Birth Intervals and Reproductive Intentions in Eastern Africa: Insights from Urban Fertility Transitions

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Every Pregnant Woman ne...
- Respect
- Caring, Loving husband
- A Proud father
- Sex
- Understanding
- Sweet words
- Rest
- Counselling
- Health Care and health Knowledge
- A Clean, Safe Home
- A Community that cares
- Hope for the future
- A Way not to get Pregnant again too soon
- Know their HIV Status
- If you are HIV take Pills to Protect your baby from Infection.

Mural, Viwandani

Declaration

I, Catriona Towriss, confirm that the work presented in this thesis is my own. Where information has been derived from other sources, I confirm that this has been indicated in the thesis.

Abstract

This thesis examines the dynamics of fertility in Eastern Africa with a particular focus on urban women. Urbanisation has long been closely associated with demographic transition and the reproductive behaviour of urban women is thought to provide insights about the future fertility transition at the national level. A mixed methods approach is used to explore birth intervals, family building strategies and women's fertility intentions. The quantitative analysis uses Demographic and Health Survey data from Ethiopia, Kenya, Tanzania and Zimbabwe, while the qualitative analysis uses data from focus group discussions that I conducted in two informal settlements of Nairobi, Kenya.

The analysis of birth intervals uses survival analysis to calculate interval-duration-specific fertility rates, median birth intervals and parity progression ratios. These are used to make inferences about fertility decision-making at the population level. Birth intervals are long and lengthening in all four countries, particularly among women who have used contraception and women with higher levels of education. Large differences exist in birth interval lengths between rural and urban women, even when the results are disaggregated by contraceptive use and educational status. Generally, lengthening birth intervals are being driven by increasing birth postponement and birth spacing, with postponement dominating among women with very long birth intervals. In Ethiopia, there is some evidence of parity-specific family size limitation.

The focus group discussions were analysed using a thematic approach. Urban living, particularly in the informal settlements, is characterised by high levels of social uncertainty, especially among new immigrants from rural areas. This is an important influence on women's relationships, which are found to be highly unstable. Fertility intentions are found to be fluid and contingent upon a variety of different factors in women's lives. As a result, women's decisions about birth spacing and family size are less distinct than demographic theory often assumes.

In sum, this thesis contributes to the body of research suggesting that long birth intervals and postponement are both important features of the fertility transition in Sub-Saharan Africa. These phenomenon are related to each other: social uncertainty leads to fluid fertility intentions, which, in turn cause the widespread postponement of births and lengthening birth intervals.

Table of contents

Chapter 3 Data and methods

RESULTS SECTION I: BIRTH INTERVALS

Chapter 4 Lengthening birth intervals

Chapter 5 Differential birth intervals

RESULTS SECTION II: REPRODUCTIVE INTENTIONS

Chapter 6 The urban environment, conjugal and family relationships

Chapter 7 Controlling childbearing

Chapter 8 Conclusions

List of tables

List of figures

11

Acronyms

AIDS	Acquired Immune Deficiency Syndrome
APHRC	Africa Population and Health Research Center
DHS	Demographic and Health Survey
DSA	Demographic Surveillance Area
ERC	Ethical Review Committee
FGD	Focus Group Discussion
HIV	Human Immunodeficiency Virus
KEMRI	Kenya Medical Research Institute
LARC	Long Acting Reversible Contraception
LSHTM	London School of Hygiene and Tropical Medicine
NCC	Nairobi City Council
NUHDSS	Nairobi Urban Health Demographic Surveillance Site
STI	Sexually Transmitted Infection
TFR	Total Fertility Rate
UN	United Nations
WFS	World Fertility Survey

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1   Introduction

1.1   The research question

This thesis aims to examine the fertility transition and the dynamics of reproduction in Eastern Africa, with a particular focus on urban areas.

Fertility decline continues to be the most debated aspect of demographic transition. In recent years there has been much renewed interest in the fertility decline in Sub-Saharan Africa. Significant falls in mortality have occurred, which, according to classical demographic transition theory should bring about fertility decline. However, the transition to low fertility on this continent has been slower than those observed in Asia and Latin America. Furthermore, in a number of populations, birth rates have been found to have stagnated in recent years (Bongaarts, 2006; Cleland et al., 2011; Ezeh et al., 2009; Kirk and Pillet, 1998; Shapiro and Gebreselassie, 2008) . This has stimulated much research into the specific nature of the decline and of reproductive behaviours in the region (Cleland, 2001; Bongaarts and Casterline, 2012; Tabutin and Schoumaker, 2004). However, national-level estimates have been shown to mask large differential declines in total fertility rates within urban areas (Shapiro and Tambashe, 2000). Urban populations in this study become the lens through which to examine the nature of fertility dynamics in the region, and will allow conclusions to be drawn about the fertility trends and reproductive behaviours which might be expected to diffuse out into rural populations in the future.

One growing focus of the literature on the fertility transition in Sub-Saharan Africa has been the phenomenon of lengthening birth intervals and how these relate to existing classifications of women's reproductive intentions and motivations for contraceptive use. Birth intervals in many populations, particularly in Southern Africa, have been found to be extremely long (six years in South Africa) and lengthening rapidly (Moultrie et al., 2012; Bongaarts and Casterline, 2012; Casterline et al., 2011). This cannot be accounted for by the existing fertility intentions framework, which classifies women's motives for avoiding pregnancy into two mutually exclusive categories of either birth spacing or birth limitation (Timæus and Moultrie, 2008). The first category, birth spacing, is usually conceptualised as the delaying of a pregnancy for reasons that are contingent on the age of a woman's youngest child. The secondary category, family limitation, is defined as the desire to halt childbearing altogether. At the population level, family limitation is identified by parity-specific declines in fertility. The typical definition is a 10 per cent decline in the total fertility rate (TFR) (Cleland et al., 1994). This phenomenon has come to be used to identify the onset of fertility transition in a population, and the potential role of other motives for fertility control has largely been neglected.

The concept of postponement has been proposed as a third family building strategy (Timæus and Moultrie, 2008). Postponers are defined as women who seek to avoid a pregnancy in the current

moment. This is conceptually different from birth spacing because it recognises that women may seek to delay conception for a number of reasons that are not necessarily contingent in the age of their youngest child. Postponement is thought to be the dominant family building strategy in Sub-Saharan African populations where birth intervals are very long. Its importance in the region is hypothesised to be linked to the long-standing emphasis on birth spacing among many traditional African societies, where prolonged periods of breastfeeding and post-partum abstinence were common (Timæus and Moultrie, 2008; Johnson-Hanks, 2007). Another explanation for this phenomenon is rooted in the nature of socio-cultural and institutional development, which is has resulted in high levels of social uncertainty in modern Sub-Saharan Africa (Moultrie and Timæus, 2013). Social uncertainty is anticipated to encourage women to engage in novel forms of social behaviour; emphasis is placed on maintaining possibilities rather than adopting closed strategies of action (Johnson-Hanks, 2005). These principles are applied to childbearing and reproduction, and it is argued that this explains the somewhat different nature of the fertility transition that is unfolding among many African populations.

Thus, the justification for this research lies in the need for an innovative approach to fertility transition in Sub-Saharan Africa. It attempts to speak to recent debates on the proposed differences of fertility decline on the continent compared with the declines observed in Asia and Latin America, to the rural/urban fertility differentials, to our critical understanding of reproductive intentions and birth postponement, and to the influence of social uncertainty. These debates raise important questions: are lengthening birth intervals a feature of fertility trends in Eastern Africa as well as Southern Africa? Are they more common among certain sub-populations of women? To what extent are birth spacing and family limitation also accounting for changes to birth rates in the region? Just how different are the dynamics of urban fertility compared to the dynamics of rural fertility? Does social uncertainty plays a greater role in fertility intentions in urban areas? The urban economy, and households within it, has rapidly been monetised bringing a transformation of traditional, rural-origin institutions. The diversity of urban areas, in combination with the erosion of traditional social structures, results in an environment of conflicting social values, attitudes and preferences (Agadjanian, 2006). This calls for an in-depth examination of reproductive decision-making in a major city within the region.

1.1.1 Objectives

Consistent with the research questions raised above, the goal of the present research is to explore birth interval lengthening in Eastern Africa, to understand how this phenomenon varies between rural and urban areas and to explore in-depth the reproductive decisions of a group of urban women.

Specifically, the three primary objectives of the study are:

1) To understand the extent to which lengthening birth intervals are a feature of fertility in Eastern Africa and to understand the family building strategies that might be driving these changes

2) To examine whether levels and trends in birth intervals and family building strategies vary between urban and rural areas

3) To explore the perspectives of a group of urban women on childbearing intentions and decisions, through an analysis of the nature of their conjugal and familial relationships, their views on the control of childbearing, and their perspectives on birth spacing and family size.

1.2   The Eastern African setting

This study focuses on Eastern Africa for two reasons. First, because fertility transition is well established in the region. Most countries in the region experienced a 10-50 per cent decline in fertility between 1960-64 and 2000-04, compared with West and Central Africa where a number of populations experienced an increase in fertility in the same time frame (Tabutin and Schoumaker, 2004). Since longer birth intervals are associated with (although not strongly correlated with) lower levels of fertility (Bongaarts and Casterline, 2012; Moultrie et al., 2012), it was necessary to carry out this study using data from populations that have witnessed a certain degree of fertility change. Second, the existing literature on birth interval lengthening has given particular focus to populations within Southern Africa; this study aims to contribute to this body of evidence through an examination of the phenomenon in Eastern Africa.

1.2.1   The selection of the countries for analysis

The first part of the study uses Demographic and Health Survey (DHS) data from Ethiopia, Kenya, Tanzania and Zimbabwe. These four countries were chosen on three grounds. First, because they represent a variety of different fertility regimes. Figure 1 shows that all four countries have differing levels of total fertility at most recent survey. Birth rates are lowest in Zimbabwe which has a TFR of 4.1 children per woman. At the opposite end of the spectrum is Tanzania, where the most recent estimate of TFR is 5.4 children per woman. The four countries also differ in the pace of their fertility decline: Kenya and Zimbabwe both represent a scenario of relatively rapid decline, both countries are identified as having witnessed some of the faster transitions in Sub-Saharan Africa (alongside South Africa, Botswana and Ghana) (Tabutin and Schoumaker, 2004). Ethiopia also appears to have witnessed a rapid decline between the last two surveys. In contrast, little change has occurred in Tanzania; the TFR only declined from 6.2 to 5.4 children per woman between the first and most recent survey.

Figure 1   Trends in Total Fertility (TFR) in Eastern Africa, by country
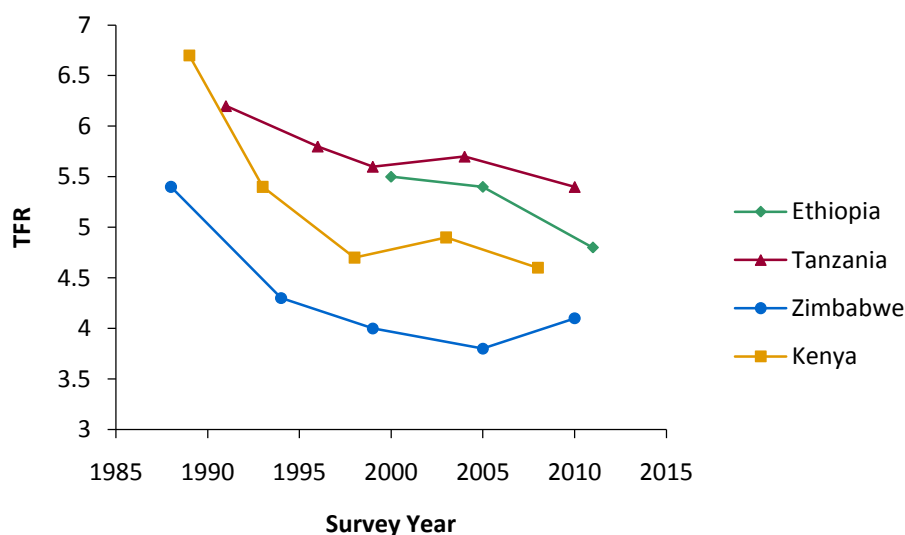
Source: Demographic and Health Survey data

The different levels and trends in fertility shown in Figure 1 are a result of differing social conditions and fertility-related practices within the region. Table 1 shows that considerable variations are observed in levels of contraceptive use and education between the four countries. Levels of contraceptive use are significantly higher in Zimbabwe and the country also represents the most educated of the four populations. Kenya follows in both of these indicators, although there remains a significant difference between the two populations. Levels of contraceptive use and education are lowest in Ethiopia by a long way. Lesser differences between the four countries are observed in terms of age at first sex, age at birth marriage and durations of exclusive breastfeeding, although it is worth noting that the median duration of exclusive breastfeeding in Kenya appears to be significantly lower than in the other three populations.

Table 1   Differences in fertility-related practices and social conditions, by country (at most recent survey)

		Ethiopia (2011)	Kenya (2008-9)	Tanzania (2010)	Zimbabwe (2010-11)
Percentage of women aged 15-49 using modern contraceptive methods		18.7	28.0	23.6	40.5
Median age at first sexual intercourse		16.6	18.2	17.4	18.9
Median age at first marriage		16.5	20.0	18.8	19.7
Median durations of exclusive breastfeeding		2.5	0.7	2.4	1.3
Percent distribution of women by highest level of education attended	No education	50.8	8.9	19.1	2.3
	Primary	38.0	56.8	64.6	28.0
	Secondary or higher	11.2	34.3	16.2	69.7

Source: Demographic and Health Survey data

The third reason for selection was that, despite the large differences in total fertility rates and fertility related practices, all four countries display large rural-urban fertility differentials. Figure 2 shows that differentials are greater than 1.5 children per woman in all four populations. The greatest difference is observed in Ethiopia, which measures 2.9 children per woman in the latest survey. This strikingly large differential has been shown not to merely be an artefact of data error (Kinfu, 2001). The smallest difference in the fertility between the two different types of residence is found in Zimbabwe (1.7 children per woman).

Figure 2   Trends in the Total Fertility (TFR) by country and residence
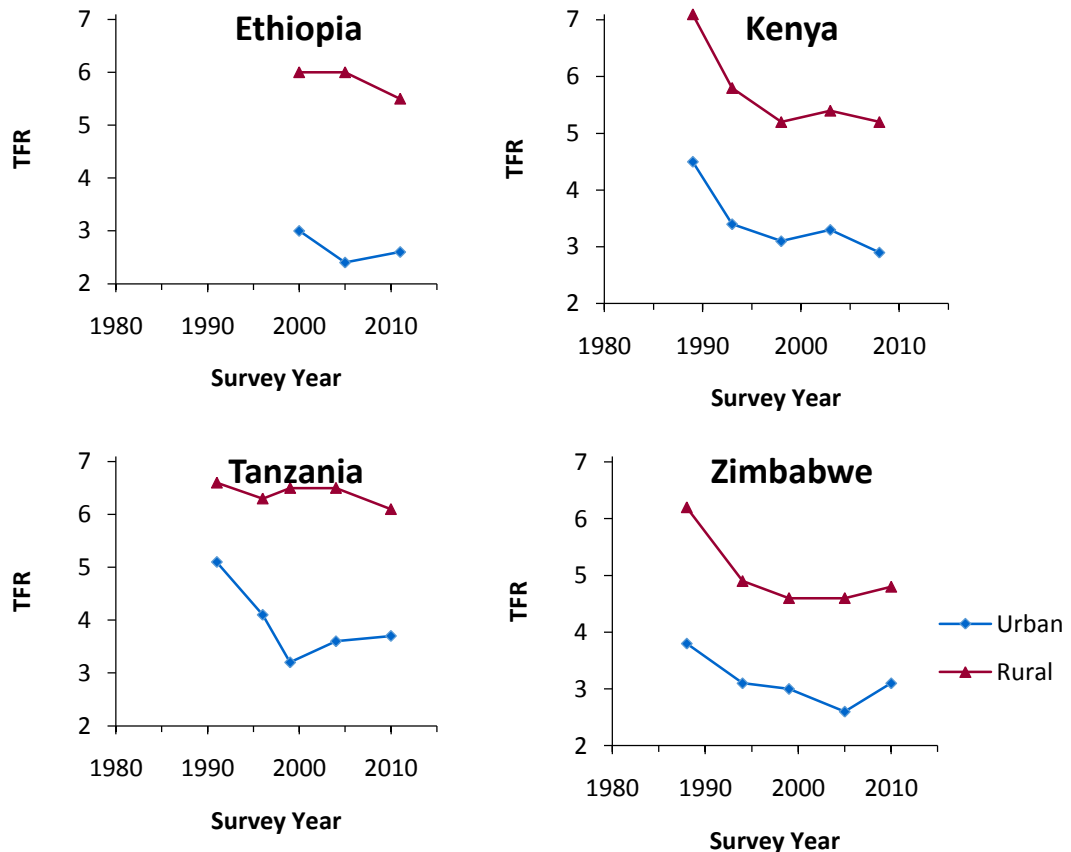
1.2.2 The informal settlements of Nairobi

The second component of this PhD uses self-collected data from focus group discussions (FGDs) held in Korogocho and Viwandani informal settlements in Nairobi, Kenya. These two settlements form the Nairobi Urban Health and Demographic Surveillance Site (NUHDSS), a Demographic Surveillance Area (DSA) run by the Africa Population and Health Research Center (APHRC). The DSA covers approximately 1 square kilometre of land in total, and the two settlements are located about 3 kilometres from each other. Since 2002, health, demographic and livelihood data have been collected from 60,000 people in both settlements every four months. The data from the NUHDSS were used to identify suitable women for participation in the study.

Nairobi was selected as a suitable location for this research because, apart from it being the largest city in the region, fertility decline has been well established in the city since the 1970s (Fotso et al.,

2011; Sinding, 1991). Since this research has a particular focus on the lengthening of birth intervals, and these changes have been shown to be associated with increased use of family planning, it was necessary to locate the study in a population where contraceptive use is high. Nairobi has some of the highest levels of family planning in Sub-Saharan Africa (Kenya DHS data shows prevalence to be 46.6% in 2008/09). In addition, these data show that use is high among the urban poor as well as the urban rich (42.8% and 44.9%, respectively) (Fotso et al., 2011).

Informal settlements are a very specific socio-economic environment. Thus, the results of this study will not be generalisable to the whole of Nairobi's population, particularly because the city is characterised by extreme socio-economic inequalities. However, an understanding of the fertility dynamics of populations of informal settlements is particularly important because such a large proportion of the Nairobi population lives in these circumstances (60% according to Alder (1995)). Indeed, two-thirds of the whole of Sub-Saharan Africa's urban population lives in informal settlements (APHRC, 2002a; UN-HABITAT, 2001, 2003; World Bank, 2000). As African populations continue to urbanise, informal settlements will play an important role in defining the national health profiles of countries (Ezeh et al., 2010).

A fuller contextualisation of Korogocho and Viwandani is provided prior to the results of the qualitative study in chapter 6.

1.3 Outline

Chapter 1 has provided an introduction to the research questions and the study setting. Chapter 2 discusses the literature that informs the research. It examines theory on demographic transition and fertility decline both in a general context and in relation to Sub-Saharan Africa. In relation to Sub-Saharan Africa, it discusses the existing evidence on the lengthening of birth intervals and relates this to the literature on fertility intentions. Finally it examines the state of knowledge on urban fertility. Chapter 3 outlines the data and methods used in this study. It gives a brief introduction to mixed methods in demographic enquiry and describes the nature of DHS data and its limitations. It then explains the regression model used in the analysis of birth intervals. This is followed by a description of the qualitative study, including the data collection and analytic procedures.

The results of this study are divided into two sections: section 1 consists of chapters 4 and 5 which both examine birth interval lengthening using DHS data. Chapter 4 examined trends in birth spacing and family building strategies at the national level and by three sub-populations: by parity, residence, contraceptive use and education level. This chapter gives an understanding of the extent to which lengthening birth intervals and postponement are a feature of fertility in Eastern Africa. Chapter 5 presents the results of the differential analysis of birth intervals by rural and urban residence. Similarly, it explores birth intervals and birth control motives by parity, contraceptive

use and education. This allows conclusions to be drawn on the nature of fertility change in urban areas relative to rural areas.

