comparison of the total fertility rate with children ever born, in Table 2.4 above, shows that urban fertility is declining since the difference between children ever born and TFR in both surveys is clearly apparent. By contrast, any fertility decline in rural areas has been both small and slow, i.e. TFR in 1992 was 6.9 and children ever born was 7.3, in 2000 TFR only fell to 6.7 and not significantly different from the children ever born of 6.9.

2.4 Parity progression ratios

A further analytical approach, which has been employed in both MDHS surveys, is to examine the distribution of children ever born by parity. Results from two MDHS surveys show that there has been a decline in the proportion of women between the ages of 45 to 49 who are likely to proceed to have 10 or more children (given that they already had the 9th child) from 25.1 percent in 1992 to 20.8 percent in 2000. However, the 2000 MDHS survey results do not give conclusive evidence of decline in the younger ages.

Parity progression ratios are used to track the percent distribution of women by children ever born. Mboup and Saha (1998) classify Malawi as one of the countries in the world that has high levels of fertility. They record that PPR increases from 89 percent, for the women progressing from parity 1 to 2, to 91 percent for the progression to parity three. For women who reached parity five and who proceeded to attain parity six, the percentage was estimated at 86 percent. In their method of estimating parity progression ratios, Mboup and Saha took into account censoring by applying the life table technique and limiting the proportion progressing to the next birth order to five years. It is therefore, a similar technique to the B60s but not the same as conventional PPRs. Details of their results will be compared with the PPR in Chapter Four. Parity progression ratios are limited in that they do not take into account the effect of selectivity and censoring (Brass and Juarez 1983), and thus more refined measurements will be applied to the data from the two surveys in the following chapters.

It is this component of fertility that the thesis would like to explore further using the 1992 and 2000 MDHS in order to look for additional evidence of fertility decline.

2.5 Changes in socio economic and proximate determinants in fertility

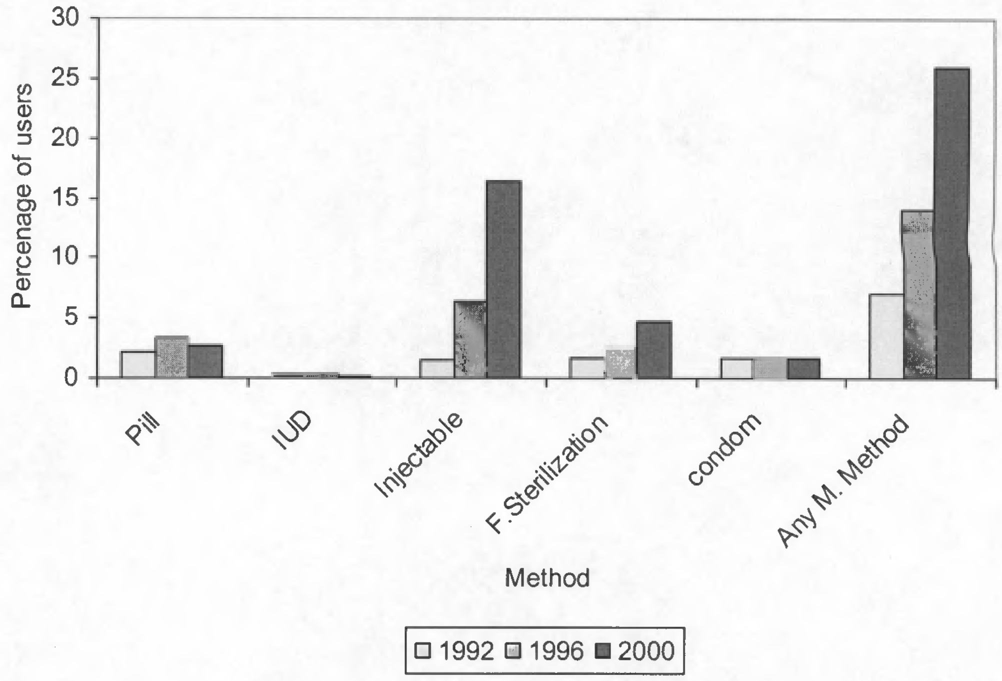
Althus (1994), comparing the 1984 Family Formation Survey and 1992 MDHS, accepts the principle that fertility must have declined in Malawi although he does not re-examine the quality of data. The other related short-coming of Althus's study is that the 1984 FFS and 1992 MDHS had applied different methodologies in data collection, which would complicate comparison of the two survey results. However, he did raise unanswered questions about the association between data on mortality (that had remained high) and fertility data which indicated a decline. That is in support of the fact that in the earlier decades the decline in fertility may have just started and required further follow-up to ascertain consistency between fertility measurements and other associated variables. In most parts of the world, the onset of fertility transition has been associated with declining levels of infant and child mortality (Althus 1994).

After examining some key determinants of fertility, such as contraceptive use, age at marriage, as well as indirect determinants, such as education, rural and urban residence and income, Kirk and Pillet (1998) ascertain that some fertility decline should be expected in sub-Saharan Africa. The above determinants have been identified in national surveys as having increased over time. A specific example can be drawn from the 1996 Malawi Knowledge and Practice Health Survey (Malawi 1997), which estimated the average parity of women who have ever used modern methods of contraception to be as low as 4.6 children. This means that the average number of children among women who use contraception is lower than it is for those who have never done so. Between 1992 and 2000, the contraceptive prevalence rate increased from about 7 percent in 1992 MDHS to 26 percent (Malawi 2001).

This finding is supported by the change in contraceptive method mix (Figure 2.5) among currently married women. Female sterilization, which is a permanent method and denotes the desire to stop child bearing entirely, has been steadily increasing from 1.7 percent in 1992 (Malawi 1994) to 2.5 percent in 1996 (Malawi 1997) and 4.7 percent (Malawi 2001) of women of all ages.

Figure 2.5 below shows that over the years, the injectable form of contraception has become the preferred modern method among users of contraception. It increased from 1.5 percent in 1992 to 16.4 percent in 2000, as compared to the choice of other methods, like the Pill and condoms, which have almost remained constant.

Figure 2.5 Percent of currently married women (aged 15-49) using contraception by method type and year of survey



Source: Malawi national survey reports

Note: F. Sterilization: Represents female sterilization and 'Any M. Method' represents women who are using any modern contraception, which is a summation of all modern methods.

The change in preference of methods is also influenced by women's perception in respect of the reliability of the method for pregnancy prevention in combination with the aim of spacing or limiting the number of children (Malawi 1997).

In comparison with other sub-Saharan African countries, the levels of urbanization, income and education of women in Malawi are still relatively low. Nonetheless, the unusual onset of fertility decline has been observed in other developing countries as well, not only in Malawi. Other writers have noticed the same thing:

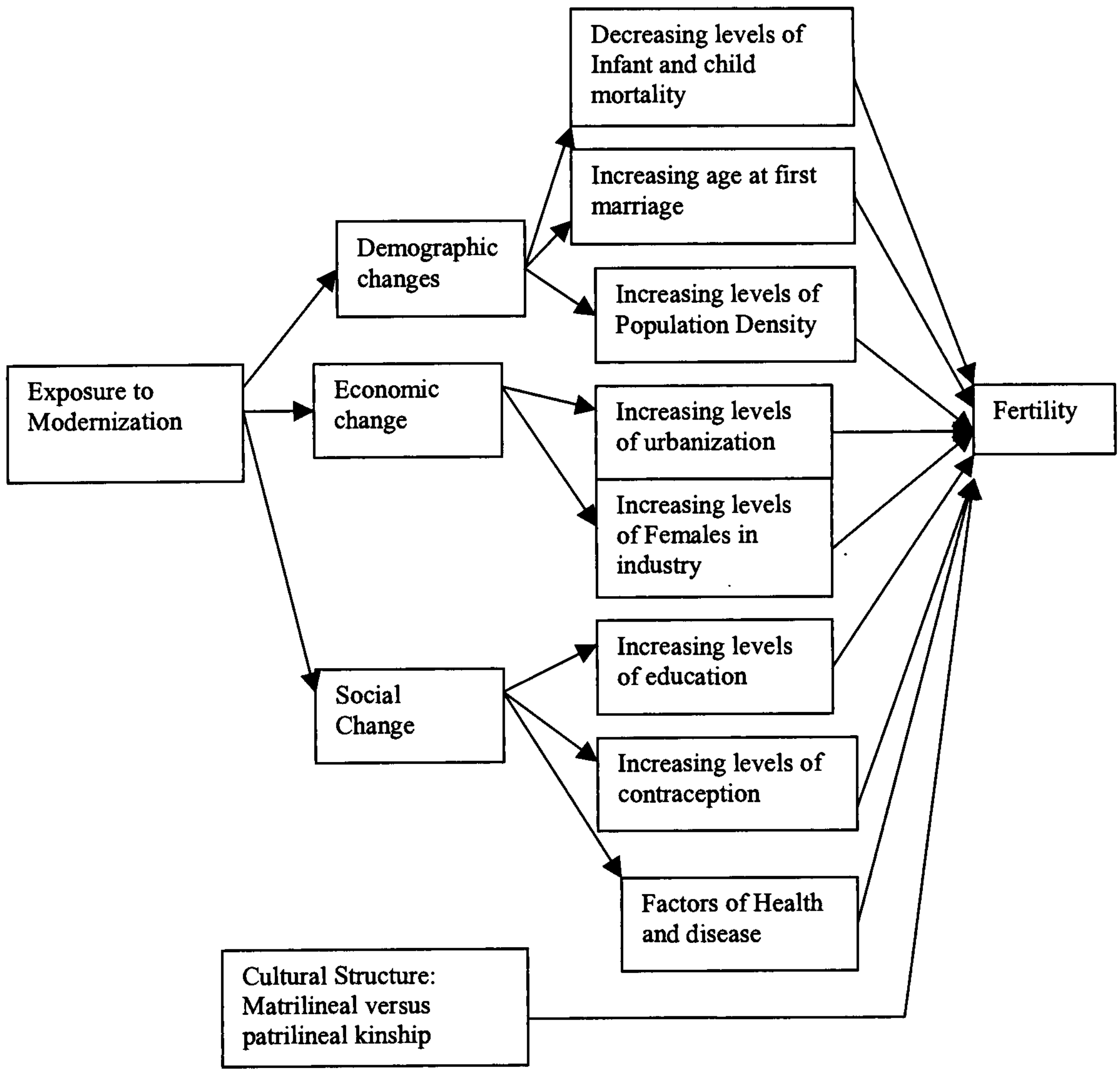
> The countries in which the fertility transition is most advanced are not the most urbanized, a discrepancy with demographic transition theory... The rapid fertility decline in Kenya suggest the influence of diffusion and social interaction processes (Kirk and Pillet, 1998:18).

The question is whether Malawi, with high levels of infant mortality, low levels of female education and predominantly rural residence, can achieve a sustainable fertility decline (and not merely temporary reversals). Research has identified a wide range of formal theories, concepts and ideologies governing fertility transition. Mason (1997) argues that it has not been practical to apply a single set of ideas or theories to explain the nature and form of fertility decline in a given location. Instead, models need to encompass a valid explanation from a range of existing major theories. According to Mason, the main theories for fertility transition include perception of surviving children, institutional changes and social interaction. Perception of surviving children can be interpreted as the change in attitude of women towards higher number of births in response to the relative change of children who are surviving. Based on empirical evidence as to what theories are relevant to a particular country, a model can be developed to explain fertility trends.

Kalipeni (1997), for example, has presented a model to explain the pattern of fertility experienced in Malawi and this is shown in Figure 2.6

The model below illustrates how variables interact to influence fertility. In his interpretation, Kalipeni (1997) indicated that cultural structures that are matrilineal have a positive impact on high fertility levels, i.e. they would increase fertility levels. On the other hand, demographic, economic and social change, as illustrated by examples under each category in Figure 2.6 would negatively influence fertility levels. In his findings, institutions which contribute to the better living standards of women can in fact influence women to prefer smaller family sizes. In the case of increasing levels of urbanization, women tend to be exposed more channels of communication, such as print media, radio and television, and would thus obtain more information about and gain access to modern contraceptives than women based in remote or rural areas (Malawi 1997). In addition, chances of women advancing in their formal education will be higher which would also increase their chances of securing jobs in an industry sector, in contrast to their counter parts with lower levels of education and located in predominantly agricultural areas.

Figure 2.6 Hypothesized demographic, socio-economic, health and cultural influences on fertility in Malawi



Source: Kalipeni (1997:Figure 2)

In the final analysis, then, Kalipeni's findings can be understood by observing that women who have limited exposure to modernization (i.e. do not have access to better education or infrastructure), are likely to be more influenced by cultural factors, which favour large family sizes. As in the case of Malawi, one of these cultural structures is the matrilineal kinship system. This system favours large family sizes with the tradition of inheriting family property and contributing to family income through increased labour in domestic and agricultural activities.

According to Garenne and Joseph (2002), there are additional and significant processes of fertility change, which were established after they had examined MDHS data from a number of African countries. They further conclude that the fall in fertility should not be the only focus of analysis, but the pace and processes involved must also be considered. The authors illustrate how further evidence can be drawn from the available MDHS data in order to explain the recorded fertility decline in the country as a whole and in urban and rural areas. For example they linked the decline in fertility to the current HIV/AIDS epidemic. Indeed, given the scenario that fertility is falling, specific socio-economic, cultural and geographic variations can easily be singled out to account for the decline and be linked to the demographic data just as it was illustrated with HIV/AIDS and apparent change in social behaviours.

2.6 Government population policy, family planning activities and HIV/AIDS

According to the Family Planning Policy and Contraceptive Guidelines (Malawi 1996), Malawi formulated a national population policy in 1994. It is further reported that family planning activities which had started in the early 1960s, under a child-spacing program, was banned by the government mainly because the community had misinterpreted and associated the child-spacing program with the pre-independence era. But the program was resumed again in the 1980s. These interruptions and the implementation of a family program without an adopted population policy must have contributed greatly to the low contraceptives prevalence rate of 7 percent as recorded in the1992 MDHS (Malawi 1994). The low level of uptake has been compounded by limited resources for funding family planning activities including allocation of funds for sustained contraceptive supply in order to meet the demand of potential users. It is evident from one of the factors that men and women travel long distance to reach a health facility. For instance in rural areas 67.2 percent of women must travel for over one hour to reach their nearest health centre (Malawi 1994).

A comparison of the total fertility rate with countries in the region is summarized in Table 2.5. In the Eastern part of the continent, where Malawi has been classified, registered fertility levels, range from 5.5 to 7.4, which are higher than in the Southern with a range of 5.0 to 5.6. For countries in this region, like Botswana and Zimbabwe, contraceptive usage rate has been recorded with significantly higher percentages than that of Malawi. Recent estimates show contraceptive prevalence rate of 32 percent in Botswana and 48 percent in Zimbabwe (Lloyd, Kaufman and Hewett 2000).

Table 2.5 Total fertility rates for selected sub-Saharan African countries

Name of Country	Year of survey	Total fertility Rate
Eastern		
Burundi	1987	6.9
Ethiopia	1990	6.6
Kenya	1988-89	6.6
Malawi	1992	6.7
Tanzania	1991-1992	6.3
Uganda	1988-1989	7.4
Zambia	1993	6.5
Zimbabwe	1988-1989	5.5
Southern		
Botswana	1988	5.0
Lesotho	1986	5.2
Namibia	1992	5.6
Swaziland	1988	5.0

Source: Cohen,1993 Table 2.2

According to 2000 MDHS, 15 percent of the population aged between 15 and 49 are infected with HIV (Malawi 2001). One of the implications of this epidemic is its enormous negative effects on the country's socio-economic and various sectors of development. The nation's response in calling for condom use and refraining from sexual acts by sexually active individuals are some of the strategies that would have an impact on fertility. Condom use, which is known for both preventing pregnancy and sexually transmitted infections, is low within marriage (Malawi 2001). That is contributing very little to contraceptive use with the intention of limiting the number of births.

In addition, Zaba and Gregson (1998) have established that HIV may directly reduce fertility by rendering HIV positive women sub-fecund. At the current rate of infection, which also affects mostly the reproductive age group, the young Malawian population is likely to experience a reduction in fertility as a result of the epidemic.

Although there are various approaches that can be used to explain and systematically show evidence of declining fertility in a given country, this study will limit itself to two approaches. First, raw data will be used to compute total fertility rates and age specific rates, so as to verify and validate the results presented in the MDHS reports. Second, calculating the cohort-period rates, parity progression ratios (PPR), projected parity progression ratios (PPPR) and B60s in each survey (of the 1992 and 2000 MDHS) will provide further evidence of fertility decline on the basis of changes in family formations. Several of these methods have been shown to be more sensitive at picking up incipient changes in fertility than the fairly blunt summary measures (ASFR and TFR) usually do.

Chapter Three: Data Sources and Methods

With regard to measurements of fertility, no estimates can be derived from the civil registration system in Malawi. As observed by Cleland (1996), the registration systems in most developing countries are generally weak. He concluded that:

> The development of civil registration in less development countries during the last 50 years can be summarized succinctly: there has been no progress (Cleland,1996:434).

This is certainly the case in Malawi. Given the background of unreliable data from vital registration systems, fertility in Malawi has had to be measured from census and surveys. Census and survey data, however, have their own limitations. It has already been pointed out in the previous chapter how census responses tend to underestimate fertility particularly if no adjustments are applied to the enumerated data. Moreover, these data are often generally not available to the public. Thus, the selection of MDHS survey data of 1992 and 2000 used in this dissertation has been arrived at based on the fact that the surveys not only usually provide more reliable data than other sources, but also because they are the most recent DHS surveys in Malawi. Additionally, comparison of two surveys should provide a better insight than examining fertility changes from one survey alone.

3.1 Data collection methodologies in the two surveys

Both the 1992 and 2000 MDHS used similar procedures in the design and data collection. The samples in both surveys were representative of the whole nation. Mapping for household listing and selection was guided by what was already done during the census. Thus, according to the 1992 MDHS (Malawi 1994) report, the enumeration areas were selected based on the 1987 census frame, whereas the 2000 MDHS stated that the sample points were drawn from the enumeration areas as re-defined in the 1998 census (Malawi 2001).

The table below summarizes the key activities in the design and processing of the two data sets.

Table3.1 Design of the 1992 and 2000 MDHS

Activity	1992 Survey	2000 Survey	Remark
Target group	Women of reproductive age 15-49 years	Women of reproductive age 15-49 years	Household questionnaires were used to identify eligible women for interviews
Sampling Technique	Stratified by region and residence	Stratified at district level	
Clusters	225 enumeration areas from 1987 census	560 enumeration areas from 1998 census	
Sample size	A total of 4,849 women	A total of 13,220 women	
Women's questionnaires	Birth history questions based on DHS model B questionnaire	Birth History questions based on MEASURE DHS model	
Data collection	Started on 1st September 1992 and was completed 1st November 1992 (2months)	Started on 12th July 2000 and was completed in November 2000 (4 months)	
Access to data sets	Application on website and downloaded files	As for 1992	

Source: MDHS 1992 and 2000

3.2 An overview of survey instruments, coding and the variables generated

Both surveys used three types of questionnaires in collecting data related to reproduction: the household questionnaire, individual female questionnaire and Health Services Availability questionnaire. The data analysis presented here has been based on responses obtained from the individual female questionnaire. More specifically, the present thesis is mainly interested in Sections 1 and 2 of the questionnaire. In Section 1, basic data for women are obtained, which includes month and year in which they were born; in Section 2, data are gathered on reproductive or birth histories (Malawi 1994, Malawi 2001). The nature of questions asked is similar in layout, content, meaning and length for both surveys. The starting question for the interview reads as follows:

> Now I would like to ask about all the births you have had during your life.
> Have you ever given birth? (Malawi, 2001:251 Appendix E).

The above question is an example of the type of questions asked in the survey, which tend to be close-ended. This means that the responses from such questions are limited and can be pre –coded (for example, as either a "Yes" or a "No"). After the woman has given a "yes" answer to having given birth, a birth history is obtained for every child by asking the woman (mother) to give name and other details such as the sex and date of birth of each child. The procedure starts by asking about the first-born child (Malawi 2001).

The strength in obtaining the type of responses, which are pre-coded and closed in nature, is that the data are easier to organize, and allow computer processing to be done systematically. For instance, the total number of births derived from initial reports of mothers which start by recalling the first birth, is compared with those added up during the reporting of each child's details by name. If there are any mismatches or inconsistencies, interviewers were trained and required to reconcile the figures. How the figures can be reconciled mainly depends on how well-trained the interviewers were and on them making the best decision during the actual interview process. This is the main reason why data quality for retrospective maternity histories is strongly influenced by the training of interviewers and their supervisors.

In respect of the checking system, which was used in the questionnaires, the 2000 MDHS included one question for ensuring completeness of birth history details:

> Were there any other live births between (NAME of previous birth and (Name)? (Malawi 2001:252, Appendix E).

The above question is clearly an attempt to help the woman being interviewed to recall the birth events in a logical order. In this way, too, memories of dates and exact birth occurrences can be improved. At the same time, though, the question raises concerns over the strength and limitations of quantitative type of study instruments that tend to be more structured than the qualitative ones (Neuman 1997). In this regard Neuman (1997) argues that in a given setting, challenges faced by data collection such as ones where an immediate inconsistency in reported number of births is spotted, the interviewer may use their discretion to probe the respondent in greater depth. Consequently, instead of just correcting the figures and recording the corrected data version without the explanation behind it, the respondent is likely to respond accurately. It further implies that questionnaires like the ones from MDHS contain questions that exclude the social-cultural context for which respondents tend to behave. A conclusion in respect of the variations in types of data generated has been reached by calling for a combination of different methodologies to achieve optimum data quality. This is referred to as triangulation (Wickman, 1997). The main point of the discussion is that though consistency in figures can be achieved, there are unexplained errors in the social context from which the data is collected. The survey instruments alone cannot reveal or provide the ultimate correction factors but are necessary for uniformity and easy to examining comparisons between surveys as will be applied in this thesis.

Thereafter, the data were downloaded from the MeasureDHS website in flat-file format. The data files were, first, the women recode file, which had been derived from a recode that was termed as an individual recode file, and second, the child recode file. The child recode file was derived from women's report about each child and its corresponding birth histories. Thus, every child was assigned an identity number for reference and was used for extracting the child data as reported by their mothers. The women's file also contained variables, which gave the basic data about the respondents themselves, such as their age at date of interview. The birth history of every child, as well as their date of birth or death, was contained in the children's file.

The data were analysed using Stata. Macros were thus written in Stata to perform the initial calculations. To derive the fertility rates, births and women's exposure in the three year period before the survey were calculated using a set of Stata commands. The results were thereafter copied into an Excel spreadsheet to calculate age specific fertility rates and estimate total fertility rates.

3.3 Quality of data based on background characteristics of women in the two surveys.

According to the results of the 1998 Malawi Census (Malawi 2002), women account for about 51 percent of the entire population, and a high proportion of them, 49 percent cannot read or write. Female literacy rates are worse than their male counterparts, with the literacy rate for men being 64 percent.

Table 3.2 Percent distribution of women background characteristics

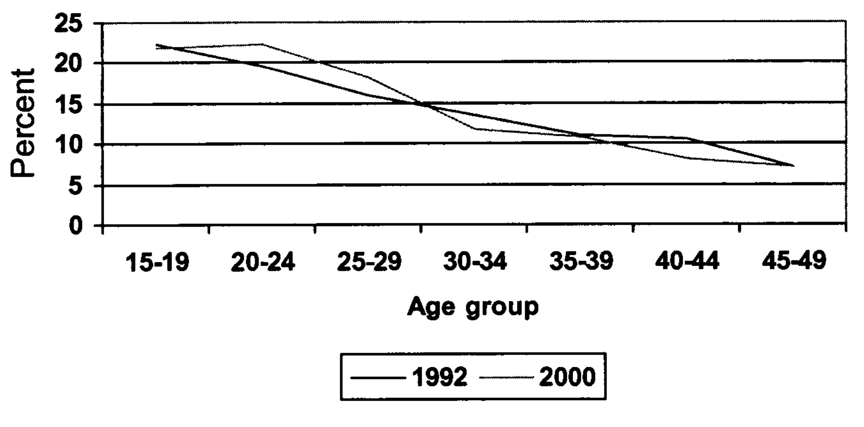
Malawi DHS 1992			
Age	**Weighted %**	**Weighted Number**	**Unweighted Number**
15-19	22.3	1082	1105
20-24	19.5	944	990
25-29	16.0	777	804
30-34	13.5	656	664
35-39	11.1	537	517
40-44	10.5	510	458
45-49	7.1	343	311
Residence			
Urban	0.123	1316	594
Malawi DHS 2000			
Age	**Weighted %**	**Weighted Number**	**Unweighted Number**
15-19	21.7	2867	2914
20-24	22.4	2957	2998
25-29	18.2	2401	2358
30-34	11.8	1566	1574
35-39	10.8	1424	1410
40-44	8.0	1053	1052
45-49	7.2	951	914
Residence			
Urban	0.159	2871	2106

Source: Own calculations from MDHS 1992 and 2000

Another characteristic of the women in the country is their relatively low status with regard to economic activity. The country as a whole is predominantly rural, with the people primarily engaged in agricultural activities. However, as documented by United Nations and Malawi (1993), about 70 percent of the agricultural work for the country is done by women. Since the nature of this work is in the form of subsistence farming and is, moreover, dependent on seasonal rains, women engaged in the tasks are particularly vulnerable to hunger and disease, especially during the drought periods which had occurred in the mid-and late 1990s.

Clearly, these data in Table 3.2 above show a young population with the majority of women being under 30 and living in rural areas. The distribution of women of reproductive age shows some differences between the 1992 and 2000 surveys. There are higher percentages of women in the younger ages between 20 and 30 in the 2000 survey than in the 1992 survey as portrayed in Figure 3.1

Figure 3.1 Percent distribution of women aged 15-49 according to age group



Source: MDHS 1992 and 2000

In an effort to explore the quality of data obtained from women through interviews and their responses through recalling of maternity histories, reported births and estimated age as at the date of interview were analyzed. Table 3.3 below shows the calculated total births by age of child.

Table 3.3 Total number of births by reported age of child and estimated calendar year of birth

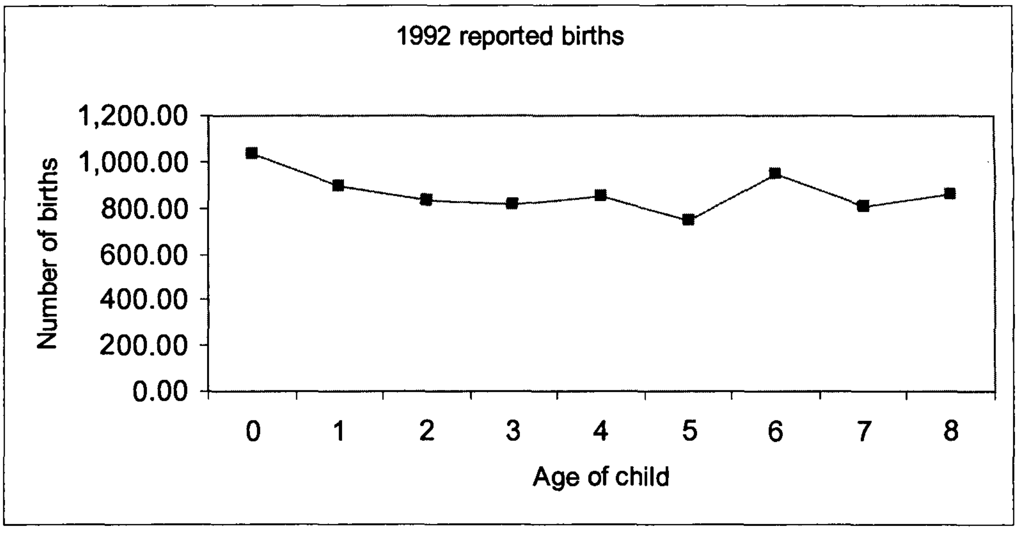
Age of child	Number of births from MDHS 1992											
	82	83	84	85	86	87	88	89	90	91	92	Total
0	0	0	0	0	0	0	0	0	0	208	829	1038
1	0	0	0	0	0	0	0	0	191	700	0	891
2	0	0	0	0	0	0	0	163	669	0	0	832
3	0	0	0	0	0	0	148	668	0	0	0	816
4	0	0	0	0	0	168	680	0	0	0	0	848
5	0	0	0	0	136	606	0	0	0	0	0	742
6	0	0	0	147	801	0	0	0	0	0	0	948
7	0	0	121	689	0	0	0	0	0	0	0	810
8	0	119	742	0	0	0	0	0	0	0	0	861

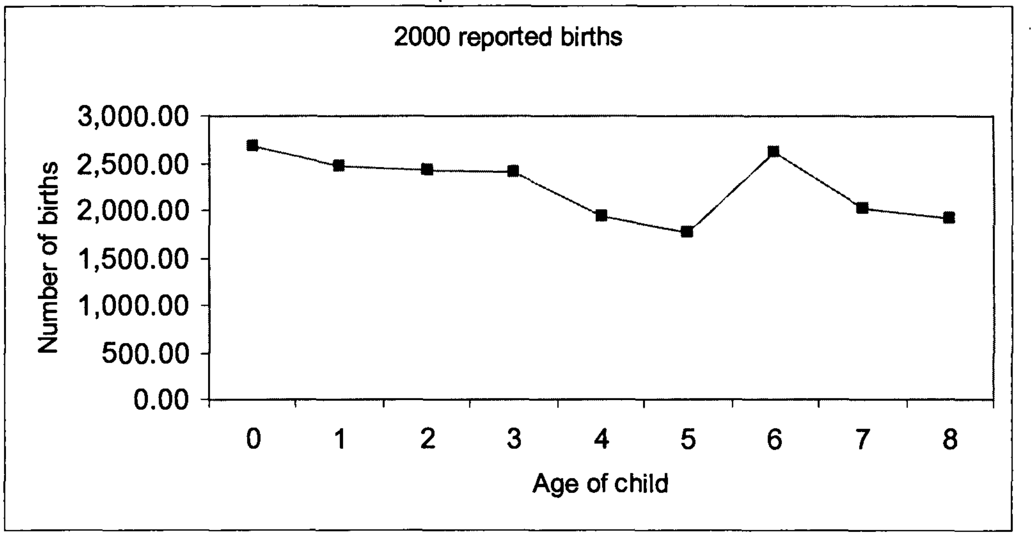
Age of child	Number of births from MDHS 2000											
	90	91	92	93	94	95	96	97	98	99	00	Total
0	0	0	0	0	0	0	0	0	0	785	1897	2681
1	0	0	0	0	0	0	0	0	657	1818	0	2475
2	0	0	0	0	0	0	0	663	1756	0	0	2420
3	0	0	0	0	0	0	671	1723	0	0	0	2394
4	0	0	0	0	0	497	1448	0	0	0	0	1945
5	0	0	0	0	556	1210	0	0	0	0	0	1767
6	0	0	0	474	2137	0	0	0	0	0	0	2611
7	0	0	468	1550	0	0	0	0	0	0	0	2018
8	0	361	1564	0	0	0	0	0	0	0	0	1925

Source: Own calculations from MDHS 1992 and 2000

The results in Figure 3.2 below shows that there is evidence to support the fact that women were under reporting birth in the younger ages with the intention of avoiding detailed questions related to the children. In the example of 2000 data, there is a clear spike of 6 year olds, and a shortage of 5 and 4 year olds. This implies that there was shifting of 5 year olds to age 6 to avoid having to answer detailed child questionnaire. In comparison to 1992, the spike for 6 year olds is smaller than in 2000 and shifting to age 6 can only be observed for 5 year olds. Therefore, data quality by this measure of reporting births is better in 1992 than in 2000.