Section 2 consists of chapters 6 and 7, which analyse the fertility intentions and reproductive decision-making of women in Korogocho and Viwandani using the focus group data. Chapter 6 begins with an in-depth discussion of the study context. It then presents the findings on relationships and the family. Chapter 7 presents the results of the investigation into women's perspectives on the control of childbearing. This chapter is subdivided into two sections: first, it discusses the findings on desired family size; second, it presents the results on the timing of births.

The final chapter synthesises the key empirical results of the study, presents a broad discussion of these findings and reflects on the strengths and limitations of the mixed methods approach. It concludes with suggestions for further research and some policy implications.

2 Literature Review

2.1 The demographic transition theory and fertility decline

Demographic transition is an incredibly important process that has affected the whole of humankind (Dyson, 2011). Originally developed by Notestein (1945), Landry (1934), Thompson (1929) and Davis (1943) it describes the changes that populations have undergone and, in many cases, continue to undergo. It states that 'modernization' in societies brings about a decline in mortality and fertility rates from high levels in pre-modern regimes to levels that are low and steady in 'post-modern' regimes.

The theory of demographic transition describes the changes that occurred to populations in historical Europe from the 18th century onwards. The changes described are regarded as being a response to shifts in economy, culture and technological innovation. The transition is divided into four stages: during the first stage fertility is thought to be moderately high, and as a result, in the short term there is slow population growth, despite a relatively high level of mortality. However, in the long term this growth is cancelled out by epidemics of infectious diseases such as plague, cholera and typhoid. As a result, during the first stage of the transition population growth is negligible. During the second stage, mortality falls as epidemics are brought under control and their frequency reduces. As a result of this decline in death rates, there is large difference between the births and deaths occurring and population grows rapidly. During the third stage, fertility also begins to fall as couples begin voluntarily to have smaller families. As a result, population growth also begins to slow. In the final stage of transition, birth and death rates have both dropped to low levels and are roughly in line with one another. At this point, growth is once again minimal, although the total population is much larger than was found in stage one. Population structure is also hypothesised to remain constant by stage four of the transition. Although the demographic transition theory is rooted in observations of European history, dramatic falls in both mortality and fertility have been observed among populations in every region of the world.

Perhaps the most debated aspect of this model is stage three: the phase of transition from high fertility to low fertility. It is this body of literature that forms the backdrop to this PhD. In the most well-known account of the model, Notestein (1945) describes how birth rates declined with industrialisation and urbanization. He described how these two processes removed the role of the family as the primary unit of production, consumption, recreation and education. Young people became increasingly mobile and individualism rose. The economic contribution of children was reduced and formal education occurred externally to the family, both of which were hypothesised to increase the costs of childbearing. In this formulation of the model, the role of falling mortality was also discussed and was thought to reduce the incentive to have large numbers of children.

Finally, Notestein also highlighted the role of the new economic roles for women which he hypothesised as being incompatible with childrearing. In these early formulations of the theory, little discussion was given to the role of contraception. Contraception was hypothesised to be the means of achieving the observed reductions in fertility, but its use was seen as being a response to changes in desired family sizes that were brought about by the socio-economic changes outlined above. Indeed, the fertility transition that occurred prior to 1945 did so despite poor contraceptive methods and heavy reliance on the withdrawal method.

The theory has continued to be debated and developed by demographers and economists alike. The European Fertility project, which examined demographic data from nineteenth and early twentieth century Europe, has made one of the most important contributions to our understanding of fertility transition. The project made three conclusions about the conditions necessary for a decline in birth rates: (i) fertility must be within the calculus of conscious choice, (ii) effective techniques must be known and accessible; and (iii) decreased fertility must be seen to be an advantage (Coale, 1973).

2.1.1   Socio-economic drivers of decline

With regards to the causes of fertility decline, two strands of elaboration and critique of the original formations of the model have emerged: the socio-economic literature and the socio-cultural. The early accounts of the transition theory outlined in the previous section focused on the socio-economic changes that explained the decline in fertility. In particular, the term 'modernisation' was key; it was resulted in a change in the structure of households that is thought to make large numbers of children disadvantageous for couples. Thus, a reduction in fertility is regarded as a rational response to changing economic circumstances.

In comparison to the original emphasis on macro-level changes, in particular urbanisation and industrialisation, much of the more recent work on this aspect of the transition has focused on the household level. Commonly known as the 'Chicago School' approach, this work argued that the basic driver of fertility decline was a reduced *demand* for children, determined by income, prices and tastes (Kirk, 1996). Of particular relevance to this research is the 'new home economics' work by Becker (1981), who write about the child quality-child quantity trade-off and the opportunity costs of childbearing. Parents are viewed as making decisions about their fertility according to their household resource constraints. According to this theory, households allocate their budgets not only for purchasing materials goods and services, but also for investing in children. Indeed, in this account the utility derived from children can be compared to that from other 'consumer goods'. As a result, parents are left with choices about the number of children they bear and the well-being of each child. The new home economics theory also has a specific interest in the idea of time as a commodity. In particular, the theory analyses how women divide their time between raising children and working outside of the home. The well-being of each child is improved by investing time and resources on the child, in particular in terms of their health and education. The more that

is invested in each child the higher its 'quality', since parents receive additional utility from that investment.

The new household economics explanation of fertility decline has been heavily criticised. In these early formulations, the theory failed to distinguish between the acquisition of a baby and, for example, the purchase of car. Consumer choice was conceptualised as being highly mechanistic. The influence of culture was largely ignored; assuming that fertility preferences are consistent across cultures. In any given society, cultural norms may delineate the kinds of behaviour that are subject to individual choice, and thus limit the areas within which rational action is sanctioned (Pollack and Watkins, 1993).

In an attempt to speak to some of these criticisms, Easterlin (1978) produced a theory that attempted to combine economic decision-making with the sociological and biological factors, as well as the cost of controlling births, which constrain demographic behaviour. While the strict macro-economic approach focussed solely on the demand side of childbearing, this framework takes into explicit consideration supply-side factors. In particular, Easterlin acknowledges factors affecting conception (frequency of intercourse, fertility regulation practices and the reproductive span of the household) and the role of infant mortality, which is expressed as a function of nutrition and health outcomes. However, despite this broader scope, the economic costs and benefits of children remain the central concern of this model. Thus, he does not escape the criticism that was levelled at his predecessors: like Becker (1981) before him, Easterlin's model does not sufficiently deal with the large differences in fertility levels in pre-modern societies. Nor does he adequately specify the socio-economic factors that explain the demand for children (Kirk, 1996).

Another important attempt to produce a theory that integrates economic, cultural and institutional approaches to fertility decline is Caldwell's (1976) intergenerational wealth flows theory. It is critical of the purely economic approach to fertility studies, arguing that fertility is always economically rational but the ends served by reproductive behaviours vary greatly between different societies. Caldwell (1976) argues that the underlying explanation for fertility decline lies in a change in the direction and magnitude of the flows of money, goods and resources (wealth) between older and younger generations. It is hypothesised that in pre-transition societies wealth flows upward from younger to older generations. This economic benefit of children is undermined increasing westernisation. It is emphasised that modernisation is not the primary causal factor, since many of the more recent declines in fertility have occurred in populations that have not witnessed significant economic development (for example, Bangladesh). Westernisation, defined as the transfer of ideas of progress, secularisation, mass education and mastery over the environment, serves to undermine the high demand for children. The family become nucleated and the locus of power over childbearing changes from extended family patriarchs to the conjugal couple. The nuclear family is more child-centred than the extended family; high child-investment strategies become the norm and smaller family sizes become the rational response.

While Caldwell's work is a noble attempt to synthesise a number of hugely different perspectives on fertility change, the model does not explain *why* western values take hold in countries such as Bangladesh. Perhaps more seriously, the theory is not easy to test. Indeed, one attempt to apply it did not produce any affirmative evidence of the theory (Dow et al 1994 cited in Kirk, 1996).

2.1.2 Socio-cultural drivers of decline

A second body of literature has emerged that engaged with the socio-cultural aspects of fertility decline. This work is critical of the socio-economic approach described in the previous section. Proponents of the socio-cultural approach argue that explanations for fertility decline must acknowledge the role of innovation and the acceptance and use of new ideas, technologies and behaviours (Cleland and Wilson, 1987).

Writing about fertility change in Europe, (Lesthaeghe, 1983) argues that the variation in fertility behaviour is due to cultural differences rather than economic factors. Although Lesthaeghe acknowledges the importance of a cost-benefit paradigm for fertility, he argues that it is in no way sufficient to explain transition. Economic prosperity is thought to bring about a new hierarchy of needs, in particular psychological, non-material needs. As a result of this shift, there is a rise in secularism, materialism and individualism. It is hypothesised that previous demographic regimes of high fertility were maintained by communal and familial authority, but with the rise of individualism reproduction enters the domain of economic rationality. Thus, the moral and ethical acceptability of fertility control rests not only on socio-economic development but, crucially, also on broader ideological change.

Related to the role of culture is the concept of diffusion, which is thought to explain the rapid adoption of fertility control across historical Europe. Despite conceptual ambiguity, diffusion has received widespread attention in the search for the causal mechanisms of fertility decline (Kirk, 1996). It is thought to explain the changes in reproductive behaviour that were more rapid than the pace of economic development. It has often been observed that there is swift adoption of fertility control practices within culturally or linguistically similar areas. Thus, diffusion follows existing lines of communication between friends, family members, neighbours and at the larger scale between members of groups with communal language and culture. The work of the European Fertility Project highlighted the central importance of cultural boundaries in shaping regional dynamics of fertility change. For example, in Belgium, fertility decline occurred earlier and more rapidly among French speaking communities as compared with socio-economically similar Flemish communities. Indeed, the time difference between the onset of transition between the two communities was often found to be several decades (Lesthaeghe, 1978). Likewise, in more recent transitions in low-income countries reproductive change commonly follows cultural boundaries, as defined by religion, language or region (Cleland and Wilson, 1987).

Importantly for this thesis, the role of diffusion has important implications for our understanding of fertility differentials. Fertility differentials are often treated as an indication of the causal role of

economic factors in the transition. It is thought that socio-economic differentials often emerge during the early stages of transition and then disappear as the fertility decline moves into the later stages. This has been found to be the case in historical Europe, and also, more recently in South East Asia where the initital stages of the decline occurred among the urban and highly educated, leading to large differentials, which quickly dissipated as other women also controlled their fertility. According to the classical model of fertility decline those groups that pioneer the use of birth control are thought to do so because it is economically advantageous (Cleland and Wilson, 1987). However, evidence gathered from the European fertility project shows that, following the adoption of contraception by the so-called 'social-leaders', those hypothesised to find family limitation economically disadvantageous also adopt contraception (Coale and Watkins, 1986).

The role of mortality decline

In a recent attempt to reengage with apparently disparate explanations of the fertility transition, Cleland (2001) argues that falling mortality is the underlying mechanism for the decline. Indeed, his argument represents a return to those outlined in earliest versions of the demographic transition theory. In particular, it speaks to the account by Davis (1963), who stated that adjustments to fertility were a response to lower mortality rates, in particular, improved child survival. A recognition of the central role of improvements of survival facilitates an integration of both the socio-economic and sociocultural approaches to fertility decline. The main route through which mortality decline effects reproductive change is through household economics. In an environment of poor survival chances, high fertility is advantageous for a family. However, as survival improves these advantages are removed and household resources become strained. In turn, this strain forces innovative reproductive behaviour, such as the adoption of contraception or abortion. Cleland (2001) argued that falling mortality and improvements in child survival explains the emergence of unwanted childbearing and unmet need for contraception in low income countries in the 1950s and 1960s. Declining fertility, in response to falling mortality, is also thought to be accelerated by increasing levels of education. The costs of childrearing are raised by schooling. Furthermore, educated populations are more responsive to social change and are thus more likely to adopt innovative behaviours. In this assessment, the diffusion of fertility control is regarded as the 'lubricant' of fertility decline, since the timing and speed of many transitions has been hugely influenced by reactions to innovative behaviour.

Despite these numerous criticisms and debates of its original formulation, the demographic transition model remains the most important theory available for those who wish to study population change. Both the socio-economic and socio-cultural arguments outlined above will be considered in this study.

2.2 Demographic transition in Sub-Saharan Africa

Sub-Saharan Africa has come to be regarded as a demographic outlier; the continent displays the most rapid population growth in the world as a result of its high mortality and fertility rates. This

situation is largely regarded as being a result of the continent's economic and social disadvantage relative to other regions of the world.

Until the twentieth century population growth in Sub-Saharan Africa remained slow. Indeed, between 1880 and 1920 growth stagnated and in some cases declined, due to forced labour, the introduction of foreign pathogens and widespread population displacement associated with colonisation. In contrast to other low income regions, where population growth began to slow in the last five decades of the twentieth century, Sub-Saharan Africa witnessed a period of very rapid growth. Since the 1990s this trend has decelerated, but at very divergent rates (Tabutin and Schoumaker, 2004). As a result of this continued (albeit slower) growth, population is projected continue to increase at least until the middle of this century. The United Nations (UN) currently estimates growth at 2.65 per cent per year. Thus, the population of Sub-Saharan Africa is projected to grow from 0.83 billion in 2010 to 2.07 billion to 2050 (UN 2012a).

2.2.1 Four profiles of transition

There is no doubt that demographic transition has begun on the continent, with initial mortality decline beginning in the 1950s. However, regional-level estimates mask considerable variation between countries. Tabutin and Schoumaker (2004) identify four profiles of transition. The traditional pattern, exemplified by Mali, is found in the poorest countries. Among these populations mortality has declined but fertility continues to be very high. The classic pattern of change is found in countries such as Ghana, where there has been a steady decline in mortality over the last fifty years and fertility has also been falling for twenty years. The AIDS-perturbed pattern is found in Southern Africa and among some Eastern African nations. Fertility and mortality were declining consistently until 1990, when the transition was interrupted by a significant rise in death rates. Finally, a war-perturbed pattern is identified: conflict and associated the associated rise in poverty and AIDS brings about a sharp increase in mortality rates.

2.2.2 Mortality decline

Sub-Saharan Africa witnessed significant declines in mortality during the 1960s through till the 1980s, with average annual life expectancy gains of 0.3 life-years per annum (Tabutin and Schoumaker, 2004). However, this progress was considerably slower that that observed in other low-income regions: even the most rapid declines in Southern African countries were considerably slower than those that were occurring elsewhere in the world. As described in the previous paragraph, the 1990s witnessed a slowdown and often reversal in mortality decline. Between 1990-1994 and 2000-2004 life expectancy stalled at fifty years in West Africa, fell by three years in Eastern and Central Africa and declined by fifteen years in Southern Africa. This was unprecedented in the world. Several factors explain this trend. AIDS is a major cause of these reversals in a number of countries. Sub-Saharan Africa is the continent most severely affected by the epidemic, which emerging in the 1980s and spreading rapidly in some countries in the 1990s. Second, there was a rise in infectious diseases (for example, tuberculosis) at least partly caused by

economic recession and structural adjustment programmes that disrupted health service provision. Third, the direct and indirect effects of wars, protracted civil conflict and, in the case of Rwanda, genocide had severe negative effects on survival rates. Specifically, maternal mortality rates are very high across the continent. And while huge progress has been made in child mortality since the 1950s, Sub-Saharan Africa still shows consistently poor indictors for all aspects of child health, including mortality rates, ante- and post-natal visits, nutrition and immunization. Furthermore, in recent years there have been some stagnation and reversals of this progress (Tabutin and Schoumaker, 2004). This is hypothesised to have important implications for fertility decline in the region.

2.3   The fertility transition

2.3.1   The onset of decline

It is thought that fertility in the majority of Sub-Saharan African countries began declining in the 1970s and 1980s (Garenne and Joseph, 2002; Kirk and Pillet, 1998; Caldwell and Caldwell, 2002; Cohen, 1993; Cleland et al., 1994; Caldwell et al., 1992; Cleland, 2001; Garenne, 2008). The decline usually began about a decade earlier in urban areas than rural areas. Of relevance to this thesis, Garenne and Joseph (2002) find that Kenya was one of the first countries to enter the transition: fertility began to decline during the 1960s in urban areas, and during the 1970s in rural areas. In contrast the urban transition began during the 1970s in Tanzania and Zimbabwe, spreading to rural areas in 1977 in Tanzania and 1984 in Zimbabwe. (The authors did not include Ethiopia in their investigation). During the early stages of the transition onset many commentators described the patterns of decline similar to those observed in other low-income regions. The greatest declines were found among urban and educated women who were living in areas of low child mortality. In addition, those countries that had witnessed the biggest changes to fertility had the strongest family planning programmes and policies (Kirk and Pillet, 1998; Garenne, 2008; Garenne and Joseph, 2002).

Prior to the transition, fertility rates across the continent were relatively homogenous, estimated to be 6.7 children per woman (Tabutin and Schoumaker, 2004). By 2000-2004 the average fertility rate had fallen to 5.7 children per woman, and recent estimates put the continental average at 4.9 births per woman (UN, 2012a). However, this hides a huge, and growing, disparity in the progress of the transition between countries. Relatively fast declines have been witnessed in Southern Africa (specifically, South Africa, Zimbabwe and Botswana) and also in Kenya and Ghana. Conversely, very slow declines have been observed in twenty countries, where the decline has averaged one child per woman in thirty years. These slow transitions are mostly found in West and Central Africa (Cleland et al., 1994; Kirk and Pillet, 1998; Tabutin and Schoumaker, 2004). Thus, Sub-Saharan Africa's transition towards low fertility is heterogeneous, with total fertility rates varying

between 2.55 children per woman in South Africa and 7.8 children per woman in Niger (UN, 2012).

2.3.2 A stalling or a slow fertility decline

In recent years there has been much concern about the pace of fertility declines in Sub-Saharan Africa. In particular, there has been widespread discussion of stalling fertility transitions. A stall is defined as an interruption in the decline, where for a period no significant change in fertility is observed, before the country reaches replacement level fertility (Bongaarts, 2008). In 2006, Bongaarts found stalls in seven low-income countries, two of which were in Sub-Saharan Africa: Kenya and Ghana. In all seven of these countries fertility had fallen during the 1980's but this trend had stalled since the early 2000's. The average annual change to fertility in these seven countries was +0.03 births, whereas in the thirteen non-stalling mid-transition countries annual change was found to be -0.08 births (which averages out to a decline of approximately 1 birth per decade) (Bongaarts, 2006).   This was an unexpected trend since the experience other low-income country transitions had been that fertility declined consistently until it reached replacement level. Kenya had experienced a rapid decline from a TFR of 8.1 in 1977-78 to 4.7 in 1995-98. However, between 1995-98 and 2000-03, fertility stalled at 4.8 children per woman. This trend of stagnation was found among women of all age-groups (Westoff and Cross, 2006). Similarly, Ghana had experienced a uniquely fast fall in fertility. By 1988 TFR measured 6.43, falling further to 4.6 births in 1998. However, by 2003 very little further decline had occurred, and TFR stood at 4.4 (Agyei-Mensah, 2002).

Following this, fertility stalls were identified in a host of African countries. In addition to Kenya and Ghana, Garenne (2008) identified stalls in Nigeria, Rwanda, Tanzania and Madagascar. These countries were found to be at various stages of the transition: with TFR ranging from 4.5 to 6.5 children per woman and between 16 and 37 years after the onset of decline. Likewise, Shapiro and Gebreselassie (2008), added Cameroon to Kenya and Ghana as a group of countries that were experiencing stalls mid-way through transition and Guinea, Mozambique and Senegal to the group of countries where fertility decline was stalling during the early stages of transition. This phenomenon was largely thought to be a distinctive feature of fertility transition in the region. In a study using Demographic and Health Survey (DHS) data from a number of regions, approximately two-thirds of Sub-Saharan African countries were found to be experiencing fertility stalls, compared with one country in the Latin America region and one country in the North Africa/Asia region Bongaarts (2008).