Figure 3.2 Comparison of reported births by year of survey





Source: Data from Table 3.3

3.4 Age specific fertility rates and total fertility rates derived from the retrieved data

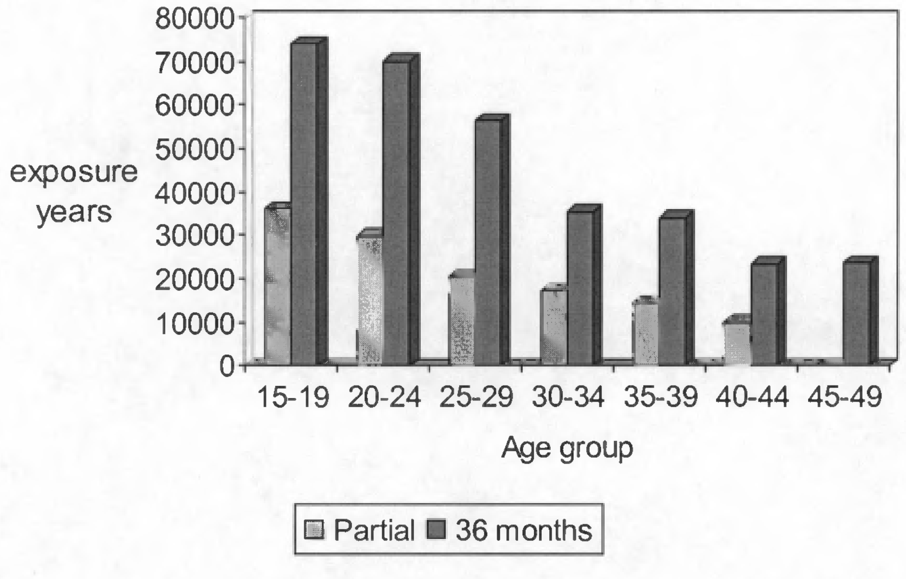
As an initial check, age specific and total fertility rates were derived from the downloaded data. The first step is to derive the number of birth for the three years preceding the survey.

The three year period was chosen to minimize the effect of random fluctuations. The numbers of births in the period of three years originate from the child recode file.

The data were weighted by using the sample weights provided with the data to ensure that the data are nationally representative. Conventional age groups of mothers (i.e. 15-19, 20-24, 25-29, 30-34, 35-39, 40-44, 45-49) were computed, corresponding to the age of mother at the time of birth. Dates, such as birth of mothers and children, are coded in Century Month Calendar format that counts the number of months since January 1900.

Weighted numbers of births by each age group of the mothers were computed for the three years preceding each survey. The derived births have to be linked to the group of women in the corresponding age groups appropriate to the age at birth. In this regard, two scenarios emerged, one of which include women who were partially at risk of childbearing during the three year period and those who were at risk for the complete three year period.

Figure 3.2 Women's exposure years to giving birth during 36 months of 2000 survey



Source: Own calculations MDHS 2000

The amount of time each woman spent in each age group interval over the three year period of investigation was then apportioned and the aggregated exposure derived by summing the number of months exposure for each age group. The exposure of women in different age groups is shown in Figure 3.2.That is how the two tables (shown in Table 3.4) are generated to allow for representation and separate calculation of women of specific age groups in the three year interval.

Age specific fertility rates are calculated by dividing the total births by the corresponding women who are at risk of giving births for each age group. The total fertility rate is the summation of the age specific rates from age group 15 to 19 up to age group 44 to 49 multiplied by five (as the age groups are in five years). The rates presented in Table 3.4 are identical to those in the official reports and presented in Table 2.4 of the previous chapter.

Table 3.4 Derived total fertility rates (TFR)

1992 data			
Age group	**Derived Birth**	**Total Exposure Years**	**ASFR**
15-19	516	3,199.61	161.23
20-24	752	2,619.86	286.99
25-29	626	2,335.72	267.94
30-34	440	1,724.19	255.19
35-39	317	1,610.54	196.79
40-44	163	1,359.40	120.15
45-49	41	703.40	57.81
Total	2,861	13,552.72	**6.73 as TFR**
2000 data			
age group	**Derived Birth**	**total Exp**	**ASFR**
15-19	1575	9,169.94	171.76
20-24	2534	8,318.54	304.57
25-29	1739	6,382.98	272.48
30-34	963	4,396.53	219.03
35-39	673	4,031.36	166.94
40-44	261	2,785.75	93.64
45-49	81	1,977.21	41.10
Total	7826	37,062.31	**6.35 as TFR**

Source: Own calculations MDHS 1992 and 2000

Based on the TFR, there has indeed been a small decline of about six percent in fertility. By themselves, this is not indicative of fertility decline. This conclusion, however, does not reveal much about how fertility levels have changed which is the subject matter in the next analysis. However, it cannot be over emphasized that a decline in fertility can only be said to have begun if the TFR falls by at least 10 percent from a previously (roughly) stable level (Cohen 1993).

In this chapter, a background to the 1992 and 2000 MDHS has been outlined by emphasizing the data collection and organization methodologies that were used, the characteristics of respondents, the software applied in this thesis to the data sets and re-calculating the conventional measures of fertility, in order to demonstrate how the results were derived from the MDHS reports. The types of instruments used in both surveys are standardized and structured questionnaires. There is awareness of the shortcomings of such study designs, which are quantitative in nature, but on the whole they allow for comparison of results over time and across regions. Women in Malawi are primarily from rural areas, with low levels of literacy and their economic status can be vulnerable in drought seasons. The re-calculated TFR agree with what was presented in the 1992 and 2000 MDHS.

Chapter Four: Analysis of fertility using Cohort-Period fertility rates, Projected B60s and Projected Parity Progression Ratios

In this chapter, fertility trends and patterns in Malawi will be examined by initially calculating cohort-period fertility rates, followed by parity progression ratios (PPRs) and then by comparing projected parity progression ratios (PPPRs) with projected B60s. From the projected PPR, an estimated completed cohort total fertility rate will be used for comparison with the TFR reported in both surveys. The Projected B60 method, first set out by Brass and Juarez (1983), is a refinement of the original approach presented by Rodiguez and Hobcraft (1980). A further variant of the technique as applied by Moultrie and Timaeus (2002) allows estimates of median birth intervals to be made in order to shed more light on the length of birth intervals.

4.1 Cohort period fertility rates

Cohort-period fertility rates can be estimated using data from surveys, but not from censuses, as the method requires full birth histories, which are typically not collected in censuses (Hobcraft and Goldman 1982). They provide an alternative method of estimating both current fertility and the average number of children to which a woman has given birth during her reproductive life. In addition to providing estimates of fertility, the method assists in determining the accuracy of data reporting by women in terms of omission of birth through the calculation of parity (cumulative fertility of cohorts) and current fertility ratios.

The data required are the number of women, grouped by conventional age groups at the date of survey and the number of births to these women grouped into five year periods, dating back from the survey date. Table 4.1 and Table 4.2 illustrate the cohort-period fertility rates from the output of number of women in each age group as reported at the time of the survey and their respective births at five year intervals (panel "B"). An analysis of the cohort-period rates is demonstrated in panel "C" which translates the rates by arranging them from the end of each five year interval preceding the survey. It is also useful to compute the cumulative fertility cohorts, as at the end of the period (panel "D"), which represents mean parities (Hobcraft and Goldman 1982). For the oldest cohort of 45 to 49 years, this gives an estimate of cohort fertility rate. Estimates of TFR for the most recent period are obtained by calculating cumulative rates by period (panel "E"). The division of parity (P) by current fertility (F) gives the P/F ratios as presented in panel "F".

Based on the analysis of the cohort period fertility, panel "C", of Table 4.1, there is not much evidence of declining fertility trend 15 years before the survey. However, fertility does start to decline after 10 years to the years immediately preceding the 1992 survey. That is where a consistent fall in cohort-period fertility rates can be detected. For instance, the age group 25-29 had fertility rates of 0.312 from 20-24 years, whereas ten years later, a higher rate of 0.327 was estimated which does not confirm a fall in fertility for much earlier years than the observed period after 10 years.

A similar trend can be observed for age group 30-34 as illustrated in Figure 4.1. Thus indicating that fertility did not start falling much earlier than 1982, which is a similar estimate as, estimated by Garenne and Joseph (2002) and discussed in section 2.1.

The calculated mean parity at age 45-49 is 7.035 children per woman. This differs from the reported 7.3 calculated directly (Malawi 1994). However, there would appear to be omission of births among older women, particularly, since the average parities here are five year averages, and so if anything should be higher than the directly calculated values, not lower.

In panel "D" of Table 4.1, fertility from older to younger cohorts indicate rising rates (i.e. age group 25-29, a rate of 2.998 20-24 years before the survey, a rate of 3.125, 5 years later and a rate of 3.31 for the 10-14 years prior to the survey).

Table 4.1 Cohort-period fertility rates for 1992

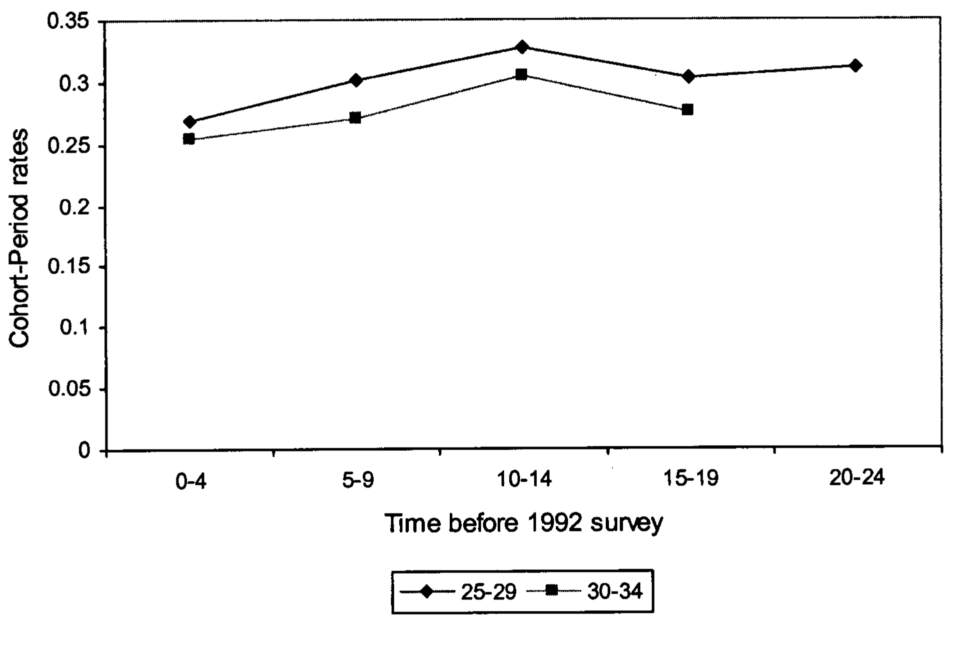
Age group @ survey		No. of Women	Years prior to survey 0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39
A			**No of Births**							
	15-19	1082	353	7	0	0	0	0	0	0
	20-24	941	1097	418	22	0	0	0	0	0
	25-29	775	1043	1001	360	15	0	0	0	0
	30-34	658	838	991	915	326	18	0	0	0
	35-39	538	546	730	880	684	216	10	0	0
	40-44	508	389	628	772	770	619	200	33	0
	45-49	346	158	326	437	478	540	362	137	11
B	**Cohort-Period fertility rates**									
	15-19		0.065	0.001						
	20-24		0.233	0.089	0.005					
	25-29		0.269	0.258	0.093	0.004				
	30-34		0.255	0.301	0.278	0.099	0.005			
	35-39		0.203	0.271	0.327	0.254	0.080	0.004		
	40-44		0.153	0.247	0.304	0.303	0.243	0.079	0.013	
	45-49		0.091	0.188	0.252	0.276	0.312	0.209	0.079	0.031
C	**At end of period group of cohort**									
	15-19		0.065	0.089	0.093	0.099	0.080	0.079	0.079	0.031
	20-24		0.233	0.258	0.278	0.254	0.243	0.209		
	25-29		0.269	0.301	0.327	0.303	0.312			
	30-34		0.255	0.271	0.304	0.276				
	35-39		0.203	0.247	0.252					
	40-44		0.153	0.188						
	45-49		0.091							
D	**Cumulative fertility of cohorts**									
	15-19		0.326	0.444	0.464	0.496	0.402	0.393	0.396	0.155
	20-24		1.610	1.756	1.887	1.674	1.610	1.441		
	25-29		3.103	3.393	3.310	3.125	2.998			
	30-34		4.666	4.667	4.644	4.377				
	35-39		5.682	5.880	5.639					
	40-44		6.645	6.579						
	45-49		7.035							
E	**Cumulative fertility within periods**									
	15-19		0.326	0.444	0.464	0.496	0.402	0.393	0.396	0.155
	20-24		1.492	1.736	1.855	1.768	1.619	1.438		
	25-29		2.839	3.242	3.491	3.283	3.176			
	30-34		4.112	4.599	5.011	4.662				
	35-39		5.127	5.835	6.273					
	40-44		5.892	6.774						
	45-49		6.347							
F	**P/F Ratios**									
	15-19		1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
	20-24		1.079	1.012	1.017	0.947	0.995	1.002		
	25-29		1.093	1.047	0.948	0.952	0.944			
	30-34		1.135	1.015	0.927	0.939				
	35-39		1.108	1.008	0.899					
	40-44		1.128	0.971						
	45-49		1.108							

Source: Own calculations from MDHS 1992

This is further confirmed by potential for omissions of birth by older women, which is reflected in P/F ratios of less than one and becomes dominant in the 10-14 years preceding the survey with a lowest value of 0.899 (which means fewer children ever born than current fertility measurements suggests).