A variety of explanations for this phenomenon have been given, and will be discussed in depth in the following two sections. But in brief, stalls have been linked to changes in the proximate determinants of fertility, lack of improvement in socio-economic indicators such as education, economic growth and child mortality, and the impact of HIV/AIDS. Fertility stalls had important bearings on the theoretic understanding of demographic transition, and also serious implications

for population policy. It had been widely suggested that these stalls in fertility decline were linked to the reallocation of donor money from family planning programmes to HIV/AIDS programmes (Agyei-Mensah, 2007; Gillespie et al., 2007 cited in Schoumaker, 2008). However, in an important study in 2008, Schoumaker concluded that most of the stalls in Sub-Saharan Africa are spurious, and their widespread identification was a result of poor quality birth history data (Schoumaker, 2008). Specifically, underestimations of recent fertility were found to be larger in the next-to-last survey than the last survey, which led to apparent increases in fertility. In other cases this underestimation was shown to be large in several surveys, leading to the conclusion that these countries are actually pre-transitional. Kenya was the only exception: the reconstruction of fertility trends showed that fertility transition has indeed slowed since the mid-1990s (Schoumaker, 2008). Thus, the pervasive nature of fertility stalls has largely been dismissed. However, what remains clear is that fertility transition in Sub-Saharan Africa has slowed since the turn of the century. The reasons for this will now be explored.

The role of socio-economic development

Much of the work that has analysed the reasons for the slow progress of fertility transition in Sub-Saharan Africa has focussed on the socio-economic circumstances of the region. Slow macro-economic growth has been cited as a reason by a number of authors (Bongaarts, 2008; Agyei-Mensah, 2007). During the 1990's most world economies were growing, while in Sub-Saharan Africa the overwhelming trend was a decline in economic growth. However, as argued in section 2.1.1, the relationship between fertility and economic growth is not straightforward. Indeed, a higher growth rate in GDP per capita was found to be associated with smaller declines in fertility in a large number of African populations (Shapiro and Gebreselassie, 2008).

In line with classical demographic transition theory, the slow pace of fertility decline in Sub-Saharan Africa has been linked to low levels of urbanisation (Kirk and Pillet 1998). However, as Garenne (2008) reminds us, the role of urbanisation in fertility transition is complex. Rather than being directly related to fertility change, urbanisation is a structural factor associated with other fertility-inhibiting factors, such a rapid social change, higher levels of education and household income. Moreover, the rapid initial decline in Kenya occurred despite the population being very rural. On the other hand, the stall in urbanisation in South Africa between 1960 and 1994 did slow the decline of fertility.

The low level of education in the region has also been emphasised. In Eastern Africa, slow declines were found to be positively correlated with the proportion of people in education, in particular in regions with a reduction in the proportion of women with secondary or higher education. However, it has been argued that education plays a different role in cross sectional studies than in longitudinal studies. Modern education is associated with fertility differentials but not fertility trends (Garenne, 2008). Furthermore, fertility decline can occur in areas with low education and no

minimum threshold exists for the onset of transition, as has been shown in historical Europe (Knodel and van de Walle, 1978 cited in Garenne, 2008).

High levels of under-five mortality on the continent have also been almost unanimously cited as a possible cause of slow transition to low fertility (Shapiro and Gebreselassie, 2008; Westoff and Cross, 2006; Garenne, 2008; Bongaarts, 2008; Agyei-Mensah, 2007). Specifically this has been linked to the rise in AIDS-related deaths and falling life expectancy (Moultrie et al., 2008; Westoff and Cross, 2006). Indeed falling child mortality was hypothesised as being the core driver of fertility decline in Davis's (1943) account of the transition. As discussed previously, Cleland (2001) has refocused attention upon the role of this phenomenon, arguing that mortality decline has been the common underlying cause of falling birth-rates in low-income countries. He argues that mortality decline facilitates fertility transition through increasing the costs of raising what are 'abnormally' large numbers of surviving children. He also argued that mortality decline is strongly linked to the process of diffusion, as shall be discussed in the following section. Thus, it seems highly probable that continuing high mortality is playing an important role in the slow fall of fertility in Sub-Saharan Africa. Regrettably, as Cleland argues himself, this is not directly measurable, since there are so many mediating factors that serve to conceal any dose-response relationship between mortality and fertility rates.

Contraceptive use and fertility preferences

Since the 1980's there has been a substantial increase in the uptake of contraception in Sub-Saharan Africa. However, in the majority of countries, widespread use of family planning is still restricted to large cities and the most educated and privileged. In Nairobi and Addis Ababa, contraceptive prevalence exceeds 35 per cent. Even in West Africa, where fertility is still high, large cities have sizeable proportions of women using family planning. In Ouagadougou and Dakar contraceptive prevalence is approximately 25 per cent. Similarly, across the continent, between 30 and 50 per cent of the most educated couples are using a form of contraception (Tabutin and Schoumaker, 2004). And yet it remains true that, with the exception of a handful of countries, the 'contraception revolution' has still not occurred in the region. And while the DHS has shown that women's knowledge of contraception is high (80-90 per cent of married female respondents are able to name at least one method of family planning), the demand for children remains high and service provision is poor (Tabutin and Schoumaker, 2004).

The persistence of high fertility preferences in the region has led to a debate about the exceptionality of households and conjugal relationships in Sub-Saharan Africa. High fertility has been regarded as a product of the unique social structure and customs surrounding childbearing and family formation in Sub-Saharan Africa. It has been argued that a close relationship exists between the organisation of societies and the nature of the production system and that the production, and thus reproduction, systems of Sub-Saharan Africa are different to those of Eurasia (Goody, 1976). The low intensity, hoe-based agricultural system of traditional societies in Sub-

Saharan Africa is thought to have supported a particular household and economic structure. In contrast to Eurasia, extended families were large and polgyny, divorce and child fostering were common since pressure to keep resources within families was low. It was argued that the key to variations in kinship organisation lay in the inheritance system which transmits property between generations. While the Eurasian societies were based on lineal or vertical inheritance, in much of Sub-Saharan Africa inheritance was lateral and lineages formed corporate groups. Goody (1962) further argued that this link between generations was manifested in the system of ancestral worship.

Similarly, Caldwell and Caldwell (1987) viewed the high fertility of Sub-Saharan Africa within the context of the active belief system that emphasised ancestry and lineage. Societies were centred on reproduction and were pronatalist. This was hypothesised to impact upon fertility through both cultural and economic pathways. Culturally, large numbers of children were regarded as desirable and morally correct, and controlled (or indeed failed) fertility was seen as morally wrong. Economically, this pronatalist system was seen as providing support to the upward flow of wealth from children to their parents. The weaker conjugal ties that characterise polygamous societies are thought to weaken the association between reproductive decision-making and the costs associated with childbearing. Men were hypothesised to not feel the full burden of high fertility and women were thought to be so dependent on their offspring that they had good reason to have many. Thus, Caldwell and Caldwell (1987) argued that the increasing economic burden of large families does not instigate a demand for lower fertility in Sub-Saharan Africa.

Caldwell and Caldwell's (1987) line of argument falls short on two counts: first, the system of lineage and ancestral worship was not unique to Sub-Saharan Africa. China, for example has a similar tradition of reverence for ancestors and lineage. Indeed, the repugnance of deliberate fertility control is found in many cultures throughout the world. It should not be forgotten that deliberate birth control was regarded as abhorrent in parts of 19th Century Europe. It was regarded as an invitation to promiscuity, a threat to national vitality and to individual health by medical professionals, the Church and politicians (Cleland, 2001). And while large desired family sizes are still the norm throughout the region, the number of wanted children has declined significantly in the last two decades (Tabutin and Schoumaker, 2004). Furthermore, in comparison to Latin America and South East Asia where there was a strong latent demand for contraception, the desire for small family size in Sub-Saharan Africa is a relatively recent development and has largely been progressing ahead of fertility decline (Kirk and Pillet, 1998).

That said, it is important to note that there are some unique features of contraceptive use dynamics in Sub-Saharan Africa. Firstly, the demand for contraceptive methods for birth spacing purposes is much higher than elsewhere in the world (Westoff, 2006). Thus, it has been argued that family planning services should prioritise the provision of reversible contraceptive methods in the region. In general, sterilisation (either male or female) is highly resisted (Chibalonza et al., 1989; Dwyer and Haws, 1990; Bertrand et al., 1989 cited in Agadjanian, 2006). Indeed, the relationship between

modern contraceptive use and fertility in Sub-Saharan Africa appears to be much weaker than in other regions of the world. Although there is a negative relationship between the two, contraception plays a variable and sometimes a minor role as a fertility regulator at the macro level (Tabutin and Schoumaker, 2004).

The role of family planning programmes must also be a consideration when understanding reproductive behaviour change and the slow transition to low fertility in Sub-Saharan Africa. As Bongaarts (2009) has argued, the 1990s witnessed a deceleration of fertility declines throughout the world, with Sub-Saharan Africa being particularly affected by this. A number of studies have shown that trends of increasing contraceptive prevalence have been reversed, or have slowed. For example, the slow fertility transition in Eastern Africa has been identified with a stagnation or sharp deceleration in trends of family planning use. In particular, the fall in contraceptive prevalence among young people was found to be associated with fertility stagnation (Ezeh et al., 2009). Similarly, in Kenya, Westoff (2006) found an increase in the contraceptive discontinuation rate between 1998-2003. A striking finding from both of these studies was the increase in the desired family size among young people and the growth in negative attitudes towards contraception (in Kenya specifically and East Africa more generally). In both cases, the authors argue that these unexpected changes are associated with weakened family planning programmes.

Indeed, there is some consensus among scholars that strong family planning programmes have a significant impact on fertility levels (Cleland et al., 2011, 2012). Between the late 1960s and the 1990s there was a huge increase in the number of countries that had official population policies, and an equally large growth in international funding for family planning programmes. During this period, dramatic fertility transitions were seen in Asia and Latin America, and decline started in Sub-Saharan Africa. However, since the 1990s the share of international development funding directed towards family planning programmes has fallen ten-fold (Van Dalen and Reuser, 2008 cited in Ezeh et al., 2009). Sub-Saharan Africa is thought to be particularly affected by this, since large amounts of funding previously targeted at family planning programmes has been reallocated to combat the spread of HIV/AIDS (Mayhew and Adjei, 2004). At a population level, this is thought to bring about increases in unmet need for contraception and unwanted childbearing, declining knowledge of family planning methods and rising negative attitudes towards contraception (Ezeh et al., 2009).

2.4   Birth intervals and fertility change

Despite the scepticism about the prospects of continued fertility decline, change is occurring in many populations across the continent. In addition to the large literature that examines declines in total family size (Garenne and Joseph, 2002; Kirk and Pillet, 1998; Caldwell and Caldwell, 2002; Cohen, 1993; Cleland et al., 1994; Caldwell et al., 1992; Cleland, 2001; Garenne, 2008), there is growing evidence of a more novel form of fertility change: the lengthening of birth intervals.

Before discussing this development, the history birth spacing in Sub-Saharan Africa is reviewed briefly.

2.4.1 Birth spacing

Birth spacing has a long history on the continent: studies from a number of populations have shown that short birth intervals are viewed as undesirable as it is believed that pregnancy and breastfeeding are harmful to women's health. In The Gambia, it is believed that women have limited sustenance to pass onto a child; thus, they are expected to space their births in order to maximise their physical strength, thereby ensuring that they can bear as many children as possible over their lifetime (Bledsoe et al., 1994). In Northern Nigeria and Tanzania these beliefs have been found to remain pervasive; women who bear their children in quick succession are thought to be unable to take proper care of themselves or their child (Wolf et al., 2008; Howard and Millard, 1997).

Traditionally, birth spacing in most African societies was controlled by three mechanisms: prolonged breastfeeding, postpartum abstinence and polygyny. Intensive breastfeeding has been shown to suppress ovulation, thus acting as a form of contraception (Santow, 1987). However, amenorrhoea does not usually last as long as breastfeeding, and in many sub-Saharan societies women were expected to abstain from sexual intercourse in the post-partum period (Lesthaeghe et al., 1981). In a survey of 51 traditional African communities, 29 were found to subscribe to this social norm (Murdock 1954 cited in Egbuonu et al. 2005), although the preferred period of abstinence varied greatly between societies (Lesthaeghe et al., 1981). Postpartum abstinence was traditionally encouraged by the belief that spermatozoa poison breast milk, and so premature sexual intercourse was thought to be morally wrong. In Nigeria, some women were separated from their partners in order to enforce post-partum abstinence (Caldwell and Caldwell, 1981). Polygyny is also more common in societies with long birth intervals. Two explanations of this phenomenon have been offered. First, in the context of prolonged abstinence, polygyny is theorised as emerging as a means of dealing with the issue of sexual deprivation for men. Second, polygyny and long birth intervals arise together as community elders control economic resources (land and cattle) and use them to secure the rights to female reproduction at the expense of younger men (Lesthaeghe et al., 1981).

Increasing urbanisation, cultural change and the use of contraception has loosened these traditional controls on birth intervals in many parts of Sub-Saharan Africa. It is thought that the mid-twentieth century witnessed declines in birth interval length in many populations (Lesthaeghe et al., 1981). For example in a number of societies in Tanzania, birth intervals were found to have declined between 1940 and 1970 (Walters, 2008). The intensity of suckling in parts of the continent is declining and levels of infant supplementary feeding have increased. As a result, the duration of lactational amenorrhea is declining, with the shortest periods being found in east and southern Africa (Ndugwa et al., 2011). This change has been accompanied by a decline in post-partum

abstinence, particularly in urban areas (Egbuonu et al., 2005; Ndugwa et al., 2011). Anthropologists have described how in Eastern Africa the post-partum period of abstinence was 'eroded from within' by *coitus interruptus* (Schoenmakers et al., 1981) Despite this, birth spacing continues to be an important feature of family building dynamics in Sub-Saharan Africa. Contraception is still often used for spacing rather than family limitation in the region (Westoff, 2006).

2.4.2 Lengthening birth intervals

Using analyses of duration-specific fertility to explore fertility transition in Sub-Saharan Africa is not new: Brass et al. (1997) calculated parity progression ratios by sixty months in order to examine the onset of transition in nine African countries. More recently, there has been a renewed interest in using calculations of duration-specific fertility to examine birth intervals at the national level across the continent. Increasing evidence exists that birth intervals are now lengthening in a large number of populations across Sub-Saharan Africa (Moultrie et al., 2010, 2012; Bongaarts and Casterline, 2012). It has been shown that, during the 1960s and 1970s, median birth intervals across the region stood between 27 and 33 months, which is to be expected of populations where lengthy periods of breastfeeding are the norm. Since then there has been a cross-continental trend of increasing intervals (with the Sahelian countries being an exception). The trend is most pronounced in Southern Africa and the largest increases have occurred in South Africa, where the median birth interval for women aged 25-29 is thought to have risen to six years by the late 1990s. In Namibia, Zimbabwe and Lesotho, intervals stand at approximately 45 months. However, this trend is not restricted to Southern Africa alone: in Ghana, the median birth interval has risen to 40 months. Moreover, lengthening intervals have been observed not only in countries where fertility decline is most established, but also to a lesser extent characterize countries with higher total fertility and lower contraceptive prevalence (Moultrie et al., 2012).

The importance of birth-spacing (as well as the hypothesized need to postpone marriage and childbearing, and the desire of women of all ages to take control of their reproductive lives) led Caldwell et al. (1992) to predict that fertility decline in Sub-Saharan Africa would occur among women of all age groups and parities, not just among older women with large families. This statement has encouraged much debate about the smaller role of parity in the African fertility transition and whether this means that the decline in this region is somewhat exceptional. The lengthening of birth intervals at a national level among a number of Sub-Saharan populations was not found to differ between women of parities 2 – 4 (Moultrie et al., 2012). Similarly, Johnson-Hanks (2007), finds that the shape of parity-specific inter-birth intervals among African women who have sought to limit their fertility do not significantly diverge from their counter-parts who have never sought to control their childbearing. Contributing to this debate from a different position, Bongaarts and Casterline (2012) argue that there is no evidence to suggest that Sub-Saharan Africa is experiencing a new type of transition in which declines in fertility in the early stages of transition are not due disproportionately to declining age-specific rates at older ages. Clearly, there is a need for more evidence in this debate.

2.5 A critical overview of the literature on fertility intentions

Understanding this phenomenon involves a critical engagement with the literature on fertility intentions. It has become the norm in demography to classify motivations for birth control into two, mutually exclusive categories: either 'limiting' (also referred to as 'stopping') or 'spacing' (Bongaarts, 2006). The popularisation of this dichotomous classification lies in the desires of the global health community to encourage women to use modern methods of contraception. In Sub-Saharan Africa, the promotion of modern contraception for family limitation purposes was seen as unlikely to succeed in a population where pronatalist values were strong. Instead, the use of family planning for birth spacing purposes was encouraged. This classification now dominates much of the literature on fertility intentions in low income countries.

Women who are limiting are those women who desire to halt childbearing altogether. This group of women are thought to have a target number of children that they wish to bear. Under this assumption, it becomes possible to detect limiting as parity-specific declines in fertility. It was this phenomenon that became the foundation for identification of the onset of fertility decline in historical European populations. The plausibility of this assumption grew in the late 1960's as evidence emerged from East and South East Asia and Latin America that fertility decline was being driven by a demand for contraception for family limitation purposes (Timæus and Moultrie, 2008). Spacers, on the other hand, are defined as those women who wish to bear another child (or children) but not at the present. Demographic analysis defines this group as women who wish to delay the birth of a child for factors that are contingent on the age of their youngest child. For example, a mother may wish to delay pregnancy until she stops breastfeeding or to avoid social disapproval as a result of being known to have had sex at short durations post-partum. Another reason may be to prevent an increase in her domestic workload that might result for having two young children of close ages, in particular to avoid having to carry two children without a pram (Timæus and Moultrie, 2008).

This dichotomy has come under much criticism in the wider literature on fertility intentions. In the case of the mainstream conceptualisation of family limitation, it is assumed that all women who wish to stop childbearing do so because they have reached their desired family size. But this decision may arise under a number of different circumstances. Women may not desire any further pregnancies for reasons related to her age, rather than her family size. For example, she believes herself to be too old to be able to bear a child safely, or she feels it is inappropriate for a grandmother to have more children (Bledsoe et al., 1998). Another case would be if a woman is divorced or widowed and is no longer exposed to conception (Timæus and Moultrie, 2008). Furthermore, the conflation of family limitation with the onset of fertility transition has been questioned: in Belgium is has been shown that lengthening birth intervals made an important contribution to the fall in birth rates (Alter, 2007). The definition of spacing has also been heavily

critiqued; it is clear that women may seek to space a birth for a number of reasons that are entirely independent of the age of her youngest child. Rather, she may be delaying a birth for reasons associated with her relationship status or because of her health (Ware, 1976).

In the 1980's the World Fertility Survey (WFS) data were used to show that women's fertility intentions cannot always be so clearly classified. Cleland and Rutstein (1986) argue that the desire to delay a birth and the desire to stop childbearing constitute a 'motivational continuum' rather than forming mutually exclusive categories. Similarly, Ryder (1985) described how women were found to start a birth interval wanting to prevent the next conception using family planning but that they may not have made a definitive decision about whether or not they want another child at some point in the unspecified future. Indeed, he argues that effective contraceptive use allows that decision to be reversed in response to her present circumstances. Presenting evidence on the same issue Lightbourne (1985) showed that in WFSs how even after birth intervals of greater than five years, many women reported not wanting to either to stop childbearing or space a birth but still reported desiring to delay their next. His suggested interpretation of this finding is that it is a reflection of 'a vague and weak desire to have additional children, coupled with a stronger motivation to avoid having one in the present' (Lightbourne, 1985:177).

The literature on the fertility intentions of women in high-income countries recognises the existence of this 'motivational continuum'. For example, (Berrington, 2004) found that a large number of women in the UK are postponing their initiation of childbearing into their late thirties, until only half of them were able to conceive. She uses the phrase 'perpetual postponers' for this group of women. However, the literature from low income populations has, at least in recent years, not engaged with this more nuanced conceptualisation of women's motivations for the use of birth control. The rigid classification of fertility intentions in the DHS questionnaires data sets has served to exaggerate this situation (Timæus and Moultrie 2008).

2.5.1 Postponement and fertility transition in Sub-Saharan Africa

In response to finding extremely long birth intervals in South Africa, and the inability of the existing mainstream conceptualisation of fertility control motivations to explain this phenomenon, Timæus and Moultrie (2008) proposed a third motive: postponement. Drawing on the literature discussed above, they define postponers as women whose 'intentions are to simply avoid any further pregnancy in the present'. They are distinct from birth spacers, as they are delaying pregnancy for reasons that are unrelated to the age of their youngest child. They differ from limiters since they are not preventing a conception for reasons that are associated with the size of their existing family. Indeed, such women may not have decided whether they want another child or not. Thus, Timæus and Moultrie argue that it is widespread postponement at the population level that accounts for the lengthening of birth intervals found among women of all ages and parities across Sub-Saharan Africa.

A large body of work from Sub-Saharan Africa suggests that a more nuanced approach to fertility intentions would give a more accurate representation of the dynamics of reproduction in the region. Bledsoe et al. (1994) and Johnson-Hanks (2007) have both argued that African women who seek to limit their fertility do so in very different ways from European women; often these women are found to be controlling their reproduction in ways that do not alter their total fertility. In particular, family size (i.e. parity-specific control) is not given the emphasis that was found to be the case in Europe, Asia and Latin America. Agadjanian's (2006) account of reproductive intentions in Maputo, Mozambique echo this finding. Here, he states that the sharp theoretical distinction between spacing and stopping is not reflected in the reality of women's lives; rather, he describes how women often desire to 'wait' before a conception. The phenomenon that Moultrie and Timæus describe as postponement is essentially that which Agadjanian describes as waiting.

Postponement is related to the uncertain nature of life in Sub-Saharan Africa. Johnson-Hanks (2005, 2007) describes how the rules of the game in Cameroon are in constant flux, which she argues results in a novel mode of social interaction. Juditious opportunism is "where instead of selecting a desired end and locating the most efficient means to achieve it, the actor remains open, flexible, and ready to jump at whatever surprising opportunity comes along" (Johnson-Hanks, 2007, p. 39). In other words, women need to act in such a way that allows them to keep their options open. In terms of reproductive intentions, this often means that women desire to be able to return to childbearing after a long break. However, this flexibility should not be interpreted as a lack of control: judicious opportunism requires women's deliberate effort in the organisation and administration of their reproductive careers. Similarly, in Ouagadougou, Burkina Faso, women were found to make reproductive decisions in a manner that reflects Johnson-Hanks's (2007) description of judicious opportunism. Women continue to desire many children, with the idea that at least one might help raise them out of poverty. On the other hand, they do not want more than they can afford (Rossier et al., 2013).

More recently, Moultrie and Timæus (2013) have related this uncertainty to the nature of institutions in the region. The modernisation of institutions – defined in the broader sense as rules and norms of behaviour that change and serve to both enable and constrain individual's action – in Sub-Saharan Africa has been weak. This is largely though to be a result of a contestation of power that has resulted from the nature of colonialism as it occurred in Africa. Prior to the intervention of imperial powers, institutions in Sub-Saharan Africa were characterised by lineage dominance (McNicoll, 1994). Colonialism "grafted" onto this system an administrative component run by urban, educated elites(Bayart, 1992). Thus much of the institutional weakness of the modern state in Sub-Saharan arises from the contestation between the two different sources of power. This is thought to lead to uncertainty in all aspects of life, including those relating to reproduction. For example, property rights, the quality of education, future employment prospects for one's children and the absence of social welfare systems (Moultrie and Timæus, 2013).

2.6 Urban fertility

This PhD will examine the dynamics of fertility change in Eastern Africa with a particular focus on urban areas, since fertility transition has been greatest in these areas. Disaggregating fertility by rural and urban residence reveals that birth rates in cities and towns have fallen significantly in the recent past. DHS data show that the urban fertility decline began in the 1970s; and since then, it has proceeded at a more rapid rate than in rural areas (Garenne, 2008). Between the two most recent DHS surveys for each country, fertility, on average, has declined by 0.9 children per woman in urban areas, compared to 0.3 children per woman in rural areas. As a result, the differential in fertility by type of place of residence is large: often a difference of more than two children per woman is found (Shapiro and Tambashe, 2000). These differences are thought to have emerged as a result of differences in a number of the proximate determinants of fertility. In contrast to rural areas, women in urban areas in Sub-Saharan Africa have higher levels of biological infertilty, higher ages at first marriage, higher usage of family planning, and better nutritional intake (Montgomery et al., 2004). In addition, at the distal level, they are known to be more educated and wealther than their rural counterparts (Garenne, 2008; Montgomery et al., 2004; Kirk and Pillet, 1998). Existing research has shown that, in many populations much of the difference between rural and urban birth rates is due to compositional differences in income, occupation and education. However, in sub-Saharan Africa (unlike in Asia and South America) a difference remains after controlling for these variables (Kirk and Pillet, 1998).

2.6.1 Reproductive decision-making in urban areas

The literature suggests that living in an urban area impacts upon women's household economies, relationships, religious and cultural beliefs and values and access to family planning services. In turn, these factors influence women's fertility intentions and reproductive decision-making.

Livelihoods in urban areas are different from those in rural areas. In urban areas women have increased economic participation and higher levels of education. This raises the opportunity costs of childbearing for women since the time they take away from paid work represents a loss of income for the household (Agadjanian, 2006, 1998). Similarly, Montgomery et al (2004) argue that urban residence affects women's fertility intentions through increased concern about the child quality-child quantity trade-off. Families are thought to become increasingly concerned with investing more heavily in each child rather than bearing large numbers of children. This heightened concern with child-quality arises through an exposure to the socio-economic diversity of towns and cities and the increased emphasis on education in these environments. Urban men and women are more likely to have encountered peers in better economic circumstances to themselves and to have come across examples of higher levels of education resulting in upward social mobility.

While urban women may have greater decision-making power in their homes, they also face heightened economic vulnerability as conjugal relationships are unstable and female-headed households are more common (Agadjanian, 2006). Such households are more likely to be

impoverished. Furthermore, the traditional support network of the extended family is undermined by the increased physical distances between its members and the decline of the traditional marital system. In this sense, modern urban life in Sub-Saharan Africa may present a dilemma for women: it is economically advantageous to control fertility as they may be reluctant to raise a child in a lone-parent household, but at the same time childbearing helps to secure unstable relationships and households (Agadjanian, 2006).

The specific nature of urban relationships also affects women's attitudes towards contraception use. If partnerships and marriages are unstable, women may be more likely to use birth control, as it allows them to strengthen bonds with their partner through the resumption of sexual relations shortly after childbirth (Agadjanian, 2006). However, relationship instability is one of many factors which impact upon contraceptive use. The diversity of cultural expectations about family is much greater in urban than in rural areas of Sub-Saharan Africa. This results in couples attempting to compromise between conflicting messages from religious teachings on the sinfulness of birth control, the traditional values of pronatalism and the emphasis of lineage and ancestry on the one hand, and the individualisation of urban life that pushes the western nuclear family model on the other (Agadjanian, 2006, 1998; Romaniuk, 2011). Agadjanian (2006) describes how this results in the tentative use of modern family planning techniques, which are often not fully sanctioned in these environments.

Indeed, the limited amount of circumstantial data that exists on this topic suggests that postponement is occurring in urban Sub-Saharan Africa. In Addis Ababa, Ethiopia, a number of commentators have noted that economic factors are having an impact on fertility levels; both housing shortages and high rates of unemployment are thought to be promoting longer birth intervals (Kinfu, 2000; Yitna 2002 cited in Montgomery et al. 2004; Gurmu and Mace 2008). In Maputo, Mozambique, Agadjanian (2006) describes 'waiting' as a common strategy. While in Ouagadougou, Burkina Faso, urban women report "now" never being the right moment to have another child (Rossier et al., 2013).

2.7 Conclusion

This PhD seeks to contribute to a number of debates discussed in the literature above. It has been shown that there continues to be uncertainty about the progress of fertility transition in Sub-Saharan Africa, with many commentators concerned about recent stagnations in the pace of declines in total fertility. This PhD will approach this debate from a different approach to much of the existing literature: it will examine time trends in birth rates through an analysis of parity progression and duration-specific fertility. Through doing so, it will further examine the role of lengthening birth intervals. It has been shown that evidence suggests that this phenomena is likely to be a major feature of the transition in the region.

Previous analyses of the issue has focussed solely on the national level. This thesis will analyse time trends in birth intervals at the sub-national level. In particular, since residential fertility differentials have been shown to be particularly large, a detailed exploration of rural-urban trends will be undertaken. Urban areas have long taken a central position in demographers' understanding of the process of fertility decline. In his early work on demographic transition, Notestein (1945) stated that urbanisation played an important role in reducing fertility through increasing the number employed within factories and raising real wages. This PhD does not seek to explain the existence of these differentials. Previous research has shown that socio-economic differences in fertility tend to emerge and then attentuate over the course of decline. However, I regard urban populations as an appropriate lens through which to examine the nature of fertility transition in Eastern Africa. It is among urban women that we are most likely to find innovative fertility behaviour which is likely to then diffuse into rural populations. Urban areas may thus give clues as to the rest of the transition will unfold. As Caldwell and Ruzicka argue: 'Fertility differentials... are of little significance in explaining the fertility transition although they do illuminate the historical process of fertility change' (Caldwell and Ruzicka, 1978 cited in Cleland and Wilson, 1987).

The role of parity-specific change and family limitation is a point of contention in the accounts of fertility change in Sub-Saharan Africa. Therefore, particular attention will be paid to trends in birth interval lengthening among women of different parities. In addition, a careful analysis of the family building strategies (birth spacing, postponement and family limitation) will be made. The literature suggests that there are important connections between the lengthening of birth intervals, birth postponement and social uncertainty in Sub-Saharan Africa. Furthermore, it appears that these associations are likely to be strongest in urban areas. This PhD seeks to explicitly explore these connections among a group of urban women and to draw conclusions on whether there is evidence of birth postponement among women's fertility intentions and reproductive decisions at the individual level.

3 Data and Methods

This PhD uses a mixed methods approach. The first part of the thesis is based upon analysis of Demographic and Health Survey (DHS) data from four Eastern African countries. The second part uses qualitative data self-collected through focus group discussions (FGDs) in two informal settlements of Nairobi, Kenya.

3.1 A mixed methods approach to demographic enquiry

Demography has traditionally been a quantitative discipline, characterised by a positivist epistemology. It has focused on the aggregate, and demographic researchers often conduct multi-site comparative studies. In many ways, this is an antithetical approach to that of more qualitative-based disciplines, which emphasise the individual. Such approaches tend to be cautious about comparative work because of concerns about decontextualising human behaviour and disconnecting knowledge from the contexts in which it was generated (Coast et al., 2007). Thus, there is sometimes an uneasy relationship between qualitative and quantitative research in demography. Despite this, qualitative and mixed methods research is becoming increasingly popular within the discipline; in particular, focus group discussions and in-depth interviews (Greenhalgh, 1997). Qualitative enquiry has much to contribute to demographic enquiry; it has a long-standing interest in using the exceptional to understand social rules and dynamics, and thus is better able to cope with the unexpected. It can obtain more honest data through building rapport with respondents, and can explore issues that are difficult to examine in surveys such as perceptions, conflicts, and psychological and social barriers. Fundamentally, the more we can combine qualitative and quantitative enquiry, the more we will be able to understand the multifaceted nature of demographic behaviour (Randall and Koppenhaver, 2004). With reference to fertility transition, Randall and Koppenhaver (2004) posit that much of our theoretical development is based upon the inference of individual-level reproductive decision-making from large-scale quantitative analysis. They argue that it is important to ascertain whether such decisions are only present at the macro level or whether we find evidence of them at the individual level. Indeed, it is precisely this that this PhD seeks to achieve. I seek to explore the statistical dynamics of fertility at a regional level in Eastern Africa using DHS data, and then create a rich account of individual-level reproductive strategies of women from two informal settlement populations in Nairobi, Kenya using qualitative data.

3.2 The quantitative analysis

3.2.1 Demographic and Health Survey data:

The quantitative analysis uses Demographic and Health Survey (DHS) data to examine time trends in birth intervals and family building strategies at the national level and separately for rural and urban areas. Specifically, the analysis is conducted on all available retrospective birth histories from the DHS of four Eastern African countries: Ethiopia, Kenya, Tanzania and Zimbabwe. The survey rounds are shown in Table 2

Table 2 Countries and Demographic and Health Surveys analysed

Ethiopia	Kenya	Tanzania	Zimbabwe
2000	1989	1991-92	1988
2005	1993	1996	1994
2011	1998	1999	1999
	2003	2004-05	2005-06
	2008-09	2010	2010-11

Demographic and Health Surveys are 240 nationally representative datasets collected from 84 low- and middle-income countries. The surveys are normally implemented by national statistical agencies, and technical support is provided by the Measure DHS programme. Since 1986, a total of 97 surveys have been conducted in Sub-Saharan Africa. Data have been collected from 39 countries, with between one and five surveys having been conducted per country.

The aim of the surveys is to further understanding of global health and population issues through the measurement of levels, trends and patterns of demographic and health indicators. The survey is structured into three sections: the household questionnaire, the women's questionnaire and the men's questionnaire.

Fertility data in DHS

With respect to fertility, DHS collect a full retrospective birth history from all female respondents aged 15-49 (regardless of marital status), including the name, sex, month and year of birth, woman's age at birth and survival status of each birth. For living children women are asked whether that child is living in the household or not. For dead children, the age at death is obtained. Information is also collected on whether the respondent was pregnant at the time of interview. Also of relevance to fertility analysis is the data on marriage, frequency of intercourse, contraceptive use and post-partum infecundability, which allow analysis of the proximate determinants of fertility. In addition, information on both men and women's fertility preferences is recorded; respondents are asked whether they want to have another child in the future, and the length of the time they would

43

like to wait before having this child, they are also asked what they consider to be the ideal number of children.

DHS data are a unique tool for the study of fertility change in Sub-Saharan Africa. The majority of countries on the sub-continent have conducted at least one survey, and because the survey data are standardised across countries, cross-national comparisons are possible. Although the surveys are single-round inquiries, the retrospective birth-histories allow both period and cohort fertility rates to be estimated. Furthermore, many countries have conducted more than one survey and this allows fertility rates to be calculated for reasonably long periods of time.

In addition to data for the analysis of fertility, DHS collect information on the following topics:

1) *Household questionnaire:* household members and relevant information on relationships to one another, residential status, water and sanitation, access to electricity, structure of dwelling, land ownership, diet, malaria net use and the height, weight and nutritional status of children 0-5 years and women 15-49 years.

2) *Women's questionnaire:* age, religion, ethnicity, partial residential history, educational achievement, postnatal care, child immunization and health, husband's background and woman's work, HIV/AIDS, domestic violence, maternal mortality and other health issues.

3) *Men's questionnaire:* age, religion, ethnicity, residential history, employment and gender roles, HIV/AIDS, other health issues.

Survey design

All DHS surveys use consistent questionnaires across countries. Although changes do occur between phases, the birth history questions have remained very similar, enabling time trends to be examined and cross-national comparisons to be made. Each implementing organisation designs the questionnaire based on the model questionnaires provided by the Measure DHS programme, but may also adapt the questions to reflect the population and health concerns of the individual country. This adaptation process is done in consultation with government agencies and ministries, non-governmental organisations and international donors. The questionnaire adjustments are done in English; once this process is finished they are translated into the local languages of the respondent populations.

Sampling Strategy

The sampling strategies of DHS surveys are designed to allow population and health indicators to be calculated at the national level, for rural and urban areas and often also at the regional or provincial level. The DHS surveys follow a two-stage sampling strategy; in the first stage, data collection points (clusters) are selected from a master sample frame (often based on census data) while in the second stage households are systematically selected from an up-to-date household list. All women aged 15-49 years who are either usual residents of a household, or those who are visitors staying in the household the night prior to the survey are eligible for interview. The

proportion of households that are sampled for the men's questionnaire varies between countries, ranging from all households to every third household.

Data collection

All DHS data are collected by national fieldworkers (teams consist of both males and females), who undergo a minimum of three weeks' training. The DHS has a standardised approach to training, with all fieldworkers participating in classroom presentations, mock interviews in the classroom and practice interviews in the field. In addition, field editors and supervisors also undergo further training in techniques of field editing, fieldwork coordination and data quality-checking procedures. Often the questionnaires are further refined after the pre-test and training of the field staff.

Data quality

There are three likely types of reporting errors that affect birth history data such as those collected by the DHS: misreporting of age, omission of vital events, and the displacement of vital events (Balkaran, 1982 cited in Timæus and Balasubramanian, 1984). In general, these errors result from problems with the design of the questionnaire, poor rapport between the interviewer and interviewee, or from misunderstandings, lack of knowledge or poor memory on the part of the respondent.

Age misreporting

Misreporting of age arises when respondents in a population state their ages to be younger or older than their actual age. Similarly, respondents may prefer to state their ages as ending in certain numbers, at the expense of other digits. Both of these phenomena may be more likely to occur among certain age groups than others, thus biasing demographic estimates.

Omission of vital events

The omission of vital events is most common among older women, who, due to memory lapses or misinterpretation of questions, may fail to report infant births or deaths or first marriages. The failure to report these events may produce misleading trends or levels of demographic indicators.

Displacement of vital events

Respondents may also recount the dates of vital events as being closer or further from the interview date than they actually were. It has been shown that in maternity histories, the displacement of dates of birth in the distant past can result in a clustering of birth in the years closer to the survey (Potter, 1977 cited in Timæus and Balasubramanian, 1984). Consistency analyses of World Fertility Survey data shows that older women were particularly likely to report events as having occurred closer to the date of survey, which gives a false impression that fertility has risen and then subsequently fallen (Chidambaram et al., 1980; Timæus and Balasubramanian, 1984).

The questionnaire requires mothers to give detailed information on maternal and child health issues about births that have occurred in the last five years. Age displacement errors have been shown to be common in DHS data: analysis has shown that mothers have a tendency to push back their children's birth dates beyond the five-year threshold in order to avoid answering these additional

questions. This age displacement results in an underestimation of birth in the five-year period prior to the survey, and an overestimation of births occurring six or more years prior to the survey. Errors results from the displacement of vital events have been shown to be more prevalent in DHS data collected from Sub-Saharan Africa than elsewhere (Arnold, 1990; Johnson et al., 2009; Pullum, 2006; Rutstein and Bicego, 1990; all cited in Machiyama, 2010)

A recent assessment of age and date misreporting in a selection of surveys from Sub-Saharan Africa revealed that there were high levels of age displacement of children in the majority of data sets. This problem was significantly higher among deceased children. There has been an improvement in the completeness of date reporting (stating both month and year), which has been attributed to improvements in women's education (Arnold, 1990; Pullum, 2006; all cited in Machiyama, 2010). However, in many surveys age misreporting is still high, with some data sets showing strong digit preferences for ages ending in 0 or 5. In many surveys women's age displacement has improved, though there are a number of country-specific exceptions to this trend. Crucially for this research, higher levels of age displacement have been found in rural areas; particularly in Ghana, Nigeria, Uganda and Zambia. It has been shown that false conclusions about fertility trends have been drawn from DHS data from Sub-Saharan Africa, due to inconsistencies in estimates between successive surveys in the 1990s and early 2000s (Machiyama, 2010).

3.2.2 Analysis

Selectivity and censoring in birth interval analysis

Analysing birth intervals using DHS data requires carefully constructed statistical methods because of two issues associated with the nature of incomplete maternity histories: selectivity and censoring. Selectivity arises because between-couple levels of fecundity are heterogeneous. Thus, even in populations which do not practice birth control, fertility rates decline with birth interval duration as more fecund couples conceive and begin a new birth interval, while less fecund women experience longer periods of time before conception. Similarly, high parity women (who are selected on high fecundity) are prone to shorter birth intervals than lower parity women (Timæus and Moultrie, 2013). Therefore, at any parity, younger women at any given age (as long as that age is less than 50) are more highly selected than an older group of women at the same parity.

Additional complications arise from the use of truncated birth histories, such as those collected by the DHS. As all women aged 15-49 are eligible for interview, many of the respondents have not yet come to the end of their reproductive lifespan. A proportion of the women in a survey who have reached parity *n* at the date of interview and are still aged less than 50 will go on to reach parity *n+1* in the future. Censoring refers to shortening of exposure time by the event of the survey. It prevents the direct calculation of parity progression ratios and birth interval distributions (Rodríguez and Hobcraft, 1980).

The implications of censoring interact with the selection biases related to heterogeneity of fecundity levels and declining fecundity with age, which leaves rising proportions of women unable to conceive or carry a birth to term. For example, women who have reached a parity of four or more children by age thirty have experienced short intervals between their births and are likely to go on to have more children in the future. However, if all women in the same cohort who reach a parity of four or more children by age fifty could be interviewed, the proportion of them going on to have more children would be smaller and the average birth interval length of these women longer than for the group measured 20 years earlier.