A current total fertility rate of 6.3 children per woman is a lower estimate of TFR in Malawi than the average of 6.7 children per woman obtained using conventional methods. However, the decline over the years as illustrated in the 35 to 39 age group (panel "E") is minimal and justifies high levels of fertility estimates. This finding further shows that fertility decline in 1992 was at a slow pace.

Figure 4.1 Trends in cohort-period fertility rates for 1992 survey



Source: Own calculations from MDHS 1992

The trend from the above figure shows that women in the older age group of 30-34 have a pronounced potential for declining fertility, which is supported by the falling rates in the period of 10 years and subsequent years. The trend for age group 25-29 does not suggest a significant fertility decline in this age group.

A similar interpretation to the 1992 results can also be applied to the 2000 results, which are presented in Table 4.2 below. The salient features of the 2000 data are that there is more evidence of fertility decline. In the example of the age group 25-29 years, fertility must have started declining 20 years immediate preceding the survey which is consistent with their counterparts in 1992 where a consistent fall is apparent 10 years preceding the survey.

A significant drop in the mean parity from 6.781 (panel "D" for women aged 45-49 years) to current TFR of 5.943 (panel "E" for women aged 45-49 years) also supports the argument for declining fertility for the years preceding the survey. In comparison to the 1992 data, there is more accurate reporting of recent fertility, which is shown by fewer P/F proportions of less than one. There are four isolated cases for the age group 45 to 49 years starting from 10-14 years preceding the survey compared to the 1992 results which had nine values of less than one (panel "F" of Table 4.1). According to Hobcraft and Goldman (1982), P/F values of greater than 1 also implies that fertility is declining, since the current estimates of fertility forms the denominator in calculating the ratios and the numerator reflects the past estimate of fertility. As such panel "F" in Table 4.2 shows evidence of fertility decline, almost 20 years before the survey (as can be read from the column "15-19" with values of greater than 1 for all age groups). The results show that estimates as reported in both surveys are quite consistent since 20 years before 2000 survey would be around 1980 and ten years before 1992 would be about 1982.

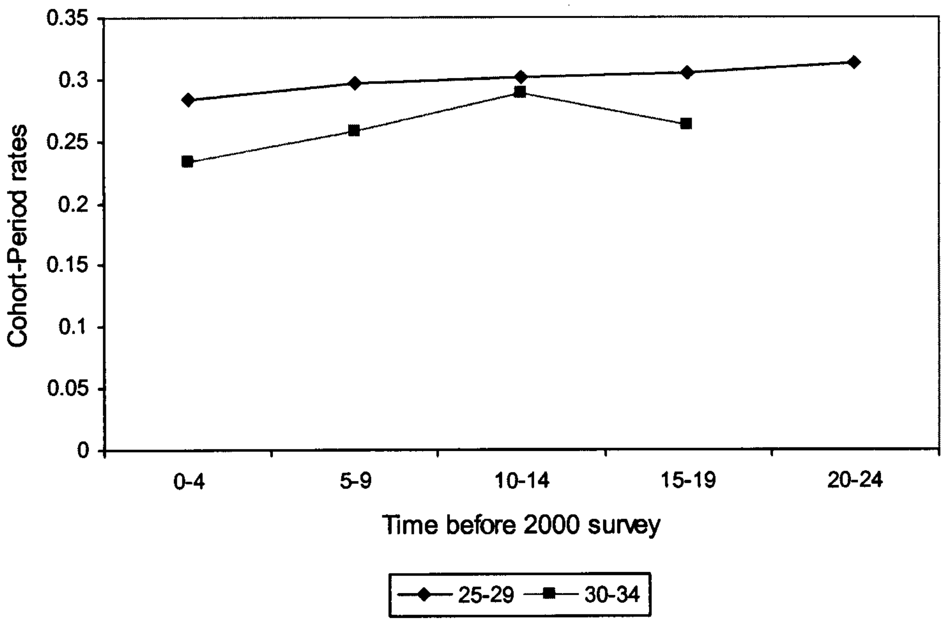
Table 4.2 Cohort-period fertility rates for 2000

Age group @ survey		No. of Women	Years prior to survey 0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39
A			No of Births							
	15-19	2867	834	16	0	0	0	0	0	0
	20-24	2957	3595	881	23	0	0	0	0	0
	25-29	2401	3392	2987	824	33	0	0	0	0
	30-34	1566	1823	2325	2020	626	20	0	0	0
	35-39	1424	1324	1833	2151	1794	594	21	0	0
	40-44	1053	631	1198	1517	1601	1385	470	14	0
	45-49	951	314	736	1129	1251	1482	1175	362	41
B	**Cohort-Period fertility rates**									
	15-19		0.058	0.001						
	20-24		0.243	0.060	0.002					
	25-29		0.283	0.249	0.069	0.003				
	30-34		0.233	0.297	0.258	0.080	0.003			
	35-39		0.186	0.257	0.302	0.252	0.083	0.003		
	40-44		0.120	0.228	0.288	0.304	0.263	0.089	0.003	
	45-49		0.066	0.155	0.237	0.263	0.312	0.247	0.076	0.009
C	**At end of period group of cohort**									
	15-19		0.058	0.060	0.069	0.080	0.083	0.089	0.076	0.009
	20-24		0.243	0.249	0.258	0.252	0.263	0.247		
	25-29		0.283	0.297	0.302	0.304	0.312			
	30-34		0.233	0.257	0.288	0.263				
	35-39		0.186	0.228	0.237					
	40-44		0.120	0.155						
	45-49		0.066							
D	**Cumulative fertility of cohorts**									
	15-19		0.291	0.298	0.343	0.400	0.417	0.446	0.381	0.043
	20-24		1.514	1.587	1.690	1.677	1.762	1.616		
	25-29		3.000	3.174	3.188	3.282	3.175			
	30-34		4.338	4.475	4.723	4.490				
	35-39		5.404	5.860	5.677					
	40-44		6.460	6.451						
	45-49		6.781							
E	**Cumulative fertility within periods**									
	15-19		0.291	0.298	0.343	0.400	0.417	0.446	0.381	0.043
	20-24		1.507	1.542	1.633	1.660	1.732	1.682		
	25-29		2.919	3.027	3.144	3.180	3.291			
	30-34		4.084	4.314	4.584	4.495				
	35-39		5.013	5.452	5.771					
	40-44		5.613	6.226						
	45-49		5.943							
F	**P/F Ratios**									
	15-19		1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
	20-24		1.005	1.029	1.035	1.010	1.017	0.961		
	25-29		1.028	1.049	1.014	1.032	0.965			
	30-34		1.062	1.037	1.030	0.999				
	35-39		1.078	1.075	0.984					
	40-44		1.151	1.036						
	45-49		1.141							

Source: Own calculations from MDHS 2000

The trends for similar age groups as in 1992 are presented in Figure 4.2 below which also show that women in the older age group of 30-34 have much potential for declining fertility while the trend for age group 25-29 does not suggest a significant fertility decline in this age group.

Figure 4.2 Trends in cohort-period fertility rates for 2000 survey



Source: Own calculations from MDHS 2000

After applying the cohort-period fertility rates, different patterns and trends in fertility rates are being noticed. There is a drop in the mean parity from the current TFR in 2000, which is more noticeable than that of 1992. It has also been observed that 10 years prior to the 1992 survey, fertility was fairly constant whereas 20 years prior to the 2000 survey, it can be shown that fertility was declining. The method also assists in detecting potential errors in women's reporting of births. The 1992 data indicate some reporting errors, which are more pronounced than in the 2000 data.

4.2 Parity Progression Ratios

Parity is the number of children a woman has already had to date (Preston, 2001). A parity progression ratio, then, reflects the proportion of women who progress to the next highest parity, given their current parity. In other words, parity progression ratios, denoted by a_i, are conditional probabilities. The proportion of women who will have *k* or more children is thus given by

$$PPR(0,k) = \prod_{i=0}^{k-1} ai$$

Table 4.3 Parity progression ratios for women aged 45-49, 1992 and 2000 survey

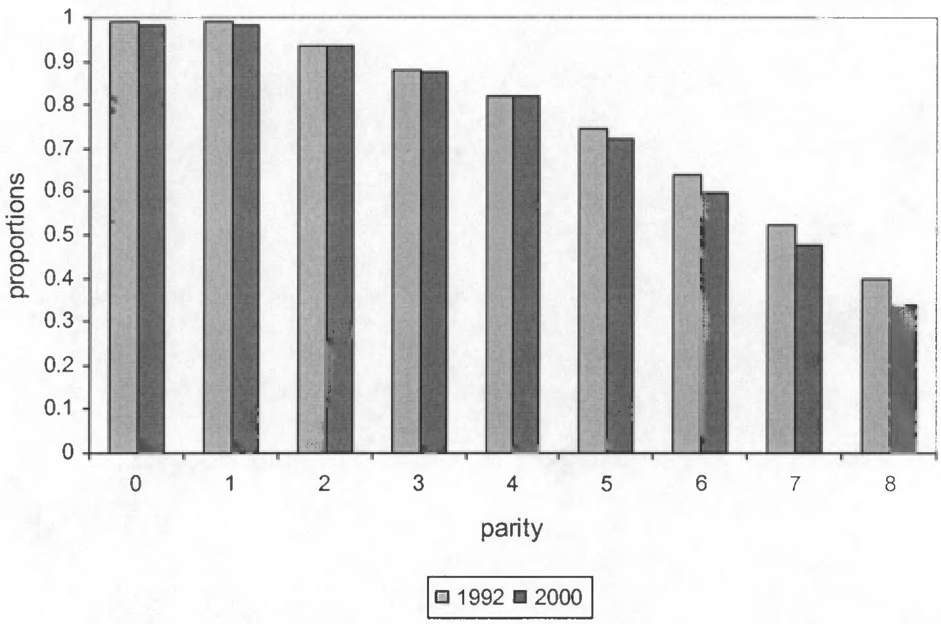
i	W_i	P_i	a_i	PPR $(_{0,i})$
1992				
0	3.68	346.43	0.9894	
1	8.01	342.76	0.9766	0.9894
2	17.89	334.75	0.9466	0.9365
3	19.30	316.85	0.9391	0.8795
4	20.81	297.56	0.9301	0.8180
5	24.70	276.74	0.9107	0.7449
6	36.11	252.04	0.8567	0.6382
7	38.10	215.93	0.8194	0.5230
8	42.17	176.94	0.7617	0.3983
9	48.01	134.77	0.6438	0.2564
10	34.82	86.76	0.5986	0.1535
11+	51.94	51.94	0.4880	0.0749
	2000			
I	**W_i**	**P_i**	**a_i**	**PPR $(_{0,i})$**
0	18.81	951.08	0.9802	
1	30.64	932.27	0.9671	0.9802
2	41.33	901.62	0.9542	0.9352
3	53.79	860.30	0.9375	0.8768
4	52.05	806.51	0.9355	0.8202
5	91.59	754.46	0.8786	0.7206
6	115.16	662.87	0.8263	0.5954
7	107.71	547.71	0.8033	0.4783
8	128.12	440.00	0.7088	0.3390
9	114.24	311.88	0.6337	0.2148
10	84.37	197.64	0.5731	0.1231
11+	113.27	113.27	0.5645	0.0695

Source: Own calculations from MDHS 1992 and 2000

Note: W_i represents number of women of parity $_i$, P_i represents the number of women of parity i or greater a_i is the proportion of women progressing to the next parity and PPR $(_{0,i})$ is the conditional parity progression ratio.

The focus is on the 45 to 49 age group where it is assumed that women have (almost) completed their childbearing whereas the estimated proportions for younger cohorts are less reliable due to the fact that these women's childbearing is not yet complete (Moultrie and Timaeus 2002). Parity progression ratios for the oldest cohort in both MDHS are shown in Table 4.3 above and presented in Figure 4.3 below.

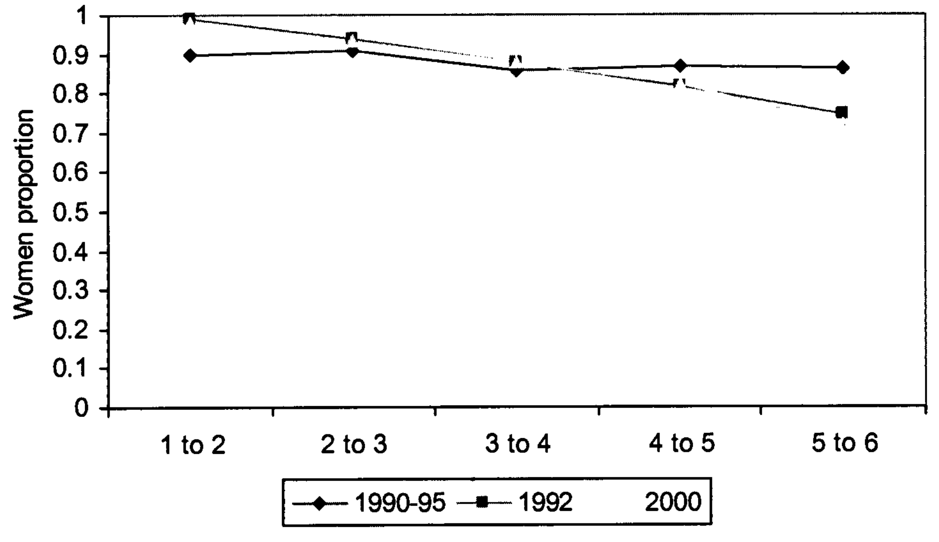
Figure 4.3 Parity progression ratios PPR $_{(0,i)}$ for age group 45-49



Source: Own calculations from Table 4.3

From Figure 4.3, it can be observed that women's preference for higher parities is generally lower in 2000 than it was in 1992. From parity five and above, the difference in the probabilities of progressing from a given parity to the next higher parity can be clearly noticed. This gives further evidence that fertility may indeed have begun to fall between the two surveys and that fertility decline is most pronounced at higher parities.

Figure 4.4 Comparison of parity progression ratios between 1992, 2000 and estimates of 1990-95.



Sources: Table 4.3 and Mboup and Saha (1998)

Other estimates of parity progression ratios in the country have been calculated by Mboup and Saha (1998) using the 1992 MDHS data. The results in Figure 4.4 show that measurements derived by Mboup and Saha indicate slightly lower proportions, between low parities of one and four, than in the two surveys. One of the reasons for this difference is that they only took into account births to women occurring within five years of their previous births. The estimates they present are not true parity progression ratios, even though the authors describe them as such, but rather adjusted B60s. These are discussed further in section 4.4. The data in Table 4.3 show lower proportions from parity four, which can be attributed to non- censoring of data, which is further discussed in section 4.6. In any event, the plotted trend based on the calculations by Mboup and Saha do not support findings from the cohort-period fertility analysis (section 4.1) that fertility decline from the 1992 MDHS was not apparent.

4.3 Projected Parity Progression Ratios

In the previous discussion, section 4.2, it has been explained how parity progression ratios are limited to oldest age group of 45 to 49. In the Projected Parity Progression Ratio Method (PPPR), proportions of women at younger age groups than 45-49 who proceed from one parity to the next can be calculated and facilitate broad comparisons about the nature and pace of family formation. Projected Parity Progression Ratios (usually denoted Pn) give the estimated proportions of women who are expected to have attained a given parity by cohort at the end of their childbearing. It is a technique derived by Brass and Juarez (1983) as a simplified version of the Bx (B60s or B84s) for analysis of family formation. A further benefit of using the PPPR is the ability to estimate projected and completed cohort fertility. In each cohort, the projected parity progression ratios are cumulated which gives a measure of the estimated completed fertility for women at the end of their childbearing.

In calculating the PPPRs, the method allows for minimizing the selectivity bias originating from fast breeders which arises mostly from younger mothers with shorter birth intervals (by cohorts by parity), Brass (1996). This selectivity effect is controlled through the paired comparison technique. Fertility on the whole changes slowly. It can, therefore, be assumed that two contiguous cohorts will be exposed to very similar environmental and fertility dynamics. As such comparison of the experience of older cohorts in progressing from a given parity to the next with a younger cohort can be achieved through truncation. In this case, the data are truncated to exclude births in the last five years. Indices of relative change are then obtained by calculating the ratio of equivalent truncated and untrucated data by age group and parity.

The computed indices of relative change convert the parity progression ratios to projected ones. This is achieved by taking the calculated indices of relative change for each group, in a chain and obtaining the adjusted PPRs. After adjusting the ratios, it is assumed that differences of the past experience in indices of relative change will remain the same in future cohorts. As pointed out above, the method of Projected Parity Progression Ratios is a simplification of Projected Bx: the estimated projected proportions of women having a subsequent birth within x months of the last. While the Bx will give estimates of proportions in a limited time interval of observation of say 60 months, the Pn give an estimate of parity progression ratios once fertility is assumed to be completed. It is considered as a simpler technique than the B60s (which will be explained under the B60s in the next section) because there is no censoring which is achieved by applying the life table technique. The calculated projected parity progression ratios are summarized in Table 4.4 below.

A comparison can be made between the1992 and 2000 projected parity progression ratios by examining the proportions of women aged 30-34 and taking the specific example of parity 4-5. It shows lower proportions at this age in 2000 than in 1992 of women progressing to the next parity (0.807 in 2000 from 0.919 in1992). There is further evidence of declining proportions of women in the age group, 35-39 and 40-44 who proceed to have births of higher parities than 4. One particular characteristic of the 2000 MDHS results is the proportions of young cohorts of 15-19 and 20-24 who had progressed from zero parity to one. The values are greater than one (1.027 and 1.008 respectively), which is not possible. One explanation for such erroneous proportions is attributed to misreporting of births in the two younger cohorts respectively. An alternative explanation is that the indices of relative change may be distorted by proportionally high values due to the fact that more births or fewer women were observed in the younger cohorts than older (truncated) ones. It may also be the case that the indices of relative change cause projected ratios to be greater than one at young ages where almost all women have experienced the parity progression in question.

Table 4.4 Projected parity progression ratios

1992	Parity Progression								
Age group	0-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9
15-19	0.759								
20-24	0.944	0.896	0.878	0.845	0.667				
25-29	0.975	0.945	0.952	0.886	0.740	0.729			
30-34	0.986	0.971	0.955	0.938	0.919	0.959	0.822	0.652	
35-39	0.975	0.972	0.963	0.924	0.933	0.925	0.864	0.713	
40-44	0.982	0.978	0.965	0.947	0.933	0.911	0.872	0.761	0.754
45-49	0.989	0.977	0.947	0.939	0.930	0.911	0.857	0.819	0.762
2000	**Parity Progression**								
Age group	0-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9
15-19	1.027	0.723							
20-24	1.008	0.911	0.751						
25-29	0.984	0.954	0.921	0.816	0.726	0.773			
30-34	0.978	0.958	0.957	0.938	0.807	0.848	0.653		
35-39	0.978	0.957	0.941	0.936	0.888	0.913	0.713	0.720	
40-44	0.982	0.969	0.960	0.930	0.911	0.920	0.819	0.813	0.688
45-49	0.980	0.967	0.954	0.937	0.935	0.879	0.826	0.803	0.709

Source: Own calculations from MDHSs 1992 and 2000

The estimated projected TFRs derived from the two MDHSs are summarized in Table 4.5. As expected the cohort TFR is higher than the one estimated from the period data reflecting the fact that fertility is declining. The cohort TFR for 2000 is 6.9 and 7.3 for 1992 in the 45 to 49 year age group.

Table 4.5 Estimated TFR from projected PPRs

Estimated TFR

Age group	2000	1992
30-34	5.7	6.5
35-39	6.2	6.9
40-44	6.9	7.4
45-49	6.9	7.3
TFR from survey	6.3	6.7

Source: Own calculations from MDHSs 1992 and 2000

There is little evidence for a sustainable decline in fertility at older ages, while there is a marked decline in the projected TFR for younger women. The decline in the projected TFR is about four percent compared to the reported six per cent from the MDHS report.

4.4 Background to B60s

B60s refers to an indirect technique derived by Brass and Juarez (1983) for measuring fertility through analysis of the proportions of women, who proceed to a next birth order within a period of the last five years (or sixty months). The idea of limiting the period is based on the empirical observation that women are likely to have stopped bearing children if there is no birth after an interval of, say, 60 months from the previous birth. That is, within the conventional reproductive ages of 15 to 49, women tend to achieve higher birth orders within five years. As further pointed out by Brass and Juarez (1983), adjusting the interval of 60 months to a lower or higher interval does not significantly affect the underlying principle of the method. While extending the interval to 84 months or above does improve the precision in measurement, it may not be practical. There would be an increase in the number of censored cases at older ages. At the same time, lowering the period to less than 60 months can yield both gains and losses to the purpose of fertility measurement:

> With i smaller than 60 months, the range of the Bi can be extended to higher orders for younger cohorts. As i decreases, however, the degree to which the Bi are dominated by quantum levels is reduced (Brass and Juarez, 1983:10).

The younger age groups are not likely to experience higher birth orders beyond a certain level, largely due to biological and other social-cultural reasons. For this project and with reference to Malawi, the 60 months period appears reasonable for its application to the two survey data sets because births intervals are relatively short. As will be seen, the vast majority of Malawian women who close their birth intervals do so within 5 years.

The other salient characteristic of B60s is how they provide more insight into family formation by cohorts over a period of time through computation of life tables (Brass and Juarez, 1983).

The B60 method deals both with censoring and selectivity effects (Brass and Juarez, 1983). In order to address the bias in selectivity introduced by "fast breeders", indices of relative change are applied using the same approach as used with the projected parity progression ratios in section 4.3. In the words of Brass and Juarez, (1983:6):

> If the B60 value at ages 45-49 is taken as a base or starting point, the cumulated ratios may be applied to it multiplicatively to give adjusted B60 values (to be viewed as projected terminal values of B60 at ages 45-49) for each younger age cohort down to the 20-24 age cohort). The implied assumption is that the ratio of the B60 values with equivalent censoring equals the ratio of the corresponding values without censoring.

Thus the issue of selectivity is taken into account by assuming that the fertility experience of two equally truncated adjacent cohort groups is the same after the estimated indices of relative change (between the adjacent cohort groups) have been applied. The age group 45-49 is considered as the base, as such the unadjusted and adjusted B60s for this age group will be the same.

The life table technique terminates the analysis of the exposure to risk of giving birth after the 60 months period (as end of observation period). The censoring is also made for those women whose birth history is interrupted on the interview date by breaking the observation period, from one given birth order and by each age group, into two months interval (i.e. the starting intervals is 0 to 2 months). As such the B60s will give cumulated ratios of future trends in fertility for the successive age groups which have been adjusted for selectivity as well as age-censoring (Brass and Juarez, 1983).

4.5 Procedures for calculating B60s

The calculation of B60s is derived from computed life tables for each of the seven conventional cohorts from 15 to 19 to 45 to 49 and for each maternity (or confinement). In cases of multiple births, only the first born is considered for analysis. An example of the STATA output (for age group 30 to 34) is presented in Appendix 1.

In a sequential process, all confinements reported by each woman are reviewed. The item of analysis is in the time between births. The length of the interval is calculated directly from the data. All women, by definition will have a last, open, birth interval. This last interval is derived by deducting the date of last child's birth from the interview date. A dummy variable is then created for each birth to indicate whether the interval in question has been closed by a subsequent birth or has been censored. A life table is created for the truncated and untruncated data separately, for each birth interval and age of the mother. Data are weighted to ensure national representativity. However Stata requires the use of integer frequency weights in the life table algorithm. This means that the apparent sample size is one million times greater than it is. While this does not affect point estimates, the confidence intervals will be orders of magnitude too narrow.

Stata produces an estimate of the failure or survival function, the probability of surviving separate portions of the interval without giving birth. The B60 is the complement of the probability of surviving to 60 months. In this instance, we are looking at women who are proceeding to a next parity and from the DHS survey a commonly defined entry point for all women will be those with parity 1. Parity 0 will not apply because the issue of marriage as a common entry point in Malawi would not be ideal due to cases of birth outside marriage, which distorts the notion of using parity zero. And it is hard to justify any other starting point for that first "interval". A criteria for reaching a cut-off point with regard to birth orders was determined based on the declining proportions to a level, which is negligible or insignificant for analysis. From the maximum number of 15 maternities per woman, 11 was established as a cut off point. Thus B60s were estimated for each birth order, by each group of women, for truncated and untrucated data and by year of survey.

4.6 Interpretation and discussion of results

Starting with the general analysis of 1992 and 2000 results, Projected Parity Progression Ratios, are generally higher than the projected B60s as shown in Figure 4.5 and 4.6. Brass and Juarez (1983) point out that the PPRRs tend to be higher due to the assumption that parity progression ratios measure completed fertility. This is different from the B60s where the limit is for 60 months and controls for numbers of birth that are aimed at regulating fertility.

It should be noted (as indicated in Table 4.6 below) that the youngest age group of 15-19 was excluded from the analysis from the 3rd to 4th birth experience because small sample sizes mean that no sensible ratios could be obtained with increasing birth order. Particularly in 1992 where the sample size was smaller, the interpretation for higher birth orders in the youngest age group becomes meaningless. For the other age groups, it was decided to limit the trend analysis from 6th to 7th birth order. According to the 1992 MDHS projected B60s, there is little evidence of a declining trend in the proportions of women who proceed to have births of higher orders at the assumed end of their years of reproduction. It is not until the high birth order of 6 to 7, where a declining trend can be noticed in age group of 35-39 and above but due to the small sample size of the survey, the results cannot be determined for the cohorts younger than 30.

The results for 2000 survey, as presented in Figure 4.6, show more support for a decline in the proportions of women progressing to higher birth orders than observed from the 1992 data. There is evidence of a consistent downward trend from the 4th - 5th birth among cohorts aged 25-29 and 20-24. The decline continues at a faster pace for both 5th -6th and

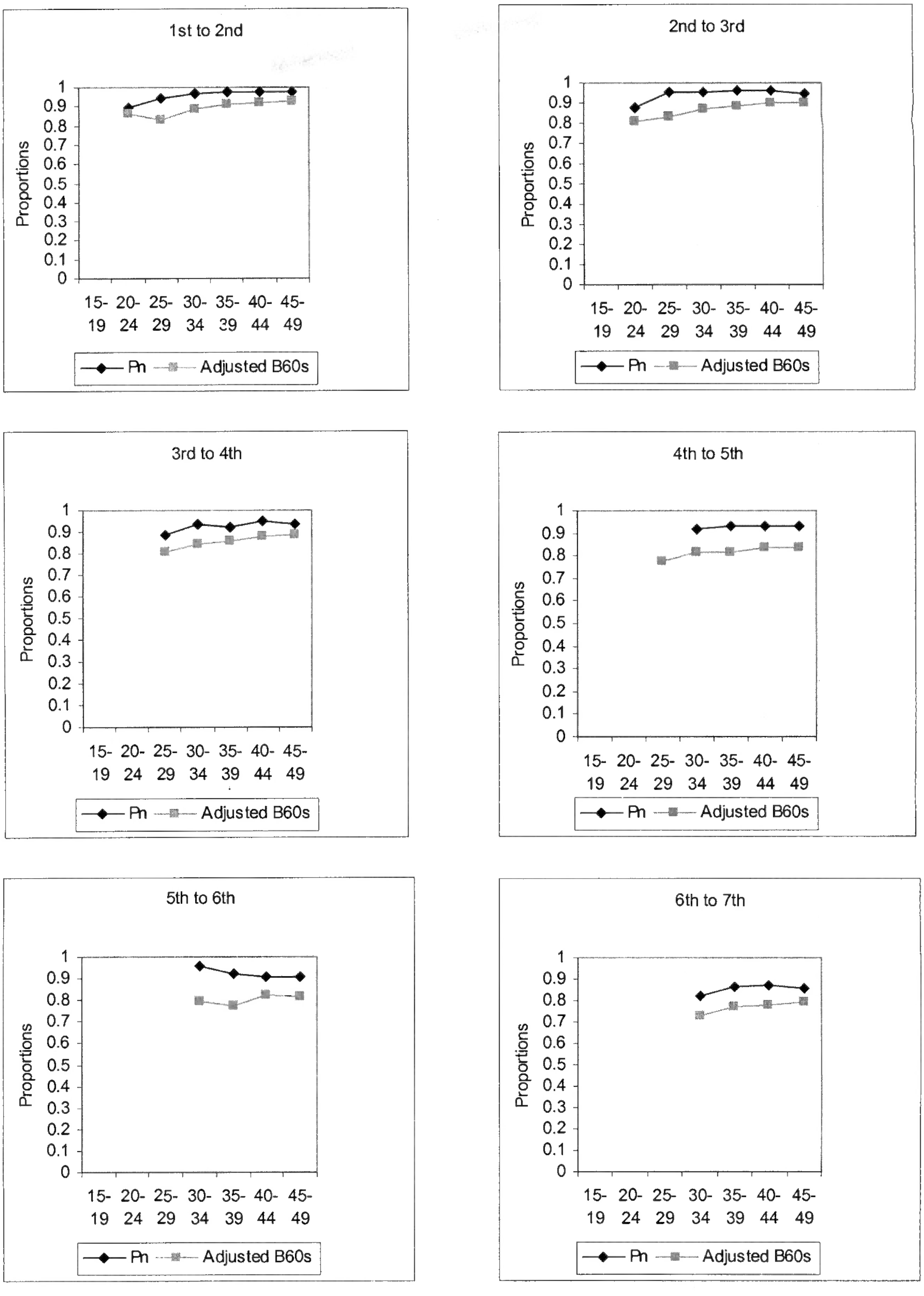
6th -7th birth orders. This finding gives a clear indication of declining fertility in the country.