A number of methods have been proposed to examine trends in birth intervals designed to control for the effects of selectivity and censoring. Hobcraft and colleagues described a life-table approach (Hobcraft and Rodríguez, 1992; Hobcraft and McDonald, 1984; Rodríguez et al., 1984; Rodríguez and Hobcraft, 1980) that looks at the proportion of women having a subsequent birth. The biases are dealt with by disaggregating the life tables by variables that control the strength of selection. Brass and Juárez (1983) used a paired-cohort truncation approach, which compares a series of life-table estimates for pairs of successive age groups with children born within the last five years eliminated for the older group in each pair. Using this procedure, the two life-table estimates are made comparable, as both have similar levels of selection bias and are equally age-censored. This study adopted a third approach: the regression method outlined by Moultrie and colleagues, which is computationally more straightforward than the Brass and Juárez method and does not encounter the sample-size problems associated with the life table approach (Timæus and Moultrie, 2013; Moultrie et al., 2010, 2012).

Regression modelling of birth intervals

The birth intervals were modelled using survival analysis to allow for the censoring of women's open birth intervals. Specifically, we use a discrete-time model variously described as a piecewise exponential model, log linear rates model or Poisson regression model for rates (Allison, 1984; Clayton and Hills, 1993; Elandt-Johnson and Johnson, 1980; Yamaguchi, 1991). Parametric survival models were not used since there is evidence of threshold effects and other discontinuities in the data. Moreover, while limiting has a more-or-less proportional impact on fertility by interval duration, spacing and postponement do not, so Cox partial likelihood models can be ruled out as poorly specified on theoretical grounds.

The coefficients of the models and their standard errors were estimated using the survey weights supplied with the data and allowing for clustering and stratification in the sample designs. To begin with, the various DHS birth history files for each country were merged into one event-exposure file. The file was then restructured so that each birth interval for each woman became an event-exposure record, with the interval-closing event (the dependent variable) being the birth of the next child. The first interval in the analysis begins with the birth of a woman's first child; thus women

with no children do not contribute to exposure time. The number of women included in the analysis is shown in Table 3.

Table 3 Number of women included in the analysis by country and survey round

Ethiopia		Kenya		Tanzania		Zimbabwe	
Survey year	No. of women	Survey year	No. of women	Survey year	No. of women	Survey year	No. of women
2000	10143	1989	5507	1991-92	6913	1988	3005
2005	9339	1993	5415	1996	6083	1994	4388
2011	10896	1998	5717	1999	2935	1999	4207
		2003	5629	2004-05	7573	2005-06	6281
		2008-09	6102	2010	7326	2010-11	6725
Total	**30378**		**28606**		**30830**		**24606**

Multiple births (twins, triplets etc.) were treated as a single maternity, so only result in one interval. The birth intervals of women who have been sterilized were censored at the date of sterilization (if the date is recorded), otherwise they were censored at the date of the woman's final birth.

Open and closed intervals

Both open and closed intervals are analysed. Other researchers have focused their analysis on closed intervals only, arguing that this prevents confusion between changes in parity progression and the pace of childbearing (Casterline et al., 2011; Bongaarts and Casterline, 2012). Undoubtedly, reductions in parity progression reduce the ratio of closed to open intervals, leading to a large increase in the mean length of all intervals. However, this research seeks to further develop the existing work that challenges the dichotomous classification of the motivations for fertility control into either spacing or stopping. This work considers there to be a motivational continuum between birth postponement and family limitation (Timæus and Moultrie, 2008; Cleland and Rutstein, 1986).

This calls into question the traditional demographic presumption that the open birth intervals of limiters are qualitatively different from the closed intervals of non-limiters. Thus, this analysis considers both open and closed intervals but uses median interval length, that is the duration by which half of the opened intervals are closed with the remaining half of the intervals being either closed later or censored by interview of the mother, as the preferred summary index of the extent of birth spacing and postponement. Increased family size limitation that is unaccompanied by changes in the extent of volitional postponement of the next birth has a large effect on fertility in

the right-hand tail of the birth interval distribution in which the stoppers represent a large proportion of women who have not progressed, and therefore on the mean interval duration, but almost no impact upon the median interval (assuming that less than 50 per cent of women stop at any given parity). Thus, adjusting for parity progression makes little difference to trends in the median duration of birth intervals and any large increases in median intervals over time cannot be due to increases in family-size limitation (Timæus and Moultrie, 2013).

The dependent variable in the regression analysis is the event of giving birth. All intervals (both open and closed) were split into exposure segments at 9, 18, 24, 30...66, 72, 84, 96 and 108 months, which reflects the distribution of the birth events in the data. . All the intervals that remain open were censored at 132 months. The interval segment then becomes the unit of analysis and I modelled the number of births within each of these interval segments offset against the time that women spent exposed to risk. The results from the regression model were then used to calculate fitted age-order-duration-specific fertility rates for each segment of the birth interval. Next, life table methods were used to compute survivorship in the interval, which is to say the proportion of women remaining in the interval at the end of each segment of exposure. The segment during which 50 per cent of the intervals (both open and closed) had been closed was then identified: the x at which $_xp_0$=0.5. Then a weighted average of survivorship to the start and end of the segment was used to estimate an exact median interval length.

In order to adjust for selection on fecundity, variables specifying the order of each maternity and the mother's age at the start of each exposure segment for all birth intervals must be included in the model (Moultrie et al., 2012). In addition, a variable was constructed that identifies the five-year calendar time period in which each segment of the birth interval began. For Kenya, Tanzania and Zimbabwe observation began at 1965-69, when women interviewed in the first surveys would have ranged between 17-22 years (Zimbabwe) and 14-19 years (Tanzania). Ethiopia's period of observation begins later (1975-79) because its first survey occurred approximately ten years later than the first surveys for the other countries of observation (see table 2). The number of intervals tends to be larger in the later surveys and this remains equally true in the weighted data. Because of this, more events are reported on in recent years and therefore the estimates of recent rates have smaller sampling errors. Therefore, including data from the earlier period would have led to particularly strong selection bias and small sample sizes, which, in turn, would have led to erratic estimates for earlier dates. Similarly, Kenya's observation period ends in 2005, since the most recent survey was in 2008-09 and so the data for the 2005-9 observation period are incomplete.

Table 4 Stages in the regression modelling of birth intervals

Stage of Modelling	Action	Aim

1	National trends in fertility are modelled as a function of:
	
	  i. Mother's five-year age group
	  ii. Birth order of the index child
	  iii. Duration since the mother's last birth
	  iv. Grouped five-year period
	  v. Whether the woman has ever married
	
	Interactions between:
	
	  i. Parity and date
	  ii. Date and interval duration
	  iii. Date and interval duration squared
	  iv. Date and the log of interval duration
	  vi. Date and whether the woman has ever married
		To assess trends in birth interval length and family building strategy at the country level

2	Birth intervals are modelled using the variables and interactions in Model 1, with additional interactions between:
	
	  i. Parity and interval duration
	  ii. Parity and interval duration squared
	  iii. Parity and the log of interval duration
		To determine whether time trends in birth interval length and family building strategy vary by a woman's parity

3	Birth intervals are modelled using the variables and interactions in Model 1. We add rural/urban residence at the time of the survey and a series of two- and three-way interactions:
	Two-way interactions between:
	
	  i. Rural/urban residence and date
	  ii. Rural/urban residence and interval duration
	  iii. Rural/urban residence and interval duration squared
	  iv. Rural/urban residence and the log of interval duration
	  v. Rural/urban residence and parity
	
	Three-way interactions between:
	
	  i. Rural/urban residence, interval duration and date
	  ii. Rural/urban residence, interval duration squared and date
	  iii. Rural/urban residence, the log of interval duration and date
	  iv. Rural/urban residence, parity and date
		To determine time trends in birth intervals and family building strategy in rural and urban areas separately

4	Birth intervals are modelled using the variables and interactions in Model 1 and the interaction between rural/urban residence and date. I add the variable on ever-use of contraception by the start of the interval, and a series of two- and three-way interactions.
	Two-way interactions:
	
	  i. Ever-use of contraception and date
	  ii. Ever-use of contraception and interval duration
	  iii. Ever-use of contraception and interval duration squared
	  iv. Ever-use of contraception and the log of interval duration
	  v. Ever-use of contraception and parity
	
	Three-way interactions:
	
	  i. Ever-use of contraception, interval duration and date
	  ii. Ever-use of contraception, interval duration squared and date
	  iii. Ever-use of contraception, the log of interval duration and date
	  iv. Ever-use of contraception, parity and date
		To determine time trends in birth intervals and family building strategy for ever- and never-users of contraception

Table 4 Stages in the regression modelling of birth intervals (continued)

Stage of Modelling	Action	Aim

5	Birth intervals are modelled using the variables and interactions in Model 1 and the interactions between rural/urban residence and date. The DHS variable identifying a woman's highest educational level attended is added alongside a series of two- and three-way interactions.
	
	Two-way interactions:
	
	   i. Educational level and date
	   ii. Educational level and interval duration
	   iii. Educational level and interval duration squared
	   iv. Educational level and the log of interval duration
	   v. Educational level and parity
	
	Three-way interactions between:
	
	   i. Educational level, interval duration and date
	   ii. Educational level, interval duration squared and date
	   iii. Educational level, the log of interval duration and date
	   iv. Educational level, parity and date
		To determine time trends in birth intervals and family building strategy for women with different levels of education

6	Birth intervals are modelled using variables and interactions in Models 2 and 3, with additional three- and four-way interactions.
	
	Three-way interactions:
	
	   i. Rural/urban residence, parity and interval duration
	   ii. Rural/urban residence, parity and interval duration squared
	   iii. Rural/urban residence, parity and the log of interval duration
	
	Four-way interactions:
	
	   i. Rural/urban residence, parity, interval duration and date
	   ii. Rural/urban residence, parity, interval duration squared and date
	   iii. Rural/urban residence, parity, the log of interval duration and date
		To determine whether time trends in birth interval length and family building strategy vary by a woman's parity for rural and urban separately

7	Birth intervals are modelled using variables and interactions in Models 3 and 4, with additional three- and four-way interactions.
	
	Three-way interactions:
	
	   i. Rural/urban residence, ever-use of contraception and interval duration
	   ii. Rural/urban residence, ever-use of contraception and interval duration squared
	   iii. Rural/urban residence, ever-use of contraception and the log of interval duration
	   iv. Rural/urban residence, ever-use of contraception and parity
	
	Four-way interactions:
	
	   i. Rural/urban residence, ever-use of contraception, interval duration and date
	   ii. Rural/urban residence, ever-use of contraception, interval duration squared and date
	   iii. Rural/urban residence, ever-use of contraception, the log of interval duration and date
	   iv. Rural/urban residence, ever-use of contraception, parity and date
		To determine time trends in birth intervals and family building strategy among ever- and never-users of contraception for rural and urban areas separately

Table 4 Stages in the regression modelling of birth intervals (continued)

Stage of Modelling	Action	Aim
8	Birth intervals are modelled using variables and interactions in Models 3 and 5, with additional three- and four-way interactions. Three-way interactions: i. Rural/urban residence, educational level and interval duration ii. Rural/urban residence, educational level and interval duration squared iii. Rural/urban residence, educational level and the log of interval duration iv. Rural/urban residence, educational level and parity Four-way interactions: i. Rural/urban residence, educational level, interval duration and date ii. Rural/urban residence, educational level, interval duration squared and date iii. Rural/urban residence, educational level, the log of interval duration and date iv. Rural/urban residence, educational level, parity and date	To determine time trends in birth intervals and family building strategy among women with different levels of education for rural and urban areas separately

National-level model

Table 4 illustrates how the regression models were built up. The first model includes time since last birth, calendar time and the key control variables (parity and mother's age). In order to allow the distribution of interval lengths to change over time, interactions between calendar time and interval duration (measured continuously), interval duration squared and the log of interval duration were included in the model (Timæus and Moultrie, 2013). In addition, in order to examine time trends in family size limitation, parity and calendar time were allowed to interact with each other. Finally, a variable identifying whether a woman had ever been married was included in the model. This was constructed by contrasting the date of birth of each child with the date of the mother's first marriage. The effect on fertility of a woman having ever been married was also allowed to vary over time. This model was used to generate fitted fertility rates by birth interval duration at a national level for all four countries under examination.

Parity model

The second model builds upon the first. It was specified to explore the question of whether birth intervals and women's tendency to space or postpone a birth varies by the number of children she has already borne. In addition to the variables and interactions included in model 1, interval duration and its square and log were interacted with parity, in order to allow the distribution of the duration-specific hazard to vary by a woman's existing family size. These two-way interactions were further developed into three-way interactions by additionally allowing them to vary over time. This allows us to examine whether the impact of parity on birth intervals and family building strategies has varied over time.

Rural/urban residence model

In order to examine the duration-specific fertility trends by type of place of residence, the DHS variable that identifies whether a woman resides in a rural or urban area at the time of interview was

added. This variable was then allowed to vary by interval duration, interval duration squared, the log of interval duration and calendar time. As with previous models, these interactions allow both the shape and level of the duration-specific hazard rates to vary. In addition, parity is allowed to vary by a woman's type of place of residence, in order to examine whether there has been parity-specific change to duration-specific fertility. The three-way interactions then allow me to conclude whether these trends have been changing significantly over time.

Contraceptive use model

In models 1, 2 and 3 which present descriptive trends, no variable identifying a woman's contraceptive use history was included. Contraceptive use was assumed to be on the causal pathway between time and birth interval length; therefore adding it into the model has the potential to remove a large amount of the change in the outcome of interest. Model 4 examines trends in the length of birth intervals by ever-use of contraception. As with all the models outlined above, the contraceptive use variable was entered into a series of two- and three-way interactions with parity, the three measures of interval duration and calendar time.

3.3   The ever-use of contraception variable

'Ever-use of contraception' by a particular interval was defined using a question on the woman's reported number of living children at the time she first "did something or used a method to avoid getting pregnant". This variable is somewhat approximate as the survey question asks women about the number of *living* children at first use, therefore a respondent's exact parity (which includes children born alive who later died) at first use is not always known. Given that deaths of children are concentrated in early infancy, the number of living children that women had after each live birth was estimated by assuming that any child recorded in the birth histories as having died did so before the birth of their next younger sibling. Thus, in instances where this assumption is unjustified, the parity at which the woman started using contraception is overestimated.

3.4   Imputation of missing data

In the most recent surveys of Ethiopia (2011), Tanzania (2010) and Zimbabwe (2010-11), the variable identifying a woman's number of living children at first use of contraception is not available. For these surveys, the parity-specific probabilities of being an ever-user for the closed intervals of women who had become ever-users by the time of the survey were imputed from a logistic regression model fitted to the earlier surveys for the same country with the following additional explanatory variables: women's age and whether they were ever-married at the start of the interval, length of preceding interval, age at first birth, current contraceptive use, births in the last 5 years and last year, and marital status, type of place of residence and highest level of schooling at the time of interview. For the open-ended intervals, ever-use by current parity equals lifetime ever-use and so imputation is unnecessary.

Education model

Model 4 explores birth intervals by a woman's level of education. The DHS variable that identifies each respondent's highest level of education attended was recoded into a binary variable: women who have never attended school and women who have attended primary school, secondary school or higher level education. Originally, the variable was coded into three ordered categories, however problems with fitting model 8 for Kenya and Zimbabwe forced me to recode the variable as binary. As with the previous models, this variable was interacted with the three measures of interval duration and with a measure of period, allowing both the distribution and level of interval lengths to vary over time. The interactions between parity and education allow me to examine whether women of differing schooling levels vary in their tendency to limit their family size. Allowing this relationship to interact with calendar time gives an assessment of whether this trend is changing over time.

Rural/urban differential trends by parity, contraceptive use and education

Models 6, 7 and 8 explore differential trends in birth intervals by parity, ever-use of contraception and level of education among rural and urban women. The shape and level interactions of the explanatory variables (type of place of residence and either parity, ever-use of contraception or level of education) from the earlier stages of modelling are combined into one model. Then three-way interactions between interval duration, interval duration squared, the log of interval duration and both explanatory variables are entered into the model, in order to determine trends in birth intervals among ever- and never-users of contraception for rural and urban areas separately. In the case of models 7 and 8, parity was also interacted with the two explanatory variables in order to examine whether there is parity-specific limitation among either ever-/never-users of contraception or women of different educational levels in either rural or urban areas. Finally, these three-way interactions are built up into four-way interactions, by additionally allowing the relationships to vary by period. This is in order to understand whether the effect of parity, contraception or education on the level or shape duration-specific fertility varies by type of place of residence and by calendar time.

Fitted duration-specific fertility rates and median birth interval estimates

The Poisson regression models estimate log fertility rate ratios relative to a baseline woman, birth, interval duration and date. From these coefficients, fitted duration-specific fertility rates for a typical woman were generated. The original intention was to use the post estimation commands in Stata to calculate the duration-specific fertility rates from the regression models. These commands allow the user to make estimations by fixing values of certain covariates and averaging or integrating over other covariates (StataCorp, 2013). However, the large number of observations and high-order interactions within the models prevented this command from producing the estimates. Thus, it became necessary to use Excel to calculate the fitted rates from the models. Because this method does not readily allow covariates to be held at their means, it was necessary to standardise the rates for certain groups.

In all models the estimates are generated for an average woman, who is ever-married women, aged 25-29 who already has three children (except for in models 2 and 6 which produce estimates for women of different parity levels). For models 3 and 4, it was decided to standardise on urban residence, since the fertility dynamics of urban areas are a primary focus of this PhD. The models examining the effect of education (models 5 and 8), are standardised for an ever-user of contraception since the aim was to estimate the additional impact of education. Table 5 shows a detailed breakdown of the categories that each model was standardised for.

Table 5 Steps in the standardisation procedure for the models

Model number	Estimates produced	Standardisation categories
1	National-level	- Ever married - Aged 25-29 - Parity 3
2	Parity at the national-level	- Ever married - Aged 25-29
3	Rural/urban residence	- Ever married - Aged 25-29 - Parity 3
4	Contraceptive use	- Ever married - Aged 25-29 - Parity 3 - Urban residence
5	Education	- Ever married - Aged 25-29 - Parity 3 - Urban residence
6	Parity by residence	- Ever married - Aged 25-29
7	Contraceptive use by residence	- Ever married - Aged 25-29 - Parity 3
8	Education by residence	- Ever married - Aged 25-29 - Parity 3

Identifying family building strategies from the regression model and duration-specific fertility rates

The distribution of birth intervals are used to examine dominant family building strategies in populations that are using contraception to control their fertility. The duration-specific fertility rate, i.e. the rate of closing a birth interval, varies in shape between populations where postponing, spacing or limiting are the dominant fertility control motives. It is important to note that the hazard shape of postponing populations is not merely an amalgamation of the distributions associated with populations where birth spacing or limitation dominate. The comparison of a baseline distribution of a variable known to affect fertility and contraceptive use can be compared with a second distribution relating to another category of that same variable. This is possible because the hazard shapes reflect differentials in patterns of, and motivations for, contraceptive use. Any factor hypothesised to affect contraceptive use can be examined using this technique, including calendar time and socio-economic indicators (Timæus and Moultrie, 2008, 2013).

Figure 3   Hazard functions associated with differential limiting and spacing of births
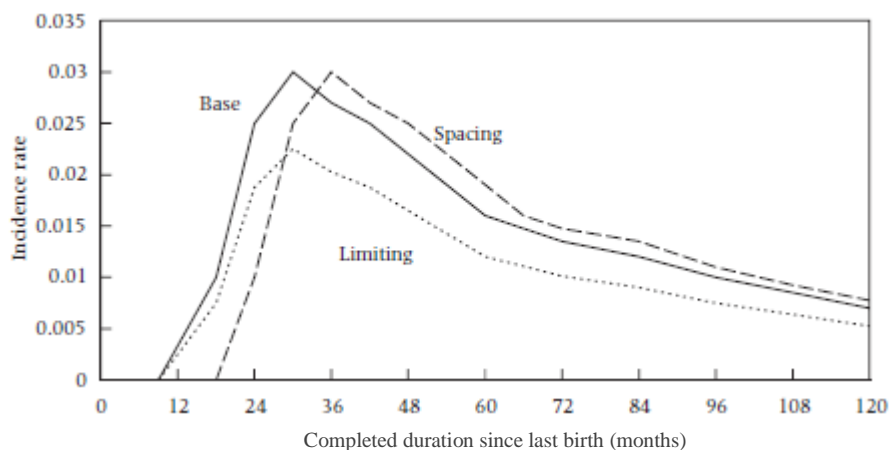
Source: Timæus and Moultrie (2008)

In a hypothetical, pure-limiting population the duration-specific fertility rates are pulled downwards at all durations of the birth interval (as in the dotted line in Figure 3). If fertility control were perfect, the proportion of women wanting no more children would be independent of the amount of time elapsed since last birth, and thus the downward shift would be proportional at all durations. However, in reality, failures of contraception mean that this group of women becomes select as more time passes since the previous birth. This results in the effects of limitation becoming more apparent at later durations, shifting the hazard distribution slightly to the left. The key factor for identifying differential limitation is that the baseline and second distributions should not intersect. In the regression model, limitation can be identified by an examination of the interaction term (i.e. time, contraceptive use or another socio-economic variable) with parity. Family limitation manifests itself as a proportionate reduction in the duration-specific rates (Timæus and Moultrie, 2013, 2008).