Table 4.6 Trends in indices of B60s for 1992 and 2000 survey

B60s unadjusted	**Parity progression,1992**					
	1-2	**2-3**	**3-4**	**4-5**	**5-6**	**6-7**
15-19	0.805					
20-24	0.836	0.849	0.863	0.790		
25-29	0.845	0.865	0.865	0.839	0.833	
30-34	0.897	0.883	0.864	0.881	0.872	0.797
35-39	0.914	0.896	0.865	0.846	0.804	0.827
40-44	0.921	0.901	0.884	0.851	0.837	0.805
45-49	0.925	0.898	0.884	0.837	0.819	0.795
Projected B60s	**Parity progression**					
	1-2	**2-3**	**3-4**	**4-5**	**5-6**	**6-7**
15-19	0.876	0.811	0.000			
20-24	0.858	0.811	0.953	0.939	0.906	
25-29	0.832	0.833	0.810	0.773	0.750	0.577
30-34	0.889	0.872	0.840	0.816	0.793	0.730
35-39	0.914	0.887	0.856	0.818	0.771	0.771
40-44	0.921	0.897	0.880	0.837	0.826	0.780
45-49	0.925	0.898	0.884	0.837	0.819	0.795
B60s unadjusted	**Parity progression,2000**					
	1-2	**2-3**	**3-4**	**4-5**	**5-6**	**6-7**
15-19	0.880					
20-24	0.888	0.880				
25-29	0.887	0.889	0.849	0.882	0.771	
30-34	0.873	0.878	0.867	0.836	0.778	0.803
35-39	0.895	0.873	0.866	0.830	0.815	0.753
40-44	0.903	0.879	0.846	0.838	0.829	0.782
45-49	0.894	0.897	0.839	0.833	0.797	0.769
Projected B60s	**Parity progression**					
	1-2	**2-3**	**3-4**	**4-5**	**5-6**	**6-7**
15-19	0.989					
20-24	0.869	0.847				
25-29	0.872	0.871	0.848	0.776	0.657	
30-34	0.872	0.865	0.865	0.786	0.714	
35-39	0.894	0.867	0.864	0.803	0.771	0.673
40-44	0.903	0.878	0.845	0.831	0.815	0.750
45-49	0.894	0.897	0.839	0.833	0.797	0.769

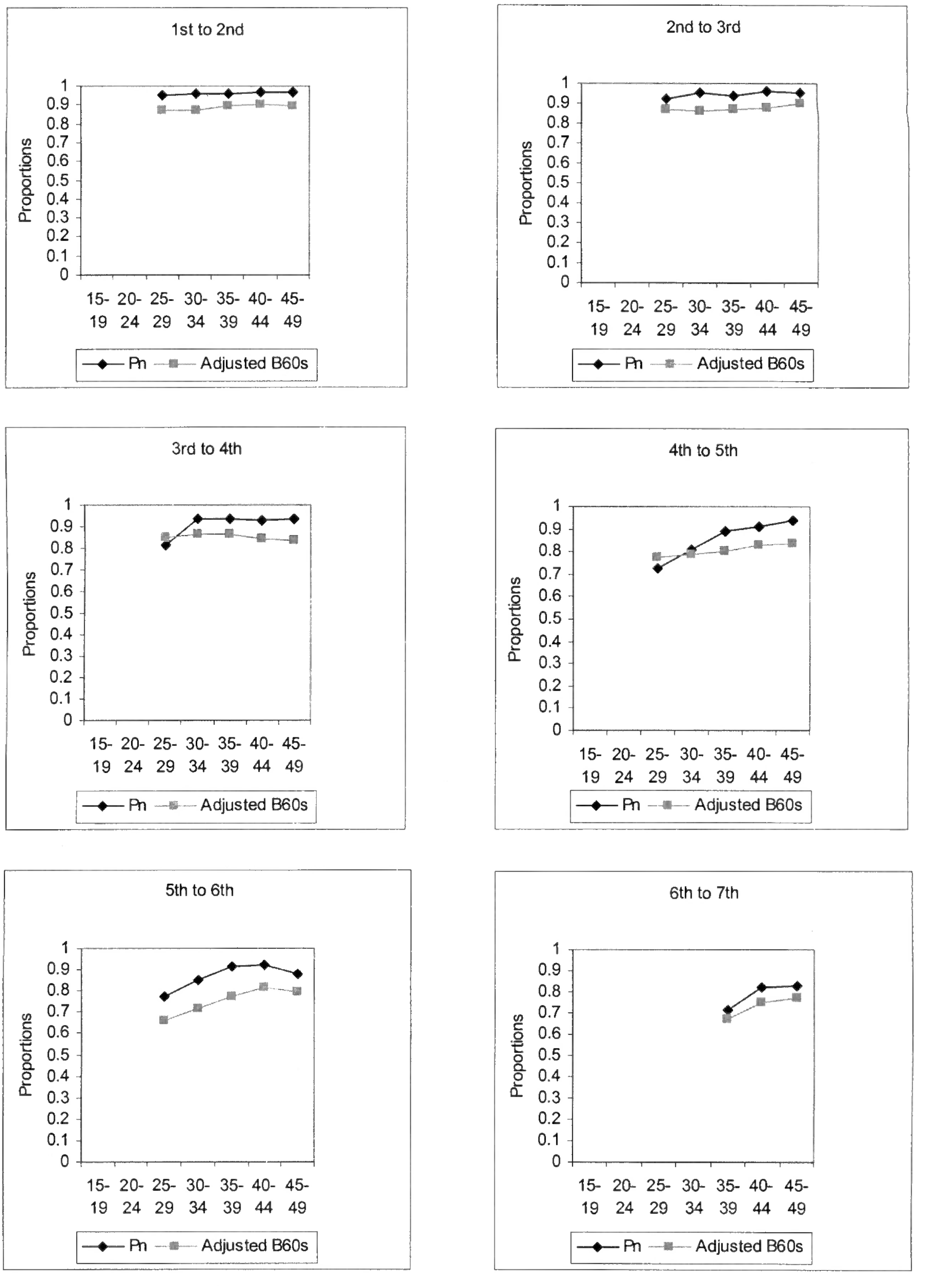
Source: Own calculations from MDHSs 1992 and 2000

Figure 4.5 Comparison of adjusted B60s and Pn for 1992 survey



Source: Own calculations from MDHS 1992.

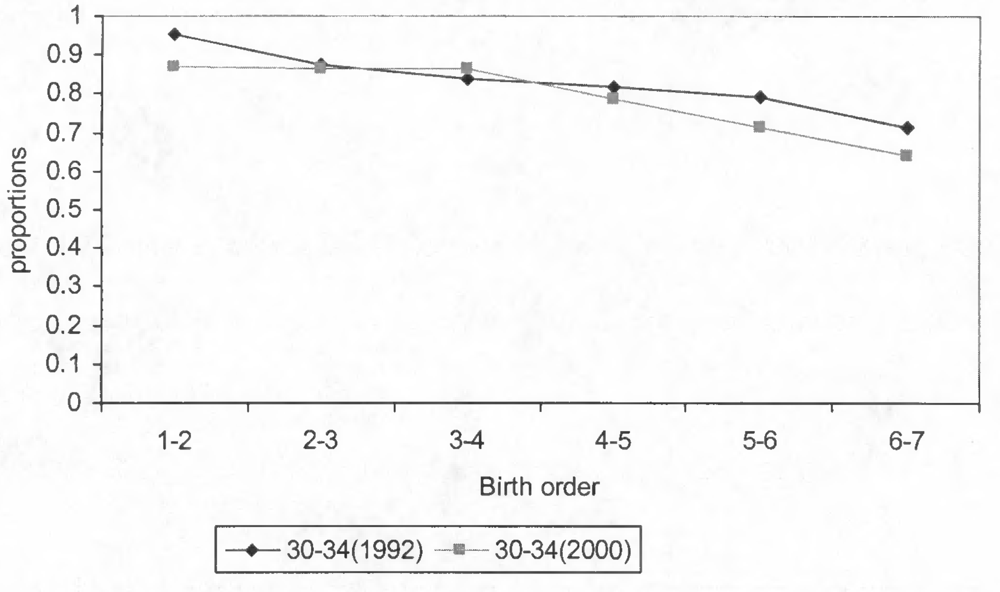
Figure 4.6 Comparison of adjusted B60s and Pn for 2000 Survey



Source: Own calculations from MDHS 2000

Figure 4.7 below confirms the difference in trends between the1992 and 2000 MDHSs. Women aged 30-34 in the 2000 survey are less likely to progress to a higher birth order than women 30-34 in 1992 were.

Figure 4.7 Comparison of projected B60 trends for 30-34 age groups



Source: Own calculations from MDHS 1992 and 2000

4.7 Median birth intervals

Median intervals can be derived from the life tables that produced the B60s. These give an estimate of the time when half of the women in each age group will have experienced the event of interest, i.e. having another child. The larger the intervals, in months, the higher are the chances of delaying the onset of higher birth orders. After identifying the median birth interval from each of the life tables a linear interpolation has to be applied to the life table values to derive the median.

Projected median birth intervals were derived by using the same approach of truncating the data and applying indices of relative change as explained and used in projected parity progression ratios and projected B60s. The general picture, from Table 4.7 below is that in the 2000 survey, women in each age group were delaying their birth or experiencing birth at longer intervals than women in the 1992 survey. However, by cohorts, the 2000 survey shows that older cohorts have a shorter birth interval than younger cohorts, which is what one would expect (since older people on average, had their births a long time ago).

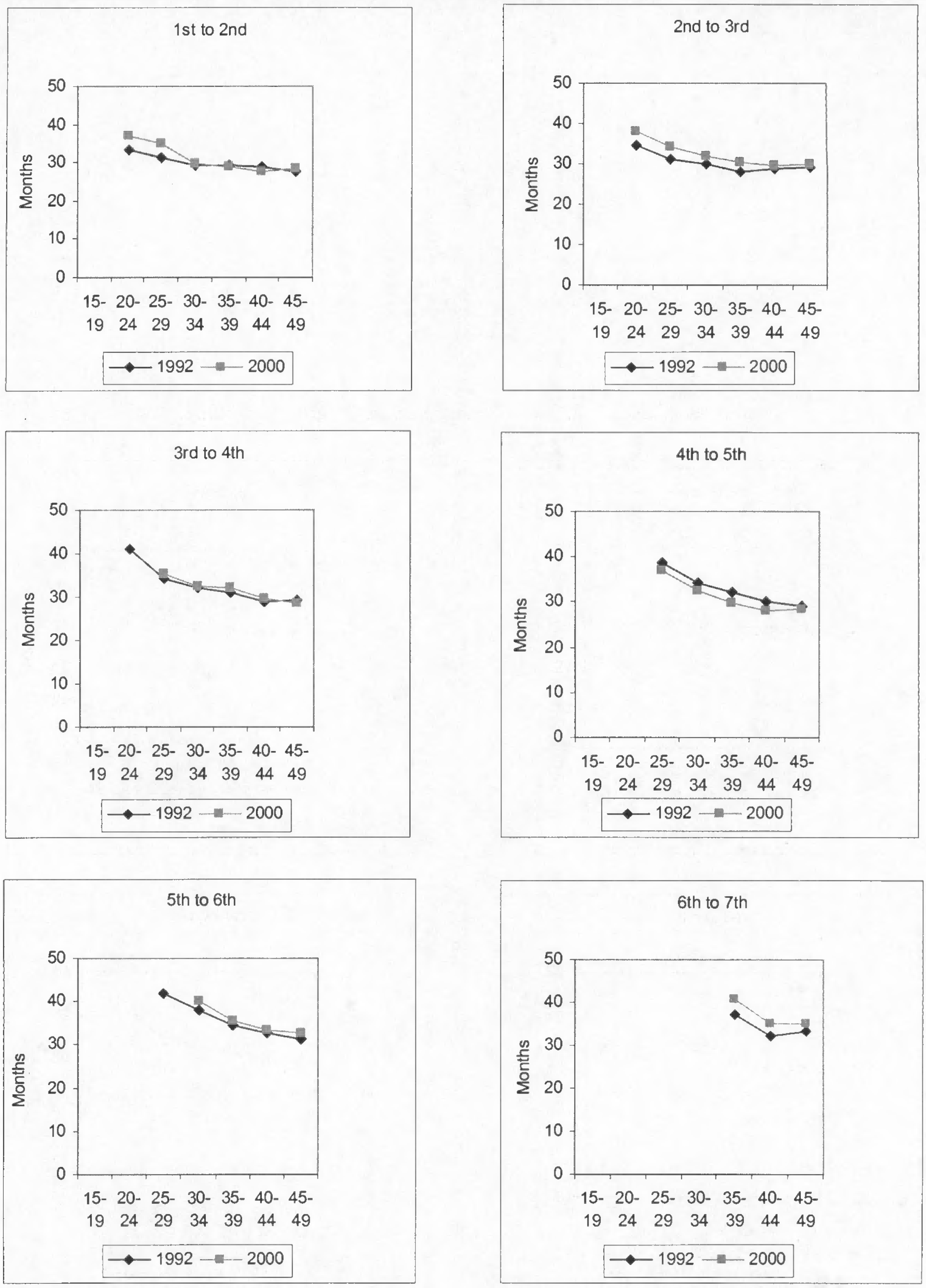
Table 4.7 Median birth intervals for B60s from 1992 and 2000 survey

Median Birth Intervals B60s unadjusted, in months 1992						
	Parity progression					
Age group	**1-2**	**2-3**	**3-4**	**4-5**	**5-6**	**6-7**
20-24	32.28	31.94	34.40			
Median Birth Intervals B60s unadjusted, in months 1992						
	Parity progression					
Age group	**1-2**	**2-3**	**3-4**	**4-5**	**5-6**	**6-7**
25-29	30.87	30.52	31.73	34.50	33.84	
30-34	29.23	29.90	31.25	31.73	34.75	32.98
35-39	29.16	27.98	30.72	30.92	33.69	33.64
40-44	28.80	28.94	28.88	30.00	32.65	31.32
45-49	27.81	29.15	29.13	29.19	31.15	33.07
Median Birth Intervals B60s unadjusted, in months 2000						
	Parity progression					
Age group	**1-2**	**2-3**	**3-4**	**4-5**	**5-6**	**6-7**
20-24	32.44	33.81	37.70	32.39		
25-29	31.24	32.69	35.27	34.73	35.95	
30-34	30.83	31.71	32.58	33.42	36.66	38.60
35-39	29.83	30.18	31.92	30.08	33.55	36.43
40-44	28.82	29.58	29.78	28.22	32.78	33.85
45-49	28.50	29.94	28.40	28.40	32.61	34.90
Median Birth Intervals B60s adjusted, in months 1992						
	Parity progression					
Age group	**1-2**	**2-3**	**3-4**	**4-5**	**5-6**	**6-7**
20-24	33.42	34.78	40.91			
25-29	31.20	31.33	34.44	38.60	41.95	
30-34	29.28	30.18	32.06	34.17	37.92	38.64
35-39	29.16	28.01	30.97	32.03	34.33	37.12
40-44	28.79	28.93	28.87	30.24	32.73	32.24
45-49	27.81	29.15	29.13	29.19	31.15	33.07
Median Birth Intervals B60s adjusted, in months 2000						
	Parity progression					
Age group	**1-2**	**2-3**	**3-4**	**4-5**	**5-6**	**6-7**
20-24	37.19	38.26				
25-29	34.94	34.12	35.31	36.96	45.90	
30-34	29.82	32.11	32.66	32.62	40.11	49.84
35-39	28.83	30.29	32.07	29.84	35.59	40.72
40-44	27.84	29.58	29.80	28.18	33.23	35.01
45-49	28.50	29.94	28.40	28.40	32.61	34.90

Source: Own calculations from MDHSs 1992 and 2000

As in the example of 2000 trends in Figure 4.8 below the young age groups of less than 25 years start showing longer median birth intervals from 1st to 2nd birth orders which are higher than the 1992 trends. These results concur with trends in projected B60s which show a slow decline at older cohorts. The conclusion must be that the falling fertility shown by the 2000 MDHS is supported by longer birth intervals, particularly in younger cohorts.