A pure spacing effect results in a rightwards shift of the birth interval distribution along the *x*-axis. The height of the distribution does not change because women's preferences for a particular family

size have not changed (as shown in the dashed line in Figure 3) (Timæus and Moultrie, 2008). In the regression model, reductions in fertility due to spacing are a function of interval duration and its log (Timæus and Moultrie, 2013).

Figure 4   Hazard function associated with postponement of births

Completed duration since last birth (months)
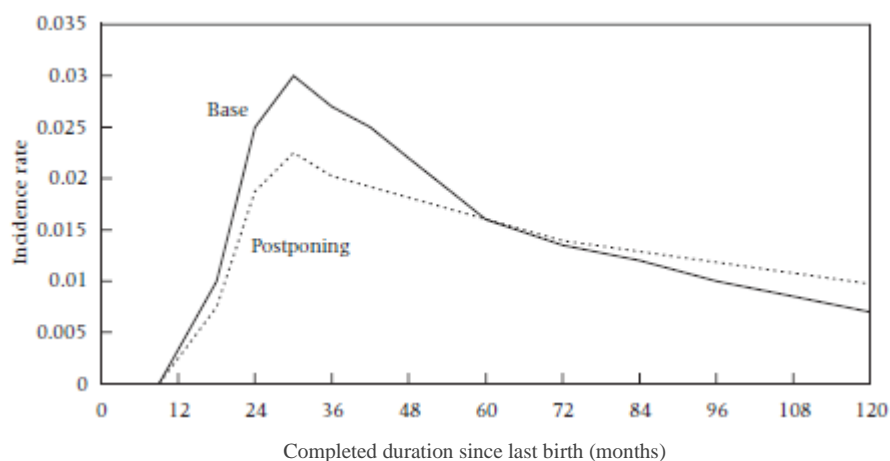
Source: Timæus and Moultrie (2008)

The distribution produced by a hypothetical postponing population has lower fertility at shorter durations of the birth interval and higher fertility at longer durations (as shown in Figure 4). This is a reflection of the fact that some women who begin the interval not wanting a subsequent pregnancy change their mind and conceive later on. This results in the pivoting of the distribution to the left. In this hypothetical population, the duration since last birth has no effect on fertility decisions (this would be spacing) and the fertility rate decreases slowly with time as more highly fecund women are removed from the at-risk population. In terms of the regression model, postponement produces a significant coefficient for the interaction between the index variable and interval duration squared (Timæus and Moultrie, 2013, 2008).

Parity-progression ratios
Where there are indications of family limitations, either in statistically significant coefficients for the interaction with parity in the regression model or in proportional declines in distribution of duration-specific fertility, parity progression ratios are used to explore this further. Parity progression ratios examine fertility as an incremental family building process. They measure the probability that a woman will have a further birth in relation to how many births she has had already. They thus give important further indications of family limitation.

Often, analyses of parity progression based on birth history data examine progression at 5 years (Brass et al., 1997). However, recent analyses of fertility in Sub-Saharan Africa have shown that a large proportion of the women who progress to a further birth do so more at durations greater than 5 years after their previous one (Moultrie et al., 2012). Parity progression ratios are therefore examined at 120 months (10 years) following the woman's previous birth. The parity progression ratios are calculated from the life table derived from the fitted regression models.

57

3.5 The qualitative analysis

3.5.1 A qualitative approach

The second part of the PhD follows a qualitative approach; it is designed to complement the statistical analysis of the DHS fertility data. While the quantitative approach adopted chapters 4 and 5 has allowed relationships between fertility and other variables to be explored numerically, chapters 6 and 7 seek to tell a different kind of story. In them, I attempt to answer questions about how women's experience of childbearing and family building is given meaning. The chapters explore the social world of the respondents, to examine the constraints of their everyday lives and to relate them to their childbearing intentions, desires and decisions (Denzin and Lincoln, 2000). This is pertinent for the exploration of fertility intentions: a qualitative approach allowed me to collect rich, descriptive information from study respondents which, in turn gives a more nuanced and realistic account of their plans and their decision-making. Respondents are able to articulate their ambivalences and doubts about fertility decisions, which are very difficult to record in surveys (Agadjanian, 2006).

Interpretivism

Within qualitative research there are many different methodologies: from the grounded theory approach, to the ethnographic tradition, through to participatory action approaches. Methodologies are "logics that justify, explain and help [researchers] understand research methods" (Carter and Little, 2007, pp. 1323). Methodology shapes, and is shaped by, the research aims and objectives and the study design. This research adopts an interpretivist methodology as it aims to reveal how the respondents understand their reproductive experiences and construct their reproductive intentions. Interpretivist research is also interested in the configuration of meanings that inform and influence people's activities, and in the case of this study, I seek to explore what shapes women's decisions about childbearing (Holstein and Gubrium, 2005). In terms of the relationship between methodology and research method, interpretivism leads the researcher to take an exploratory stance and encourages data collection that is as assumption-free as possible (The Open University, 2012). Although this study has a particular interest in birth intervals, I seek to conduct a more general exploration of childbearing in the two settlements (Korogocho and Viwandani) that make up the study population for this research. In other words, this study aims to provide an overview of childbearing decision-making rather than to specifically examine and build a theory on birth spacing.

3.5.2 Focus group discussions

The data for this part of the PhD research were collected using FGDs. FGDs typically involve recruiting a small group of individuals who share some research-relevant characteristic and facilitating an informal discussion focused on a particular set of issues. While it is usual for the moderator to have prepared a list of topics or questions, as much as possible they encourage the research participants to discuss and interact with each other (Silverman, 2011).

While most childbearing decisions are made within the context of a relationship, both women's and men's attitudes and behaviours are formed and shaped within a wider social context. Compared with the wealthier suburbs of Nairobi, many aspects of women's lives in the informal settlements are communal. Homes are located closely together and manifold social and financial connections exist between neighbouring households. FGDs allow the researcher to "access interaction between the participants, and thus [they give] some insight into how social knowledge is produced" (Green and Thorogood, 2004, pp.107). In particular, FGDs have been identified as being a suitable method for research among marginalised groups. They can reveal and validate respondents' day-to-day knowledge and experiences through exposing under-researched aspects of their existence, their feelings, opinions and aspirations (Madriz, 2000).

Traditionally, qualitative researchers have used the individual interview as their primary data collection tool. In-depth interviews were also considered for this study; however this tool tends to encourage focus on individual experiences rather than social learning and group knowledge.

Sampling

Only parous women were eligible for participation in the study, as the aim of the study was to explore the reproductive intentions of women who were likely to be engaged in making decisions about childbearing and family building. For the same reason, the target study population was restricted to women between the ages of eighteen and forty. The youngest mothers (those under eighteen) were excluded because I did not want the age range of the women to be so large as to affect the dynamic of the discussions and the study sample size was not large enough to stratify the groups by age group.

In addition, I decided that respondents should be women who have ever been in a co-residential relationship. A significant part of the study protocol focused on the impact that relationships have on decisions about childbearing, and in order to do this it was necessary to hear from women who had experienced a long-term relationship at some point in their lives.

The inhabitants living in Viwandani and Korogocho represent a diverse population, but individuals from the same ethnic background tend to live in close proximity. Thus, the potential participant list was drawn in equal proportions from the different neighbourhoods of the two settlements to allow for variation within the sample.

The sample frame consisted of women drawn from two samples: one simple random sample and one purposive. The simple random sample used the criteria just described to select women in equal proportion from Viwandani and Korogocho. The purposive sample selected women using the same criteria, but in addition these women had all experienced a birth interval of more than three years in length. Women with long birth intervals were selected since the study explicitly aimed to

explore decisions about birth spacing and postponement within the two study communities[1]. The potential respondents list was drawn with a ratio of 3:1 simple random to purposive sample. This ratio was designed to capture the perspectives of women who may have postponed a birth, but also to ensure that their opinions did not dominate the discussion.

3.5.3 Ethics

Confidentiality

It was vitally important that the study participants felt confident that what they discussed in the FGDs would be treated confidentially and would not be passed on. The research assistants recruited to assist with the project were given training (by myself) to ensure that they understood the importance of participant confidentiality and could commit to adhering to project rules and procedures about protecting participant confidentiality.

During the FGD, women were not asked about their personal experiences; instead the protocol directed them to respond in a general manner through a focus on *perceived* attitudes towards childbearing and childrearing within the participant communities. Prior to the FGD taking place, the research assistant clearly explained our expectations of the group and nature of the discussion to the participants, and clarified that each of the participants' contributions would be shared with others in the group as well as with the investigator. The respondents were requested to keep confidential what was shared during the discussion.

Certain steps were followed to ensure the confidentiality of the participants once they had participated in an FGD. The only paperwork that linked the name of each respondent to their respondent number was the seating plan, which was necessary to enable the transcriber to be able to quickly record who said what during the discussions. Following the conclusion of the FGD, the seating plan was always stored separately from the transcript. Access to project data was limited to a very small number of people whose involvement in the study required it. All electronic data were stored on external hard drives that were kept in a secure place.

Informed consent

All potential recruits into the study were provided with an explanation of the project's aims, purpose, data collection activities, how the data were to be used, methods of ensuring the confidentiality of the data collected and the study's potential value. The expectations of respondents' involvement in the study were honestly explained, including the fact that the discussions were to be audio recorded. All of this was discussed during the initial recruitment visits. The information was also provided in the form of an information sheet (translated into Kiswahili).

After participants joined the study and before FGDs began, the project information was explained to them again. The confidentiality of what would be said or observed during the discussions was

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[1] It is important to note that we did not know the reasons why a respondent might have experienced a long birth interval. It may be due to a deliberate effort to delay a birth, but it may equally be due to uncontrollable biological factors or lack of opportunity to conceive.

explained and emphasized. The respondents were given an opportunity to ask any further questions, and were then directed to sign the informed consent form. Those who were unable write were asked to sign with a fingerprint.

Compensation

In line with the rest of Africa Population and Health Research Center's (APHRC) studies, participants in this study were compensated for their time. Each respondent was given 200 KES (US $2.2) and half way through the FGD refreshments were provided. Originally, I had hoped to only inform participants about the compensation if they asked directly; however, in order to comply with Kenya Medical Research Institute (KEMRI) Ethical Review Committee (ERC) regulations, each participant was told of this during the recruitment visits.

Ethical clearance from this study was gained from London School of Hygiene and Tropical Medicine (LSHTM) ERC on 30th January 2012 and KEMRI ERC on 17th April 2012 (Appendices 1 and 2).

3.5.4 Data collection

Recruiting the respondents

The sample frame produced from APHRC NUHDSS data gave the names and dwelling numbers of all potential respondents. My primary research assistant and I then used it to visit the identified women in their homes in order to recruit them into the study. If we found that a woman selected into the sampling frame was not at her registered dwelling, we attempted to locate her whenever this was possible: by waiting for her to return, revisiting her at a later date or finding her new place of residence (if it was within the same settlement).

During this initial meeting, my research assistant and I introduced ourselves, explained the study, answered any questions and asked the women to participate. Generally, we aimed to recruit eight respondents as this number was thought to be good a balance between manageability of the discussion and having enough participants in the study to capture a variety of perspectives. We also attempted to maintain the ratio of women drawn from the simple random and purposive samples (3:1). However, in reality, the number we decided to recruit varied according to how certain we were that each respondent would attend. Even when we attempted to account for likelihood of attendance at the recruitment stage, the number of attendees per discussion varied markedly (as illustrated in Table 6). As a result of this, the ratio of simple random to purposive sample respondents ranged from 2:3 to 7:2.

In almost all of the discussions, the respondents came from different neighbourhoods within the settlements; this was done in order to ensure that one ethnic group did not dominate the discussion. However, FGD 5 was an exception to this; these participants were all drawn from Grogan B in Korogocho and were mostly Kikuyu. Grogan B is the most insecure neighbourhood

of Korogocho and we were only able to recruit women there with additional security. It was more practical to do this in on a single day rather than hire security for every recruitment session.

Table 6   Numbers of purposive sampled to simple random sampled respondents attending by FGD number

Discussion	Purposive	Simple Random	Total
1	2	7	9
2	2	3	5
3	2	4	6
4	2	6	8
5	3	2	5
6	2	6	8

Conducting the discussions

In both communities, the discussions were held in quiet and private venues that were within easy walking distance for all of our respondents. Since the discussions were conducted in Sheng (a patois derived from Swahili and spoken widely in the informal settlements of Nairobi) I was unable to moderate the discussions myself, so my primary research assistant took on this role. I also used an interpreter, who translated throughout the discussions. This allowed me to follow what was being said and enabled me to intervene if a question was being misunderstood or I wanted a respondent to elaborate on an interesting point. I also recruited a note-taker, who took brief records in English of who said what throughout the discussion. This served two purposes: firstly, it allowed the transcriber to identify each respondent in the transcript and secondly, it allowed me to begin the initial analysis of the data without needing to wait for the full transcripts to be produced. Each discussion lasted between two and two and a half hours. We stopped the recorders for ten to fifteen minutes during the discussion for the respondents have a break and take refreshments.

The conceptual model

The FGD protocol was informed by the conceptual model shown in Figure 5: it guided the topics that were to be discussed and the probes that were suggested for the moderator. The model was developed from the existing literature on reproductive intentions in Sub-Saharan Africa to illustrate the relationship between the urban environment and birth intervals.

Figure 5   Conceptual model used to inform the study design
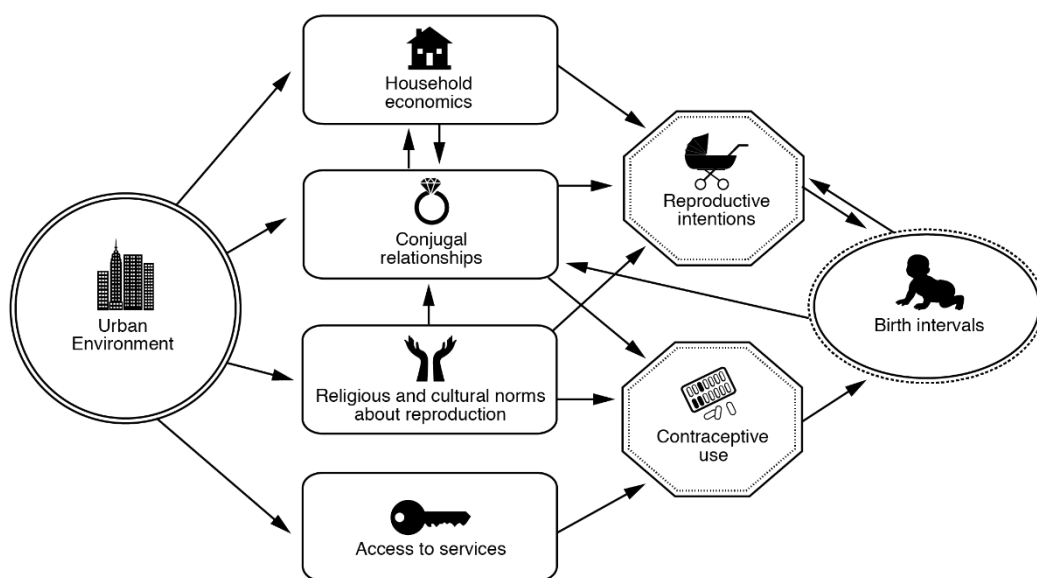
Figure 5 shows that both reproductive intentions and attitudes to contraceptive use impact upon birth intervals. The literature suggests that urban economics, relationships, culture and access to family planning services lead to uncertainty and tentative reproductive intentions because they influence fertility in contradictory ways. In many cases this results in a 'mismatch' between women's use of contraception and their fertility intentions. Such reproductive ambiguity means women seek to maintain their options and wait for the 'right time' for a birth; resulting in long intervals between their births (Johnson-Hanks, 2005; Agadjanian, 2006). Indeed, I hypothesise that birth postponement is likely to be widespread among this study population. The literature suggests that women in this environment may be delaying a birth for reasons that are not contingent on the age of their youngest child (Timæus and Moultrie, 2008). Finally, I predict that there may be a feedback loop between birth intervals and conjugal relationship; for example, long spaces between births may destabilise conjugal relationships. I also anticipate that there is a bi-directional relationship between birth intervals and reproductive intentions; women may alter their fertility intentions after an additional birth. They may also rationalise a child post-partum, describing an unwanted birth as wanted at a later date (De Silva, 1991).

Focus group discussion protocol
The FGD protocol was created in collaboration with three other researchers who have considerable experience in conducting studies in Korogocho and Viwandani. The topics and relationships outlined in the conceptual model were transformed into broad topics to be explored, and more specific hypotheses were added into the protocol as further probes. It was originally written in English and then translated into Swahili/Sheng and then back-translated into English by the

primary research assistant. The protocol (shown in full in appendix 3) was divided into seven sections:

1. Introductory questions
   - Social importance of childbearing and motherhood
   - Ability to control childbearing
2. Conjugal relationships
   - Childbearing within marriage and outside marriage
   - Trust, relationship satisfaction and childbearing
   - Couple communication and childbearing decision-making
3. Extended family
   - Proximity to, and support received from, extended family
   - Opinions and influence of extended family members over childbearing decisions
4. Difficulties of raising children
   - Costs of child raising, and how these might be met
   - Influence of costs over childbearing decisions
   - Influence of health concerns over childbearing decisions
5. Women working
   - Importance of paid work for women and their households
   - The relationship between paid work and childbearing
6. Contraception and family planning
   - Opinions about modern, traditional, short and long-term methods of contraception
   - Reasons for using/discontinuing contraception
   - Communication about contraception within couples and between women
7. Reproductive intentions
   - Advantages and disadvantages of long/short birth spacing
   - Desired and community ideal family size
   - Ability to control family size
   - Ability to control timing of a birth

Each section consisted of a series of questions organised by topic and suggested probes for the moderator. During the pilot stage of the study the moderator followed the wording of the questions and the probes closely. In the later stages of the study, however, she was able to ask them in a more natural style.

The topic sections were ordered in such a way so as to guide the discussion through from simpler topics toward conceptually more complex questions about community norms surrounding childbearing, about the respondents' own reproductive intentions, and about how much certainty and control they felt that they had over their reproductive decision-making. The introductory section was designed to get the respondents thinking and talking about the topic. Thereafter, the

moderator proceeded onto the main part of the discussion. The pilot stage of the study showed that beginning the main body of the discussion with the questions about relationships worked best. The respondents talked confidently and animatedly about this topic, which helped to establish intra-group rapport for the rest of the sections.

Since the protocol was lengthy, not all of it was covered in each discussion; I judged it to be more important for the moderator and the respondents to have some freedom to control how much time they spent discussing each topic than to cover all sections fully. Generally, the topic to which the moderator gave less focus was either the extended family or women working. The protocol was edited during the pilot stage of the study; poorly understood questions were reworded and some questions were added. As the study progressed and transcripts were reviewed in depth, the protocol underwent further minor changes.

A total of six FGDs were conducted. This total includes two pilot discussions (one conducted in Korogocho and one in Viwandani). The decision to incorporate the pilot study was taken because both of them generated very valuable data. Furthermore, only minimal changes were made to the protocol used for discussions 2-6, thus the pilot transcripts did not differ greatly from the main-study transcripts. By FGD 6, data saturation level had been reached and I was clearly able to identify strong themes that were appearing in the discussions. Furthermore, each topic section had been covered in depth in a number of discussions. By the final FGD, participants had been selected from all the neighbourhoods of both settlements.

3.5.5 Analysis

The data from the focus groups were analysed using qualitative thematic analysis. This approach attempts to find out about the respondents' lives through what is said within the discussions. It endeavours to base the data interpretation within the particular context of the study and in the participants' perspectives, as opposed the analyst's perspective. In the write-up, data are presented as accounts of social events or social customs using illustrative quotes from the discussions (Silverman, 2011). Thematic analysis techniques allow the researcher to capture the rich and intricate meanings that are held within a qualitative dataset. One of the most cited advantages of thematic analysis is its flexibility: it can be used in a variety of different research contexts and applied to different kinds of data. In particular, it is recognised as working well with mixed methods research projects (Pope et al., 2007).

Grounded theory was ruled out as a potential analysis approach because the analysis of the quantitative data for the other sections of the PhD meant that a large amount of background literature on childbearing decision-making had already been read and a conceptual framework formulated. Grounded theory states that there should be minimal pre-research reviewing of the literature (Hallberg, 2010). However, as will be discussed in the next paragraphs, certain steps (open coding and memoing) of the analysis followed grounded theory procedure.

Thematic analysis of qualitative data uses codes to "identify and focus on explicit and implicit ideas within the dataset" (Guest, MacQueen, and Namey, 2012:10). The codes are created to correspond to these identified themes which are then applied to the transcript. The analysis of the data generated from this study began immediately after the first FGD had been held. The FGD and debrief notes were typed up and the main themes which had emerged were summarised.

Once the full transcripts were transcribed and translated, each one was read through a number of times before coding began. During the first stage of coding of the transcripts the data were open-coded. Analysis was conducted on a line-by-line basis, and a large number of concepts were highlighted. These concepts were then modified, merged and renamed and formed the coding structure shown in Figure 6. The process of open-coding allowed the codes to be grounded, as much as possible, in the data I had collected, rather than in the existing literature (Glaser, 1998). The full transcripts were coded in NVivo (version 9.2). During the coding procedure, I also created memos. These served as records of my ideas about concepts, codes and about relationships between codes (Glaser, 1998). The memos were later used to plan the write-up of the study findings.

The disadvantages of thematic analysis are twofold: first, it does not allow the researcher to examine the "process" of dialogue within the group, meaning it is easy to lose sight of where the coded data sits within the whole of the discussion (Silverman, 2011). In part, the problems associated with this were minimised because I was present during all the FGDs and I am currently able to remember the nature of the dynamics of the discussion and the interactions between the respondents. The debrief notes also served as reminders of these things. When choosing quotes to illustrate arguments, I referred back to the original transcript in order to understand the group context within with they were situated. The second issue associated with thematic analysis relates to the reliability of the thematic analysis, which is of greater concern with thematic than with the alternative word-based analysis methods, as more interpretation is involved in the creation of themes within the dataset than is needed to apply them to the raw data. I attempted to increase the reliability of my coding structure by discussing it with the primary research assistant, who was acting as the FGD moderator and had also been fully briefed on the academic background, aim and objectives of the study. Furthermore, I attempted to use "in vivo" codes as much as possible; these included phrases such as "lucky child", "organising oneself", "observe and investigate" and "raising a burden" which reappeared frequently in the transcripts. These codes helped to root my analysis firmly within the original dialogue of the discussions.

Figure 6   Diagram showing the Nvivo coding tree used for thematic analysis
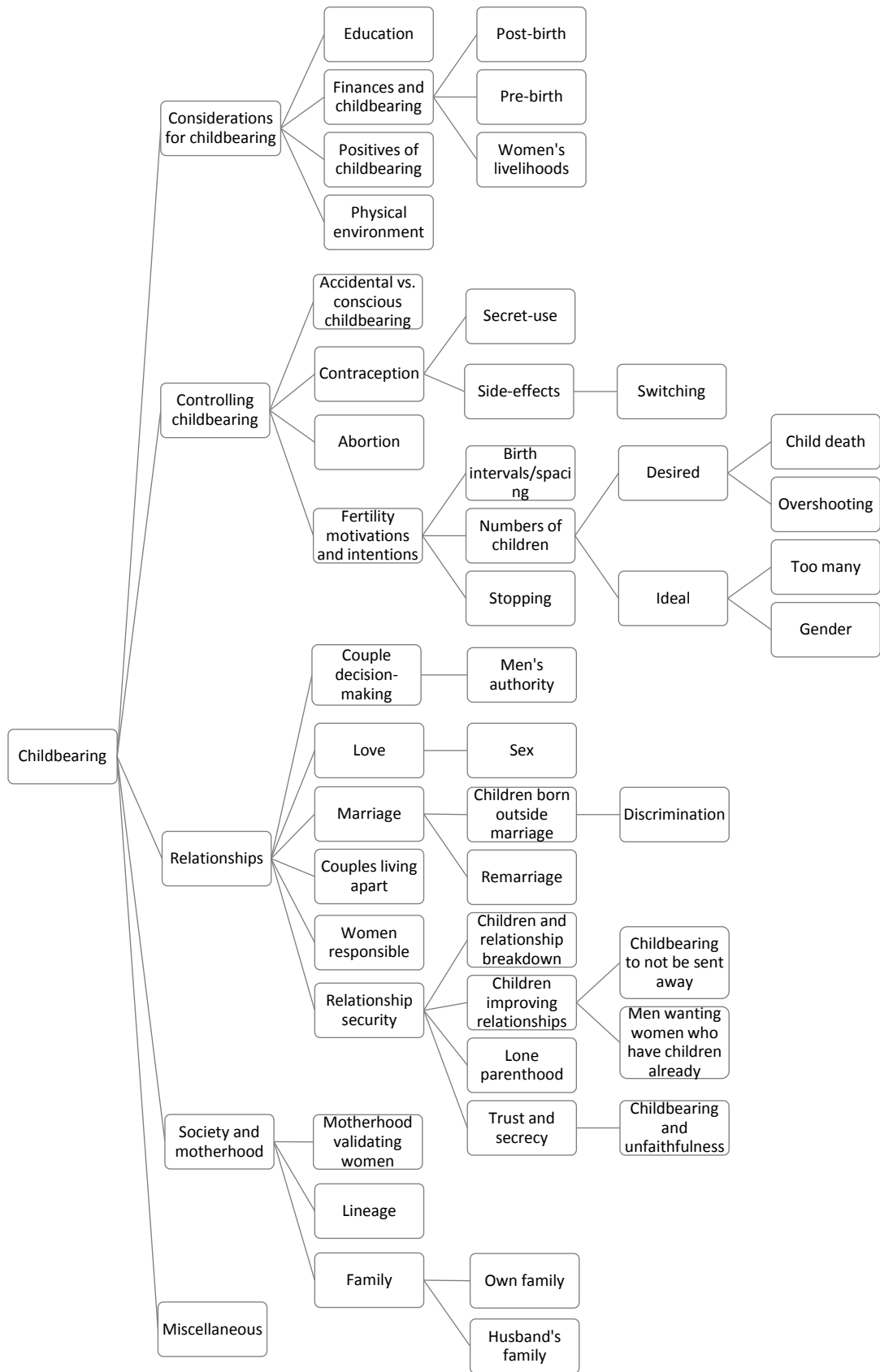
Results section I:
Birth intervals

Introduction

Section objectives

The first objective of this section of the thesis is to understand the extent to which lengthening birth intervals are a feature of fertility in rural and urban Eastern Africa, and to understand the family building strategies that might be driving these changes. A number of previous studies have shown that birth intervals have lengthened significantly in Sub-Saharan Africa, particularly in the southern region of the continent (Bongaarts and Casterline, 2012; Moultrie et al., 2012). I seek to provide an in-depth examination of trends in birth intervals in Eastern Africa. In particular, since the fertility transition is well established in urban areas, I seek to explore trends in birth intervals separately for rural and urban residence. I hope this will allow me to draw conclusions about their significance in the fertility transition of this region. Thus, the second objective of this section is to examine whether levels and trends in birth intervals and family building strategies vary between rural and urban areas.

The more detailed objectives for this section of the PhD are as follows:

1. To explore time trends in birth intervals and duration-specific fertility at the national level and among the following sub-groups:
    i. Women of different parities
    ii. Women residing in urban and rural areas
    iii. Users and non-users of contraception
    iv. Women with differing levels of education

2. To analyse whether there are differential time trends between rural and urban areas in the birth intervals and the duration-specific fertility of women of differing parities, users and non-users of contraception and women with differing levels of education

3. To understand what family building strategies are driving these changes, in particular whether it is parity-specific limitation, birth spacing or birth postponement

Structure of the section

This section of the PhD is divided into two chapters: the first examines trends in duration-specific fertility at the national and sub-national level. The results section of chapter 4 is comprised of four parts. The first explores changes to birth intervals, duration-specific fertility and family building strategies at the national level, the following three examine these trends by rural/urban residence, contraceptive use and educational level. This is followed by a summary of the results on a country-by-country basis. The chapter ends with a discussion of the national-level results.

The second examines differential trends in other sub-groups for rural and urban areas separately. It presents two sets of results: differential trends in birth-intervals and family building strategies by residence and contraceptive use and by residence and education. As with the previous chapter, the findings are followed by a review of the results on a country-by-country basis and a discussion.

4 Lengthening birth intervals

4.1 Results

4.1.1 National level

Regression models were created in order to calculate duration-specific fertility rates, from which life tables were created to calculate median birth intervals. Table 7 shows the full output for regression model 1, which was created to calculate the national-level median birth intervals (Figure 7) and duration-specific fertility rates (Figure 8). For easy reference,

Table 8 shows the estimates of median birth interval lengths at the national level and for all the sub-groups presented in the chapter.

Table 7　　　　　Full regression model showing national-level estimates of duration-specific fertility rates

	Ethiopia		Kenya		Tanzania		Zimbabwe	
	Coefficient	Standard Error	Coefficient	Standard Error	Coefficient	Standard Error	Coefficient	Standard Error
Mothers age at interval segment								
<15	-0.06	0.05	0.00	0.06	-0.04	0.07	0.03	0.08
15-19	0.07	0.01	0.06	0.02	0.07	0.02	0.06	0.02
20-24	0.08	0.01	0.14	0.01	0.11	0.01	0.12	0.01
25-29	0.00	-	0.00	-	0.00	-	0.00	-
30-34	-0.15	0.01	-0.18	0.01	-0.16	0.01	-0.18	0.02
35-39	-0.46	0.02	-0.47	0.02	-0.49	0.02	-0.54	0.02
40-44	-1.02	0.03	-1.07	0.04	-1.03	0.03	-1.22	0.04
45-49	-2.09	0.09	-2.05	0.11	-2.00	0.09	-2.23	0.12
Parity								
1	0.00	-	0.00	-	0.00	-	0.00	-
2	-0.04	0.10	0.32	0.11	0.16	0.10	0.14	0.08
3	0.08	0.12	0.40	0.12	0.04	0.11	0.06	0.10
4	-0.07	0.14	-0.03	0.13	-0.19	0.13	0.09	0.12
5	0.03	0.16	-0.16	0.16	-0.20	0.15	0.11	0.16
6	0.28	0.20	0.05	0.19	-0.33	0.19	-0.12	0.22
7	0.06	0.25	-0.23	0.24	-0.20	0.23	0.18	0.27
8	0.03	0.34	0.10	0.33	-0.80	0.31	-0.78	0.44
9	-0.06	0.47	-0.25	0.49	-0.91	0.46	-0.09	0.63
10	0.98	0.58	0.00	0.56	0.78	0.43	-0.89	0.84
Five-year period of interval segment								
1960-64	0.83	1.02	0.81	0.25	1.62	0.20	0.76	0.29
1965-69	0.55	0.19	0.59	0.20	1.40	0.16	0.64	0.23
1970-74	0.30	0.13	0.47	0.15	1.09	0.12	0.51	0.17
1975-79	0.22	0.09	0.38	0.10	0.77	0.08	0.37	0.12
1980-84	0.08	0.05	0.23	0.05	0.38	0.04	0.33	0.06
1985-89	0.00	-	0.00	-	0.00	-	0.00	-
1990-94	-0.06	0.04	-0.31	0.05	-0.33	0.04	-0.36	0.06
1995-99	-0.22	0.09	-0.48	0.10	-0.70	0.08	-0.55	0.11
2000-04	-0.34	0.13	-0.51	0.15	-0.99	0.12	-0.59	0.17
2005-10	-0.52	0.17	-0.61	0.20	-1.27	0.16	-0.78	0.23

Table 7   Full regression model showing national-level estimates of duration-specific fertility rates (continued)

	Ethiopia		Kenya		Tanzania		Zimbabwe	
	Coefficient	Standard Error	Coefficient	Standard Error	Coefficient	Standard Error	Coefficient	Standard Error
Interval segment (months)								
0-8	-3.48	0.37	-2.75	0.29	-2.02	0.25	-3.05	0.24
9-17	-0.89	0.12	-0.55	0.09	-0.30	0.09	-0.71	0.08
18-23	-0.27	0.07	0.17	0.06	0.29	0.05	0.11	0.05
24-29	0.01	0.05	0.41	0.04	0.46	0.03	0.37	0.03
30-35	2.8E-04	0.03	0.18	0.03	0.27	0.02	0.22	0.02
36-41	0.00	-	0.00	-	0.00	-	0.00	-
42-47	-0.21	0.03	-0.28	0.03	-0.37	0.03	-0.29	0.03
48-53	-0.38	0.05	-0.51	0.05	-0.71	0.04	-0.53	0.04
54-59	-0.60	0.08	-0.75	0.07	-1.01	0.06	-0.78	0.05
60-65	-0.81	0.10	-1.00	0.08	-1.25	0.07	-1.03	0.07
66-71	-0.97	0.13	-1.18	0.10	-1.55	0.09	-1.27	0.09
72-83	-1.29	0.16	-1.68	0.12	-2.02	0.11	-1.72	0.11
84-95	-1.51	0.21	-2.07	0.16	-2.44	0.15	-2.29	0.15
96-107	-1.62	0.27	-2.58	0.20	-2.85	0.18	-2.57	0.19
108-119	-1.78	0.34	-2.98	0.25	-3.41	0.23	-2.92	0.22
120-131	-1.53	0.42	-3.40	0.31	-3.43	0.27	-3.06	0.26
132-143	-1.86	0.54	-4.21	0.40	-3.93	0.32	-3.56	0.32
144-179	-1.83	0.80	-5.38	0.64	-4.81	0.44	-4.26	0.40
180-239	-1.00	1.62	-8.47	1.42	-6.18	0.84	-4.83	0.67
240+	6.64	6.33	-18.90	7.00	-7.74	3.92	-2.35	0.88
Ever-married at interval segment	-0.04	0.25	-0.12	0.13	-0.19	0.13	0.73	0.13
Parity by date of interval segment								
1	4.0E-04	2.4E-04	-2.9E-06	2.6E-04	3.0E-04	1.9E-04	-5.3E-04	4.0E-04
2	4.2E-04	2.4E-04	-2.2E-04	2.6E-04	1.9E-04	1.9E-04	-6.4E-04	4.0E-04
3	4.0E-04	2.5E-04	-2.5E-04	2.6E-04	2.5E-04	1.9E-04	-6.0E-04	4.0E-04
4	4.7E-04	2.5E-04	-5.4E-05	2.6E-04	3.8E-04	1.9E-04	-5.8E-04	4.0E-04
5	4.3E-04	2.5E-04	4.4E-05	2.6E-04	4.1E-04	1.9E-04	-5.6E-04	4.0E-04
6	3.2E-04	2.5E-04	-4.7E-05	2.6E-04	4.9E-04	2.0E-04	-4.2E-04	4.1E-04
7	4.3E-04	2.6E-04	1.1E-04	2.7E-04	4.6E-04	2.1E-04	-5.0E-04	4.1E-04
8	4.4E-04	2.8E-04	-4.8E-05	2.9E-04	7.3E-04	2.3E-04	-3.5E-05	4.4E-04
9	4.6E-04	3.1E-04	1.1E-04	3.4E-04	8.0E-04	2.7E-04	-3.3E-04	4.9E-04
10+	0.00	-	0.00	-	0.00	-	0.00	-
Interval segment by date of interval segment	1.4E-05	5.8E-06	-4.0E-06	7.6E-06	-6.6E-07	5.2E-06	1.7E-05	4.7E-06
Interval segment squared by date of interval segment	-9.0E-08	2.6E-08	5.2E-08	3.7E-08	-1.5E-09	2.1E-08	-6.4E-08	1.7E-08
Log interval segment by date of interval segment	-3.3E-05	1.2E-04	3.5E-04	1.5E-04	6.7E-04	1.2E-04	1.8E-04	1.1E-04
Never-married by date of interval segment	-1.7E-04	1.1E-04	-3.0E-04	6.1E-05	-2.9E-04	6.0E-05	1.9E-04	5.8E-05
Intercept	-4.51	0.81	-5.42	0.88	-8.56	0.71	-5.43	1.01

Table 8 Summary of median birth interval lengths presented in chapter 4

			Year					
			1965-69	1975-79	1985-89	1995-99	2000-04	2005-09
NATIONAL	**Ethiopia**		-	32.0	32.9	33.3	34.7	36.8
	Kenya		28.8	29.1	31.7	36.8	35.5	-
	Tanzania		30.8	31.9	34.6	36.5	36.5	36.3
	Zimbabwe		31.8	34.3	38.8	49.2	48.6	52.4
PARITY*	**Ethiopia**		-	29.3 - 33.6	30.1 - 34.1	30.5 - 34.5	32.1 - 36.0	34.2 - 38.5
	Kenya		28.2 - 30.4	27.5 - 29.9	28.7 - 32.2	31.7 - 36.4	29.9 - 34.9	-
	Tanzania		24.9 - 31.1	26.8 - 31.8	29.8 - 34.1	30.7 - 37.1	29.7 - 37.9	28.8 - 37.2
	Zimbabwe		28.5 - 32.2	28.8 - 34.6	30.2 - 39.2	34.9 - 49.3	33.4 - 48.8	34.3 - 52.6
RESIDENCE	**Ethiopia**							
		Urban	-	30.4	35.8	41.3	47.0	55.4
		Rural	-	31.9	32.5	32.6	33.8	35.4
	Kenya							
		Urban	31.5	33.5	38.9	49.4	47.3	-
		Rural	28.4	28.7	30.8	35.2	34.0	-
	Tanzania							
		Urban	30.3	33.7	39.7	45.9	47.8	49.5
		Rural	30.6	31.4	33.7	34.9	34.8	34.6
	Zimbabwe							
		Urban	35.7	39.9	47.0	63.8	63.8	70.3
		Rural	30.7	32.8	36.4	45.4	45.3	48.7
CONTRACEPTIVE USE	**Ethiopia**							
		Ever-use	-	35.4	40.7	44.3	47.9	52.2
		Never-use	-	21.1	21.6	21.5	22.0	22.6
	Kenya							
		Ever-use	33.0	37.9	45.6	59.0	57.3	-
		Never-use	23.2	23.2	23.9	25.3	24.4	-
	Tanzania							
		Ever-use	35.8	40.7	50.1	59.0	61.6	64.7
		Never-use	21.4	21.9	23.1	23.7	23.7	23.8
	Zimbabwe							
		Ever-use	36.7	41.0	47.1	62.4	62.6	69.1
		Never-use	28.8	29.8	31.9	37.6	36.8	39.0
EDUCATION	**Ethiopia**							
		No education	-	33.2	36.4	39.2	42.3	47.4
		Primary	-	30.3	36.4	41.9	47.5	55.4
		Secondary+		41.2	72.6	91.3	120.0	-
	Kenya							
		No education	30.8	31.9	34.5	39.8	37.9	-
		Primary	29.0	31.4	35.8	44.4	43.5	-
		Secondary+	**29.5**	33.6	40.5	53.8	52.8	-
	Tanzania							
		No education	30.4	35.8	40.7	51.6	50.7	54.2
		Primary	31.0	33.9	39.0	43.7	45.1	46.2
		Secondary+	**30.0**	34.8	43.4	53.5	57.3	60.4
	Zimbabwe							
		No education	33.1	35.8	40.7	51.6	50.7	54.2
		Primary	34.2	37.6	43.3	56.7	56.4	61.7
		Secondary+	41.0	44.7	50.9	65.7	65.0	71.3

* For parity the minimum and maximum estimates of median interval lengths for women of parities 1-10+ are presented

Birth intervals

Figure 7 shows the trend in the median length of birth intervals by country, between 1965 and 2010. The estimates presented are for a woman who is aged 25-29, has ever been married and has three children. As has been shown already by Moultrie et al. (2012) (using different methods), there has been a clear trend toward longer birth intervals in all four countries over the observation period. In the late-1960s birth intervals had a median length of between 27 and 30 months. Since then they have lengthened markedly. This trend was most pronounced in Zimbabwe, where the median birth interval increased from 32 months in 1980-84 to 52 months in 2005-09. The phenomenon of lengthening birth intervals has been shown previously to be most marked in Southern Africa (Moultrie et al., 2012; Casterline et al., 2011). However, while the increase in Ethiopia, Kenya and Tanzania since the 1980s has been less dramatic, it was still substantial: by the time of the most recent survey the median interval in all four countries stood at approximately 36-37 months (an addition of 5-7 months). The increase in birth interval length appears to have stalled in Kenya in 2000-04 and Tanzania in 2005-09.