Figure 4.8 Comparison of trends in projected median birth intervals



Source: Own calculations from DHS 1992 and 2000

4.8 Rural and urban differentials

It has been observed in section 2.1 that the TFRs of rural and urban women varies significantly. Fertility in the urban areas appears to be lower than fertility in rural areas. An attempt to illustrate the existence of a difference with regard to family formation was made by applying the projected parity progression ratio and projected B60 techniques to the two data sets examining rural and urban trends separately. The 1992 and 2000 projected parity progression ratios, by place of residence, are shown in Table 4.8 and the trends illustrated in Figure 4.9 and Figure 4.10.

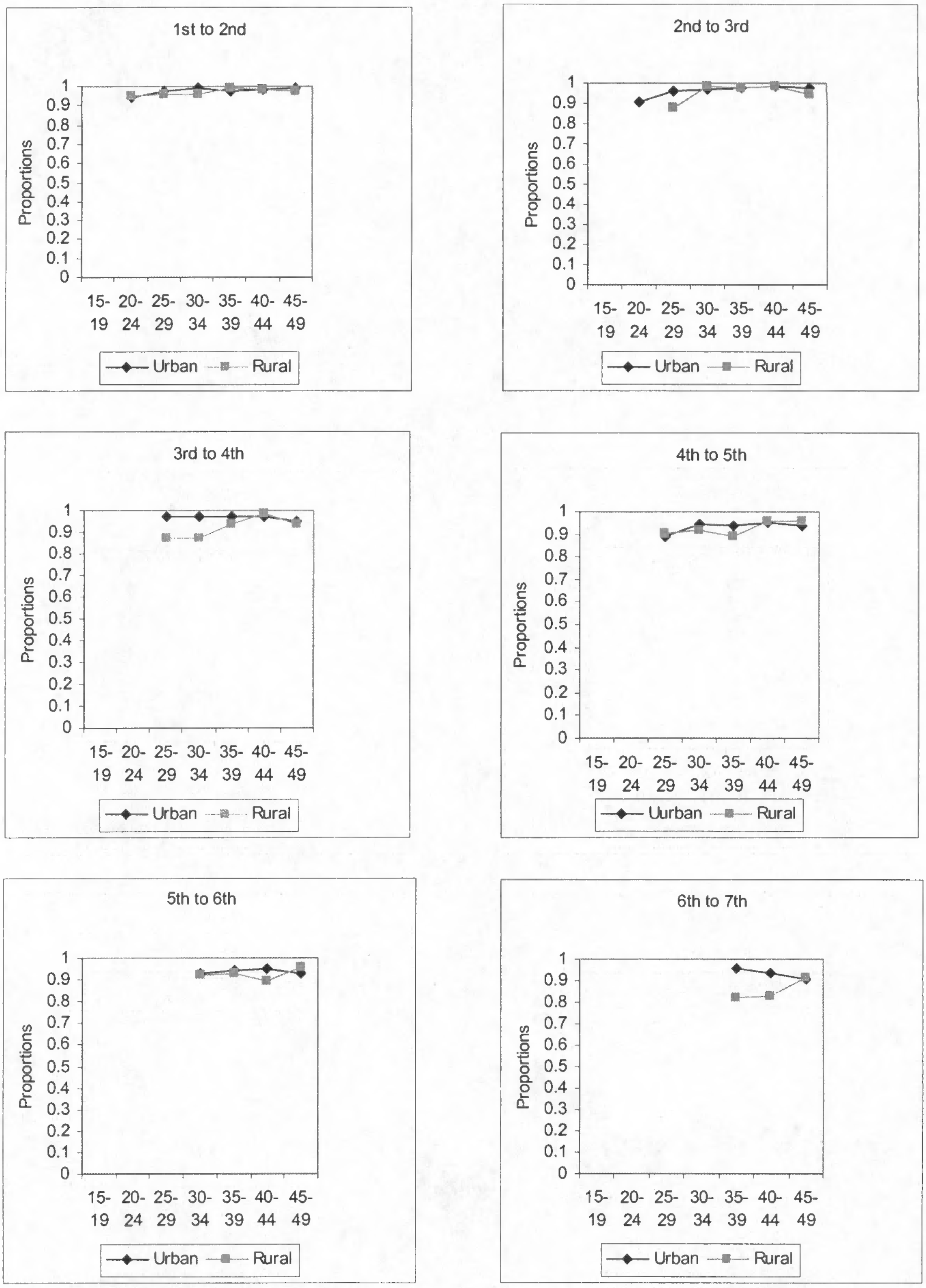
Table 4.8 Projected parity progression ratios by place of residence

1992 Rural					**Parity progression**				
Age group	0-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9
20-24	0.953								
25-29	0.959	0.877	0.869	0.901					
30-34	0.962	0.988	0.870	0.917	0.919				
35-39	0.992	0.975	0.934	0.887	0.928	0.818			
40-44	0.983	0.982	0.986	0.959	0.895	0.826	0.841	0.705	0.746
45-49	0.976	0.944	0.935	0.959	0.957	0.917	0.858	0.852	0.760
1992Urban					**Parity progression**				
Age group	0-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9
20-24	0.943	0.908							
25-29	0.978	0.959	0.972	0.890					
30-34	0.990	0.971	0.974	0.947	0.930				
35-39	0.974	0.974	0.974	0.935	0.945	0.957	0.923		
40-44	0.983	0.981	0.970	0.953	0.948	0.938	0.915	0.816	
45-49	0.990	0.979	0.947	0.936	0.926	0.908	0.853	0.812	

2000 Rural					**Parity progression**				
Age group	0-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9
20-24	1.036								
25-29	0.995	0.968	0.931						
30-34	0.980	0.960	0.963	0.960	0.821				
35-39	0.978	0.957	0.956	0.942	0.900	0.931	0.724		
40-44	0.983	0.971	0.964	0.933	0.912	0.927	0.829	0.820	
45-49	0.978	0.968	0.960	0.945	0.947	0.887	0.823	0.822	0.718
2000Urban					**Parity progression**				
Age group	0-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9
15-19	0.593								
20-24	0.795								
25-29	0.946	0.796	0.631						
30-34	0.989	0.911	0.739	0.714					
35-39	0.996	0.938	0.768	0.820	0.683	0.747			
40-44	0.997	0.953	0.885	0.837	0.797	0.808	0.782		
45-49	0.994	0.960	0.910	0.875	0.827	0.796	0.860		

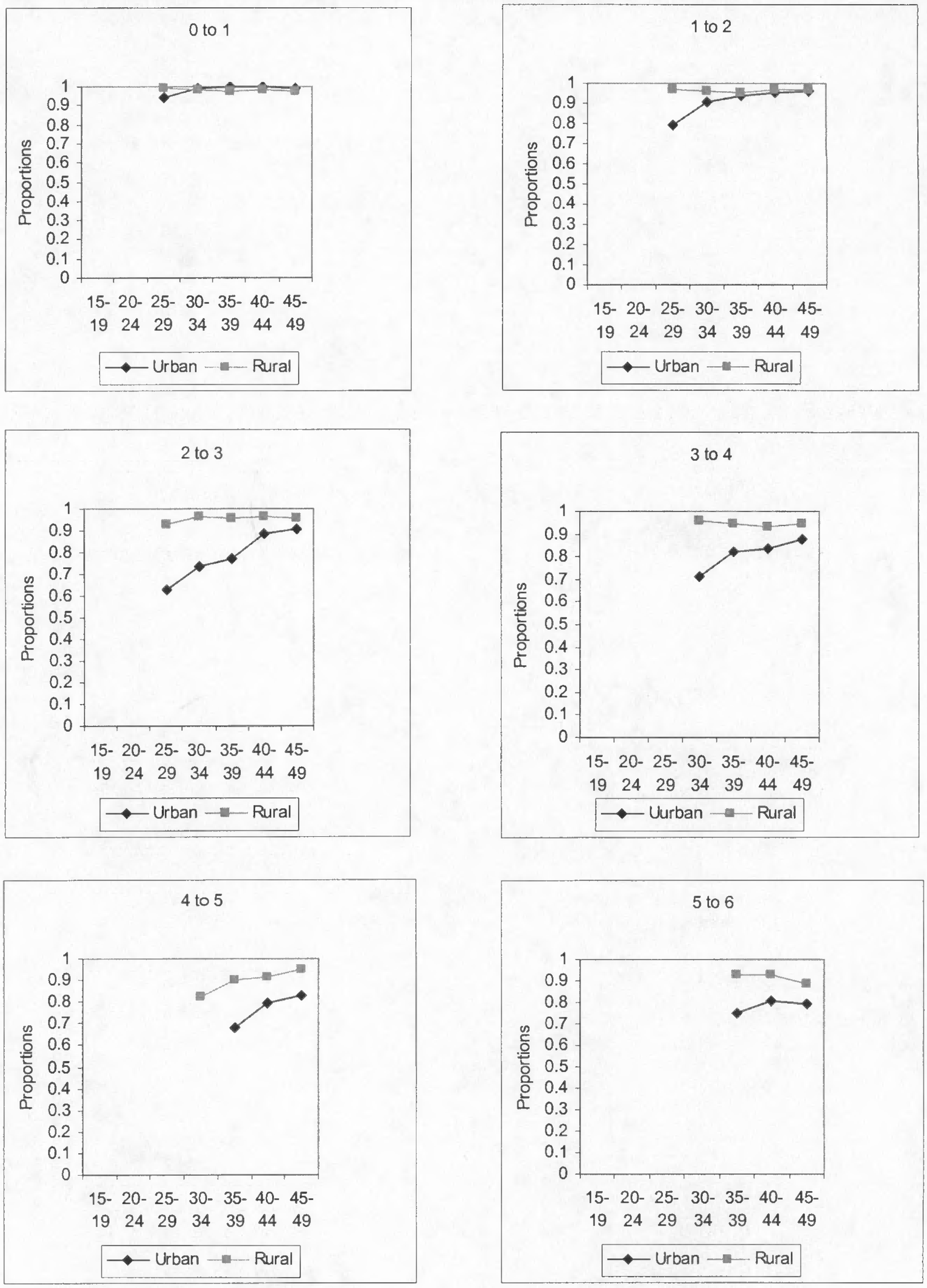
Source: Own calculations from MDHSs 1992 and 2000

Figure 4.9 Rural and urban projected parity progression ratios for 1992 survey



Source: Own calculations from MDHS 1992

Figure 4.10 Rural and urban projected parity progression ratios for 2000 survey



Source: Own calculations from MDHS 2000

The comparison of trends in projected parity progression ratios between rural and urban women as presented in Figures 4.9 and 4.10 above show that fertility decline is more visible among urban women and particularly in the younger age groups. The downward slope starts from parity 2-3 and above. For higher birth orders, it can also be observed that fertility decline in urban areas for the 2000 survey is supported with low proportions for women who are aged less than 40 years progressing to birth order 4 and above.

Similarly, as was done in Table 4.5, it is possible to estimate completed cohort fertility rates. These are shown for urban and rural areas in both surveys in Table 4.9 below.

Table 4.9 Projected TFR by place of residence

Estimated TFR 1992

Age group	Rural	Urban
25-29	4.17	5.05
30-34	5.27	6.93
35-39	6.02	7.22
40-44	7.00	7.49
45-49	7.34	7.18
TFR survey	6.9	5.5

Estimated TFR 2000

Age group	Rural	Urban
25-29	4.99	2.59
30-34	5.86	3.55
35-39	6.34	4.27
40-44	7.04	5.29
45-49	7.15	5.70
TFR survey	6.7	4.5

Source: Own calculations from MDHSs 1992 and 2000

It is observed that urban completed cohort fertility rates have declined significantly between the surveys, from a measure of 7.18 children per woman in 1992 to 5.7 in 2000 (for the age group 45-49 years). In comparison, in rural areas, the decline was very slight, from 7.34 children per woman in 1992 to 7.15 in 2000.

Further analysis was done by using the 2000 MDHS data and calculating the B60s by place of residence. Since there was a significant difference between the TFRs of urban and rural women (Table 2.4), it is useful to examine the patterns of family formation by rural residence. The 2000 MDHS was chosen because of its larger sample size, and hence a better representation of the urban women than the 1992 MDHS. The results are summarized in Table 4.10 below and presented in Figure 4.11.

Table 4.10 Projected B60s for 2000 MDHS by rural and urban

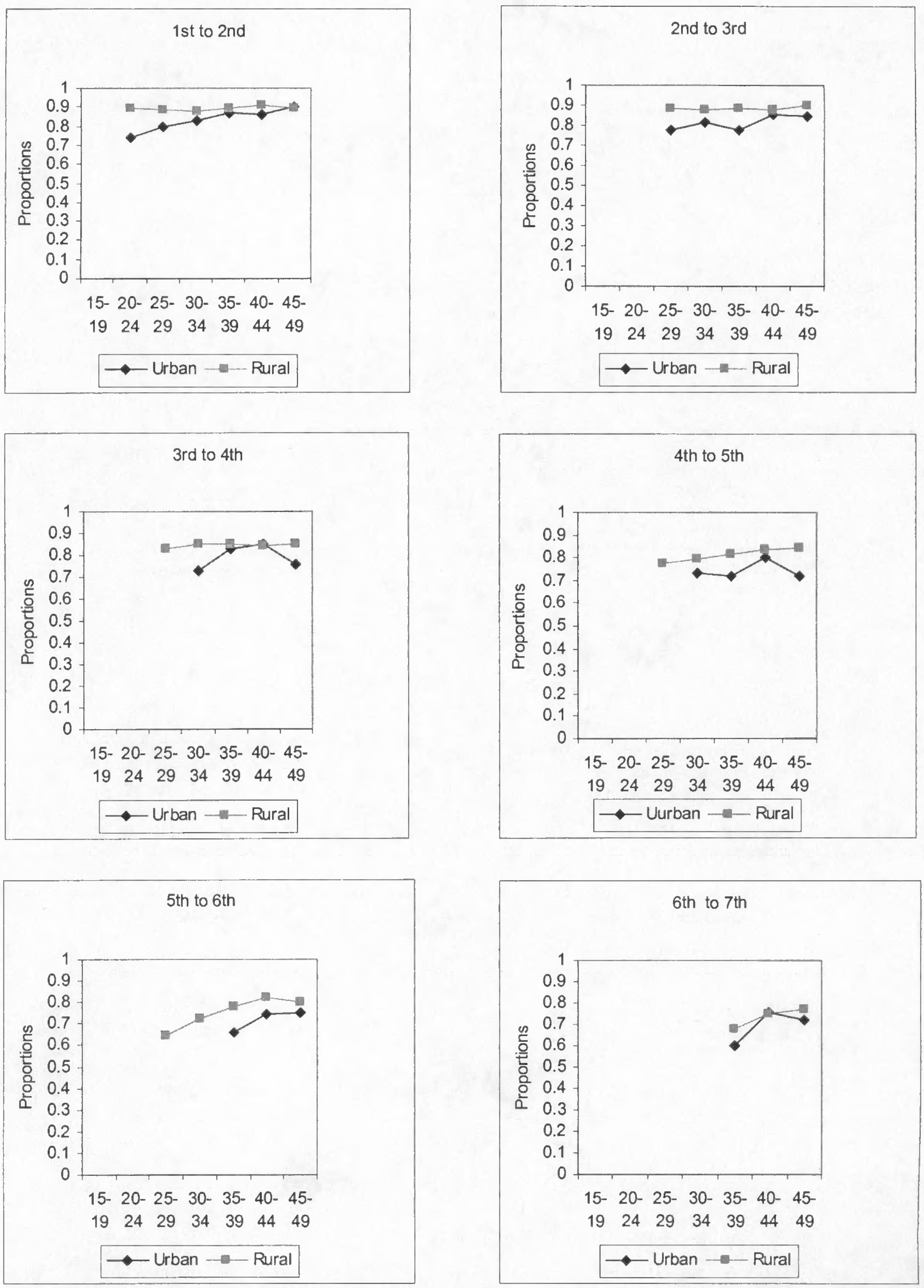
2000 Rural			**Parity progression**			
Age group	1-2	2-3	3-4	4-5	5-6	6-7
20-24	0.892	0.882	0.691	0.428	0.135	
25-29	0.886	0.885	0.828	0.777	0.642	0.455
30-34	0.880	0.874	0.848	0.793	0.726	0.660
35-39	0.898	0.881	0.849	0.814	0.783	0.682
40-44	0.909	0.880	0.843	0.834	0.824	0.750
45-49	0.892	0.902	0.850	0.845	0.801	0.773
2000 Urban			**Parity progression**			
Age group	1-2	2-3	3-4	4-5	5-6	6-7
20-24	0.738					
25-29	0.793	0.780				
30-34	0.827	0.813	0.732	0.734		
35-39	0.872	0.777	0.832	0.720	0.660	0.599
40-44	0.859	0.857	0.848	0.800	0.743	0.757
45-49	0.904	0.850	0.759	0.717	0.755	0.719

Source: Own calculations from MDHS 2000

The results of the urban and rural B60 calculations show further evidence of fertility decline among the younger cohorts in urban areas in the 2000 survey. In Figure 4.11, trends of projected B60s for women in the rural residence are almost constant indicating decline in rural areas is yet to begin.

The analysis in this chapter shows the various measures of fertility derived from the application of different methods of cohort-period fertility rates, parity progression ratios and the B60s. For each of the procedures that has been applied, measurements of fertility have been compared between the two MDHSs of 1992 and 2000 with a further break down by age and place of residence. On the whole, results of 2000 data indicate falling fertility particularly in urban areas, which is supported by the B60s. For the 1992 data, the results show fertility decline at a slow pace with little evidence of a declining trend in projected B60s.

Figure 4.11 Rural and urban projected B60s for 2000 survey



Source: Own calculations from MDHS 2000

Chapter Five: Conclusion

5.1 The reality of fertility decline from different measures

All measurements of fertility which have been applied to the 1992, and 2000 MDHS in this thesis indicate that fertility in Malawi has been declining since the 1980s. However, each technique adds a particular piece of the puzzle, explaining the levels and trends of the decline. It has been argued with examples from various data sources and methodologies that fertility as measured by total fertility rate has been declining between the two survey periods as well as possibly prior to the 1992 survey. Measures in the MDHSs, have fallen from 6.73 to 6.35 children per woman between 1990 and 2000. This represents a fertility decline of six percent over an eight year period. In the earlier years estimates of TFR had shown roughly constant fertility trends with only a negligible decline. The magnitude and nature of fertility decline cannot be assessed in detail by applying only conventional measures.

One of the key questions examined in this project, the dependability of the estimates and the confirmed onset of fertility decline, was addressed by calculating cohort-period fertility rates. The decline in the TFR was confirmed in the trends of cohort-period rates from 2000 survey but could not be easily established in the 1992 survey results. But still it was observed that fertility decline must have started about ten years before the 1992 survey. The results presented in the thesis, were focused on the data from the 1992 and 2000 MDHSs but with supporting literature and analysis from earlier decades.

A comparison of results between the 1992 and 2000 projected parity progression ratios show evidence of declining proportions of women, particularly in the age groups 35-39 and 40-44, who proceed to have births of higher parities. One of the contributions of using the projected parity progression ratio is that the effect of bias due to selectivity is removed. Beyond that, Projected B60s lead to an overall picture of family formation that significant changes towards smaller family sizes are visible at young to middle age groups of women. The derived projected median birth intervals also support falling fertility as they have lengthened.

5.2 Patterns of family formation under declining fertility

The results of B60s for 2000 survey have confirmed the decline in fertility through lower proportion of women, by age groups, who proceed to the next birth of higher order, within the five year period than observed in the 1992 survey. The decline among the young cohorts, for the 2000 MDHS is clearly seen when the analysis is subdivided into rural and urban residence. Proportions of women of urban residence who proceed to a next birth are lower than their counterparts in rural areas, which indicate that the trend in fertility decline varies by such factors within the country. The projected median birth intervals for 2000 were in general at longer months than for 1992 survey which is also in support of declining preference for higher parities.

As argued by Garenne and Joseph (2002), efforts in respect of fertility regulation should not only focus on the fall in fertility as portrayed by the TFR but also the pace and patterns of the decline have to be explained. Their observation is supported by this thesis in the differences in preferences for different family sizes between young and older cohorts and indeed the differences in fertility between rural and urban women. It can also be shown that although the whole county's picture is that of low preference for higher parities and onset of fertility decline in the early 1980s, projected B60s of rural women in 2000 MDHS are almost constant implying that there is delayed fertility decline for rural based women. A delay that is much slower than was indicated by Garenne and Joseph (2002) so that fertility in rural areas should be expected to lag behind but follow a downward trend from as early as two years after the urban one.

5.3 Limitations of the Study

Use of secondary data, from the two surveys of 1992 and 2000, has some limitations. In the first place, the questionnaires are well known for their length with a lot of variables. Conceptualization and classification of key variables of direct reference to birth histories can be complex and time consuming. Second, existing literature on the subject matter of fertility decline in Malawi could not be easily retrieved (electronically) or obtained from the authors. The 1982 MDHS and the 1984 Family formation Survey could not be accessed from the libraries in South Africa and were not readily available at the Central Statistics Office in Malawi. The scope of study has been limited in ascertaining the direction of fertility change as measured in the two recent surveys from which the tools used to collect data are quantitative in nature. The thesis does not go beyond the discussion of quantified trends in fertility in order to find explanations of qualitative information on the established changes in fertility estimates.

5.4 Future considerations

The TFR as conventional measure assist in observing trends and patterns of fertility in a given population like Malawi where there are indications of fertility decline. Such measurements should be supported by appropriate application of indirect techniques to fertility data sets with the purpose of expanding the understanding of trends and patterns. For future trends in fertility, there is a potential for further declining trends as evidenced from lower proportions of B60s at younger cohorts, and particularly since the urban population is likely to grow. Measurements of fertility in disaggregated form (by age groups and residence) as applied through the indirect techniques in this thesis will assist in targeting of programme interventions and for related population, gender and socio-economic policy formulations. It is recommended that similar research on family formation, trends and regional comparison of fertility in Malawi should be undertaken.

Application of similar techniques such as the B60s should be employed in future MDHSs with particular attention to rural and urban differentials.

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Appendix 1: Sample of Computed Life Table for untruacted B60s (2000 MDHS, when parity is equal to 4)

Interval		Unadjusted Beginning Total	Deaths	B60s for Lost	maternity experience of 4th to 5th child for mothers aged 30-34 Survival	N*x	npx	nqx	lx
30-34									1.0000
0	2	1,117,530,368	0	8,688,064	1.0000	1,113,186,336	1.0000	0.0000	1.0000
2	4	1,108,842,240	0	6,642,168	1.0000	1,105,521,156	1.0000	0.0000	1.0000
4	6	1,102,200,064	0	7,786,742	1.0000	1,098,306,693	1.0000	0.0000	1.0000
6	8	1,094,413,312	0	8,922,182	1.0000	1,089,952,221	1.0000	0.0000	1.0000
8	10	1,085,491,072	2,989,519	14,397,401	0.9972	1,078,292,372	0.9972	0.0028	0.9972
10	12	1,068,104,128	4,875,249	9,261,472	0.9927	1,063,473,392	0.9954	0.0046	0.9927
12	14	1,053,967,424	12,395,650	8,468,860	0.9809	1,049,732,994	0.9882	0.0118	0.9809
14	16	1,033,102,912	17,884,332	10,962,192	0.9639	1,027,621,816	0.9826	0.0174	0.9639
16	18	1,004,256,384	21,345,920	12,710,236	0.9432	997,901,266	0.9786	0.0214	0.9432
18	20	970,200,256	26,367,870	14,370,898	0.9174	963,014,807	0.9726	0.0274	0.9174
20	22	929,461,504	42,048,388	8,195,936	0.8757	925,363,536	0.9546	0.0454	0.8757
22	24	879,217,152	40,422,364	10,327,576	0.8352	874,053,364	0.9538	0.0462	0.8352
24	26	828,467,200	55,753,124	17,776,900	0.7784	819,578,750	0.9320	0.0680	0.7784
26	28	754,937,152	62,199,696	16,559,336	0.7136	746,657,484	0.9167	0.0833	0.7136
28	30	676,178,112	52,667,088	12,849,808	0.6575	669,753,208	0.9214	0.0786	0.6575
30	32	610,661,248	43,127,524	22,290,628	0.6102	599,515,934	0.9281	0.0719	0.6102
32	34	545,243,072	40,208,364	11,934,940	0.5647	539,275,602	0.9254	0.0746	0.5647
34	36	493,099,776	47,002,240	13,045,728	0.5101	486,576,912	0.9034	0.0966	0.5101
36	38	433,051,808	50,528,476	5,836,956	0.4502	430,133,330	0.8825	0.1175	0.4502
38	40	376,686,368	33,185,210	6,711,150	0.4102	373,330,793	0.9111	0.0889	0.4102
40	42	336,790,016	29,302,332	8,640,188	0.3740	332,469,922	0.9119	0.0881	0.3740
42	44	298,847,488	29,717,752	8,630,248	0.3363	294,532,364	0.8991	0.1009	0.3363
44	46	260,499,488	29,950,660	8,764,728	0.2970	256,117,124	0.8831	0.1169	0.2970
46	48	221,784,096	19,802,516	7,403,776	0.2700	218,082,208	0.9092	0.0908	0.2700
48	50	194,577,808	15,489,079	0	0.2485	194,577,808	0.9204	0.0796	0.2485
50	52	179,088,736	15,847,293	4,495,575	0.2262	176,840,949	0.9104	0.0896	0.2262
52	54	158,745,872	11,305,916	1,703,191	0.2100	157,894,277	0.9284	0.0716	0.2100
54	56	145,736,768	15,864,512	5,223,912	0.1868	143,124,812	0.8892	0.1108	0.1868
56	58	124,648,344	10,483,066	4,883,320	0.1707	122,206,684	0.9142	0.0858	0.1707
58	60	109,281,960	3,919,713	3,779,022	0.1645	107,392,449	0.9635	0.0365	0.1645
60	62	101,583,224	13,181,508	3,344,173	0.1428	99,911,138	0.8681	0.1319	0.1428
62	64	85,057,544	2,669,736	755,452	0.1383	84,679,818	0.9685	0.0315	0.1383
64	66	81,632,352	4,478,099	4,112,241	0.1305	79,576,232	0.9437	0.0563	0.1305
66	68	73,042,016	4,449,390	1,216,839	0.1225	72,433,597	0.9386	0.0614	0.1225
68	70	67,375,784	2,614,733	4,518,565	0.1176	65,116,502	0.9598	0.0402	0.1176
70	72	60,242,488	3,993,906	3,652,080	0.1095	58,416,448	0.9316	0.0684	0.1095
72	74	52,596,504	2,084,568	847,913	0.1052	52,172,548	0.9600	0.0400	0.1052
74	76	49,664,024	3,398,735	3,233,521	0.0977	48,047,264	0.9293	0.0707	0.0977
76	78	43,031,768	1,230,665	2,777,351	0.0948	41,643,093	0.9704	0.0296	0.0948
78	80	39,023,752	747,522	1,993,136	0.0930	38,027,184	0.9803	0.0197	0.0930
80	82	36,283,096	747,522	2,521,235	0.0910	35,022,479	0.9787	0.0213	0.0910
82	84	33,014,340	1,344,817	2,433,038	0.0871	31,797,821	0.9577	0.0423	0.0871
84	86	29,236,484	1,693,597	2,836,250	0.0818	27,818,359	0.9391	0.0609	0.0818
86	88	24,706,636	1,467,196	753,697	0.0769	24,329,788	0.9397	0.0603	0.0769
88	90	22,485,744	1,224,129	0	0.0727	22,485,744	0.9456	0.0544	0.0727
90	92	21,261,616	0	2,119,395	0.0727	20,201,919	1.0000	0.0000	0.0727
94	96	19,142,220	755,452	3,219,872	0.0696	17,532,284	0.9569	0.0431	0.0696
96	98	15,166,896	1,172,703	0	0.0642	15,166,896	0.9227	0.0773	0.0642

98	100	13,994,193	0	1,210,553	0.0642	13,388,917	1.0000	0.0000	0.0642
102	104	12,783,640	0	1,467,196	0.0642	12,050,042	1.0000	0.0000	0.0642
108	110	11,316,444	0	2,126,559	0.0642	10,253,165	1.0000	0.0000	0.0642
110	112	9,189,885	0	4,137,310	0.0642	7,121,230	1.0000	0.0000	0.0642
112	114	5,052,575	0	747,522	0.0642	4,678,814	1.0000	0.0000	0.0642
114	116	4,305,053	0	1,818,088	0.0642	3,396,009	1.0000	0.0000	0.0642
130	132	2,486,965	0	847,913	0.0642	2,063,009	1.0000	0.0000	0.0642
136	138	1,639,052	0	755,452	0.0642	1,261,326	1.0000	0.0000	0.0642
160	162	883,600	0	883,742	0.0642				1.0000