Figure 7   Trends in median birth interval length by country
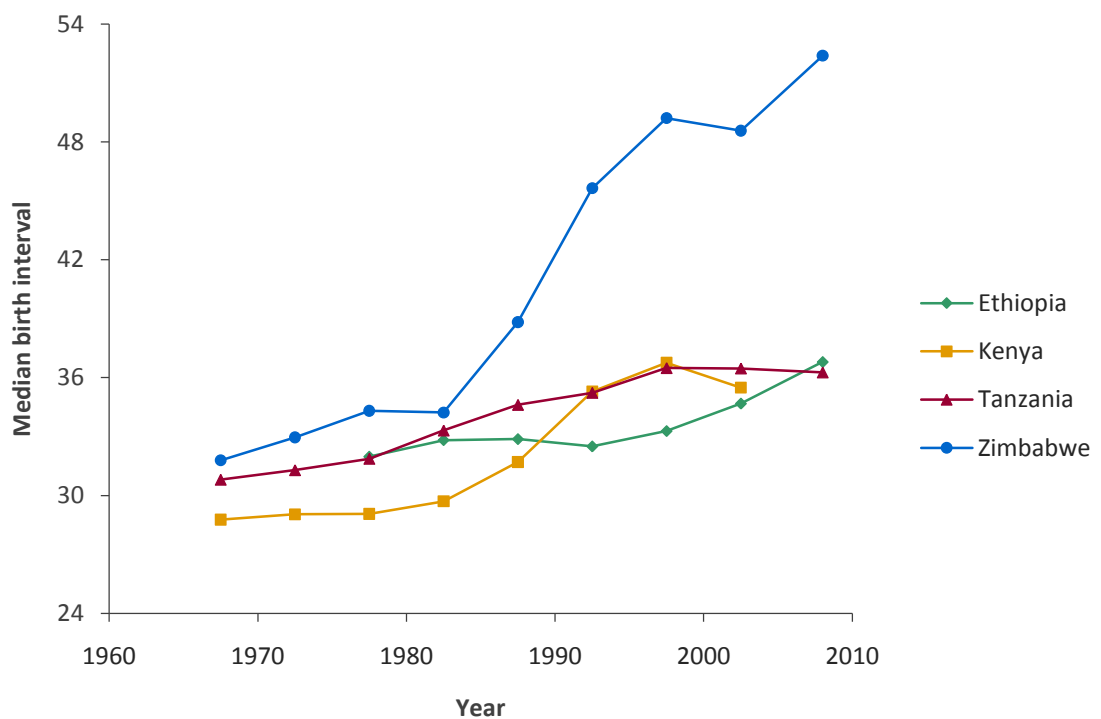
Note: Estimates presented for an ever-married woman, who has three children and is aged 25-29

Family building strategies

Duration-specific fertility

In order to explore the changes to family building strategies that may be driving the increases in birth interval length shown in Figure 7, graphs of the duration-specific fertility rates are explored alongside the details of the regression models. The series of interactions between interval duration, interval duration squared, the log of interval duration, parity and calendar period allow the duration-specific fertility rates to vary in shape by calendar period and by sub-group (i.e. residence, contraceptive use or education). As Timaeus and Moultrie (2013) have argued, differential spacing produces a rightward-shift of the birth interval distribution along the x-axis, while limiting can be identified by a downward shift of the fertility schedule at all durations. Finally, postponement produces a flattening of the fertility schedule, with lower rates at shorter durations and higher rates at longer durations. Therefore, reductions in fertility due to spacing are a function of interval duration and its log, whereas decreases in fertility due to the postponement of births are a function of interval duration and its square. The coefficients for the interaction term with parity allow us to identify whether any of the sub-groups have experienced proportionate parity-specific reduction in the duration-specific rates over time, which Timæus and Moultrie (2013) argue is indicative of family limitation.

The graphs in Figure 8 show the duration-specific fertility rates in 1975-79 and more recently in 2000-04. We observe very little change in the duration-specific fertility rates for Ethiopia, which is confirmed by the lack of significant interactions between the three measures of interval and calendar time. In both Kenya and Tanzania, there has been a significant drop in the incidence rates at shorter durations, which has been accompanied by a slight rise in the incidence rates at longer durations. Although the interaction terms for the identification of postponement were not statistically significant, the pivoting of the birth interval distribution to the left, with lower birth rates at shorter durations and higher rates at longer durations, is suggestive of increasing postponement in these populations (Timæus and Moultrie, 2008). In addition, in Tanzania a slight shift of pattern of duration-specific fertility to the right of the x-axis is observed. This is indicative of increased birth-spacing durations within a population (Timæus and Moultrie, 2008). Indeed, the regression model shows a statistically significant interaction between the log of interval duration and calendar period in both Tanzania and Kenya.

The change between the two periods of observation has been most dramatic in Zimbabwe, which serves as a clear example of birth postponement. A large fall in the fertility rates at both short and medium durations and minimal change at long durations means that, except in the first two years, there is rather little variation in the incidence rate by interval duration in 2000-04. The coefficients for the interactions between interval duration and period and between interval duration squared and period shown in Table 7 show that this change is statistically significant.

Table 7 also shows that there has been little parity-specific change to duration-specific fertility in the region. Only in Tanzania and Zimbabwe are significant coefficients for the interaction between parity and period observed. In Tanzania, however, there has not been a differential decline by parity: rather there has been an increase in fertility at higher parities (5-9) with little increase at lower parities. In Zimbabwe, the decrease in duration-specific fertility has been less among women at parities 8, 9 and 10+.

Figure 8   Birth interval duration-specific fertility rates for 1975-79 and 2000-04
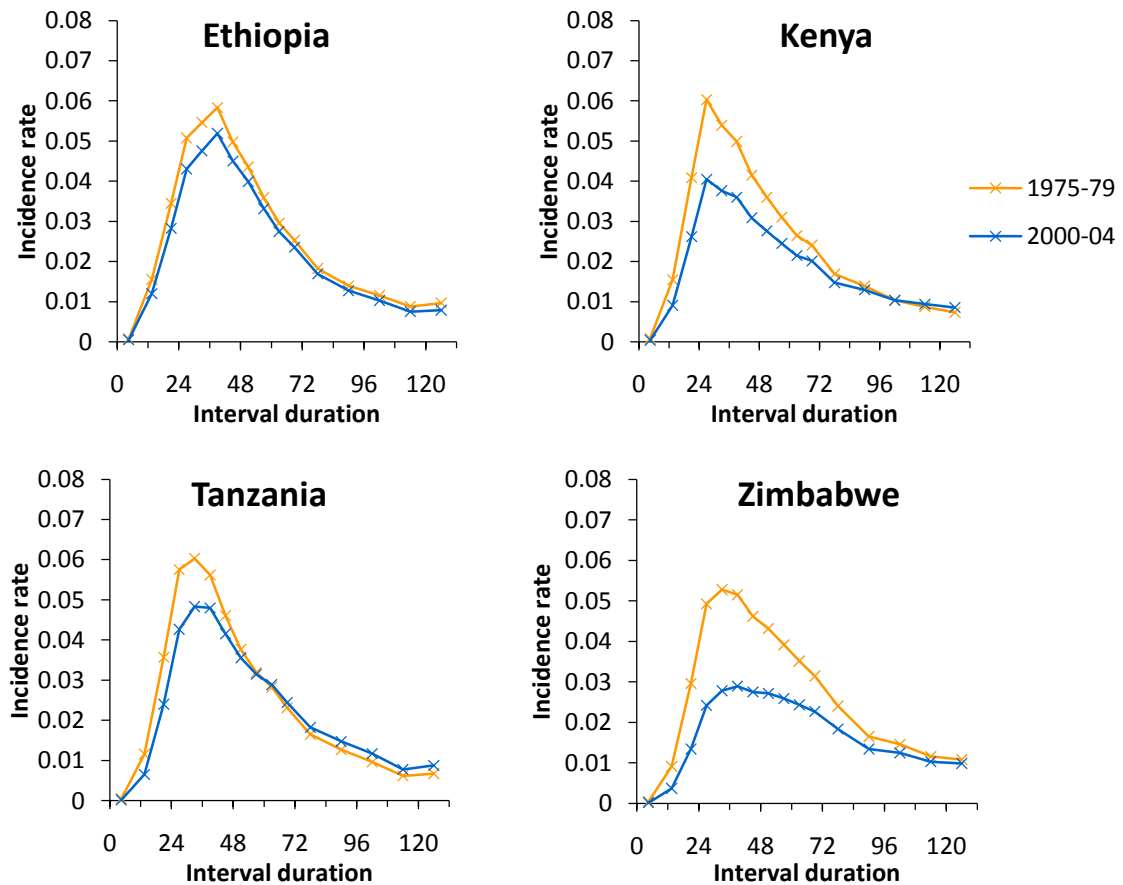
Note: Estimates presented for an ever-married woman, who has three children and is aged 25-29

4.1.2 Parity-specific change

Birth intervals

It has been argued that birth interval lengthening in Sub-Saharan Africa (which is thought to be a result of postponement) has occurred in a largely non-parity specific manner (Moultrie et al., 2012). Indeed, this is line with Caldwell et al's (1992) prediction that fertility change on the continent will be largely parity non-specific. However, given that there is some evidence of parity-specific change to duration-specific fertility in Tanzania and Zimbabwe, a more in-depth examination of the relationship between women's existing family size and family-building strategies is presented. The next set of results examine whether there is any evidence to suggest whether birth interval length and birth spacing or postponement vary by parity. The parity-progression ratios are also presented, in order to make a more detailed examination of the evidence for family limitation at the national level.

Figure 9 shows time trends in birth interval length by parity. Time is represented on the *x*-axis, median birth interval length is shown on the *y*-axis and each line represents a parity (with the darker shades representing lower-order parities and lighter shades higher-order parities). The graphs illustrate that, controlling for the effect of age, rather little variation exists in birth interval length by parity. In Ethiopia, Kenya and Tanzania intervals vary by 4 and 8 months between parities in 2000-04. Zimbabwe is an exception, however, and the median duration of the intervals varies by 20 months between parities in the most recent five-year period.

Differential trends in the median birth interval by parity are generally small in all four countries, the lines of the graph are clustered closely together across almost all parities, suggesting that changes in birth interval length do not vary much by a woman's existing number of children. (With the exception of Ethiopia, where intervals have lengthened by between 4 and 8 months, with no concentration at either low or high parities.) In Kenya and Tanzania, intervals have lengthened by between 1and 7 months, and mostly at lower parities. In Tanzania, we also observe some slight shortening at longer parities (ignoring the anomalous estimates for high-order births). The major exception is Zimbabwe. In this country significant variation has emerged over time by women's existing number of children. Birth intervals have lengthened most at parity two (22 months). Nevertheless, significant lengthening has also occurred at high parities (6 months among women who have 10 or more children).

Figure 9   Trends in median birth interval by parity
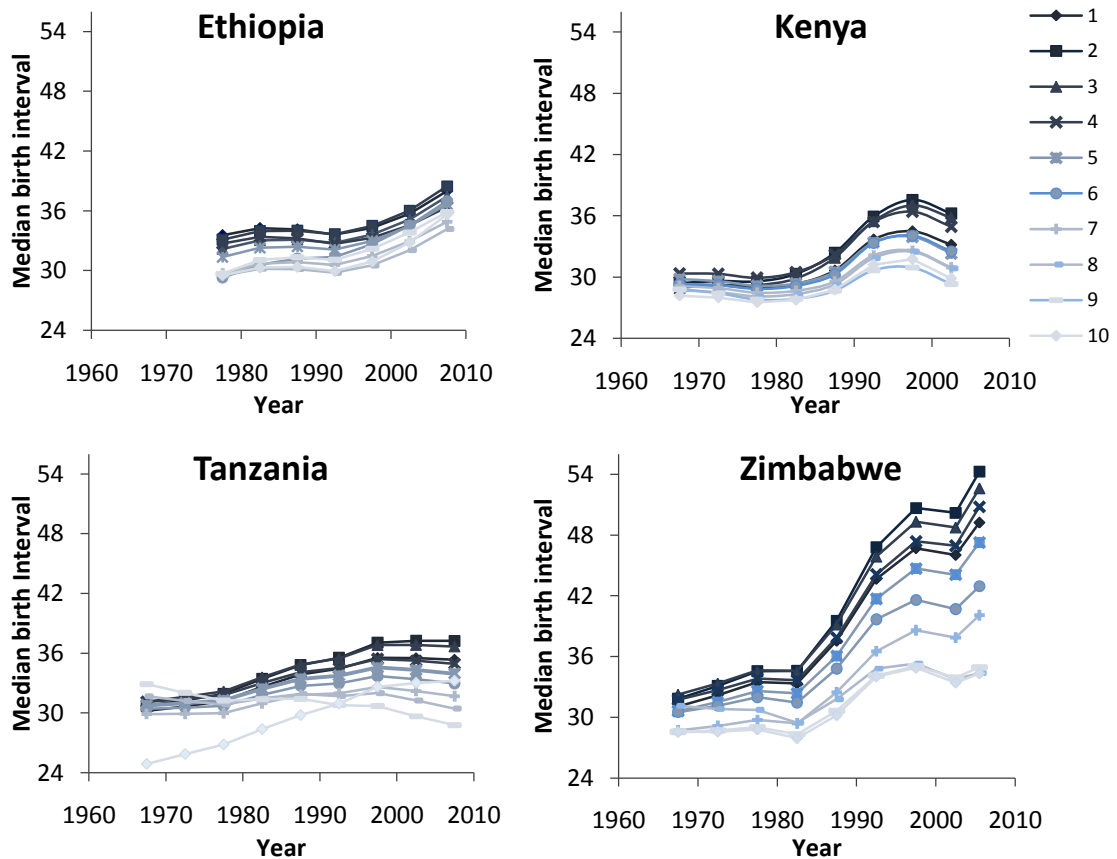
Note: Estimates presented for an ever-married woman aged 25-29

Family building strategies

Duration-specific fertility

In order to further understand the changes to parity-specific median birth intervals shown in Figure 9, the duration- and parity-specific fertility rates are explored in detail. The output from regression model 2, shown appendix 4, shows that there appears to have been little parity-specific change to the duration-specific birth rates that underlie these median birth intervals. Figure 10 shows a graphical representation of these changes. The figure suggests that birth postponement appears to be more common among women of lower parities. No parity-specific change to duration-specific fertility is found in Ethiopia. In Kenya, there has been a slight rise in fertility at longer durations among women at lower parities. In Tanzania a fall in the peak fertility at 24-29 months has occurred among women of lower parities. Indeed, the regression model shows a series of statistically significant coefficients for the interaction between parity and interval duration squared. As expected, significantly more change is observed in Zimbabwe. Fertility has fallen more at lower parities. Figure 10 shows that in this population, the duration-specific fertility schedules for women of lower parities has rotated, suggesting that birth postponement is occurring more dramatically among women with fewer children. However, this change is not found to be statistically significant.

Figure 10   Birth interval duration-specific fertility rates by parity in 1975-79 and 2000-04
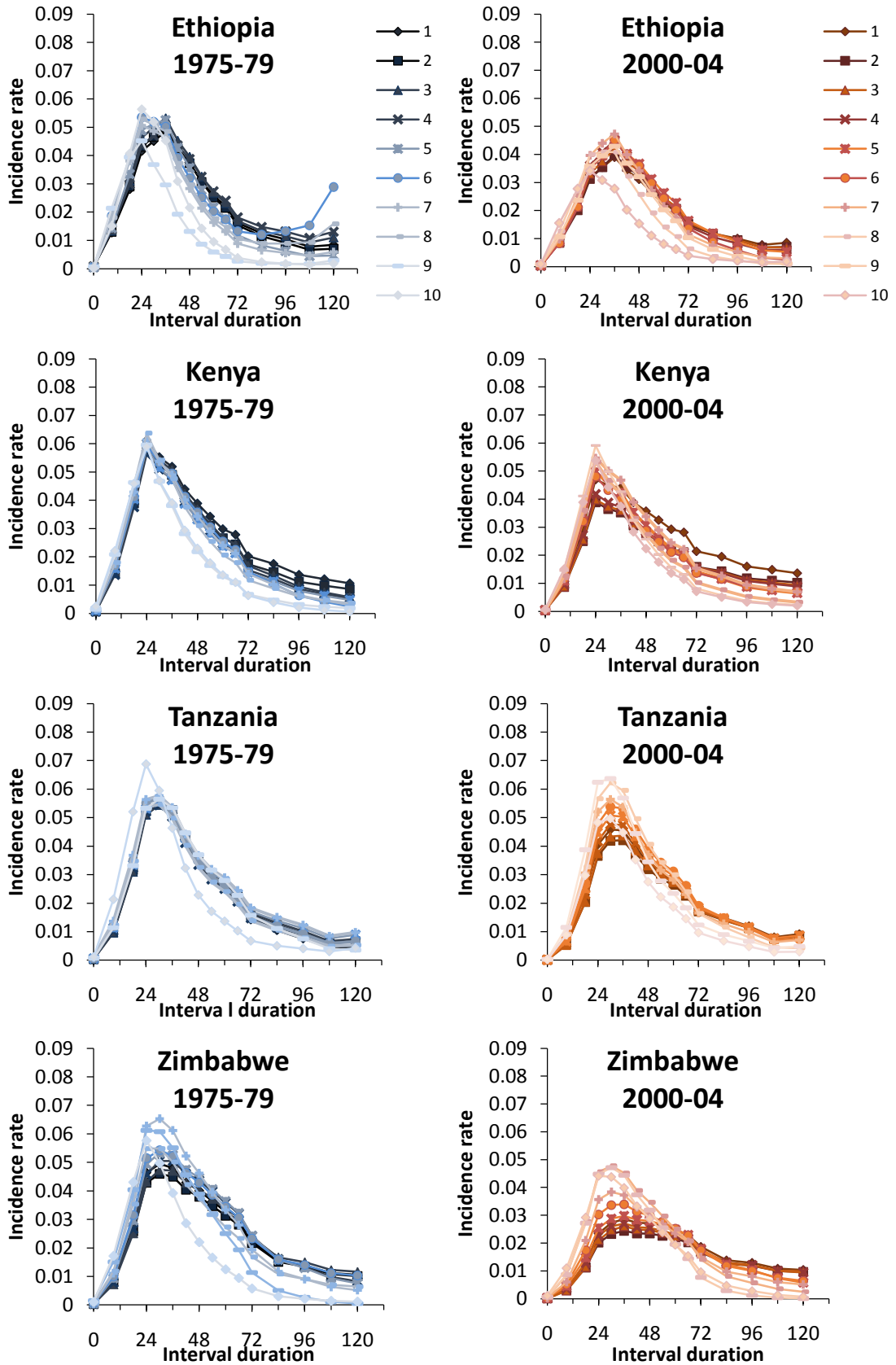
Note: Estimates are presented for an ever-married woman aged 25-29

Parity progression ratios

In order to further examine family limitation in the four countries, trends in parity progression ratios by 120 months following a woman's previous births are presented in Figure 11. Trends are shown for women progressing from parity 1 to 2 through to women progressing from parity 7 to 8. Ratios for women of higher parities are not shown since sample sizes are small and extrapolation of the data meant that the estimates were likely to be erroneous. Parity progression ratios examine fertility as an incremental family building process and allow for further examination of family limitation behaviour.

Figure 11   Trends in parity progression by 120 months by parity at the national level
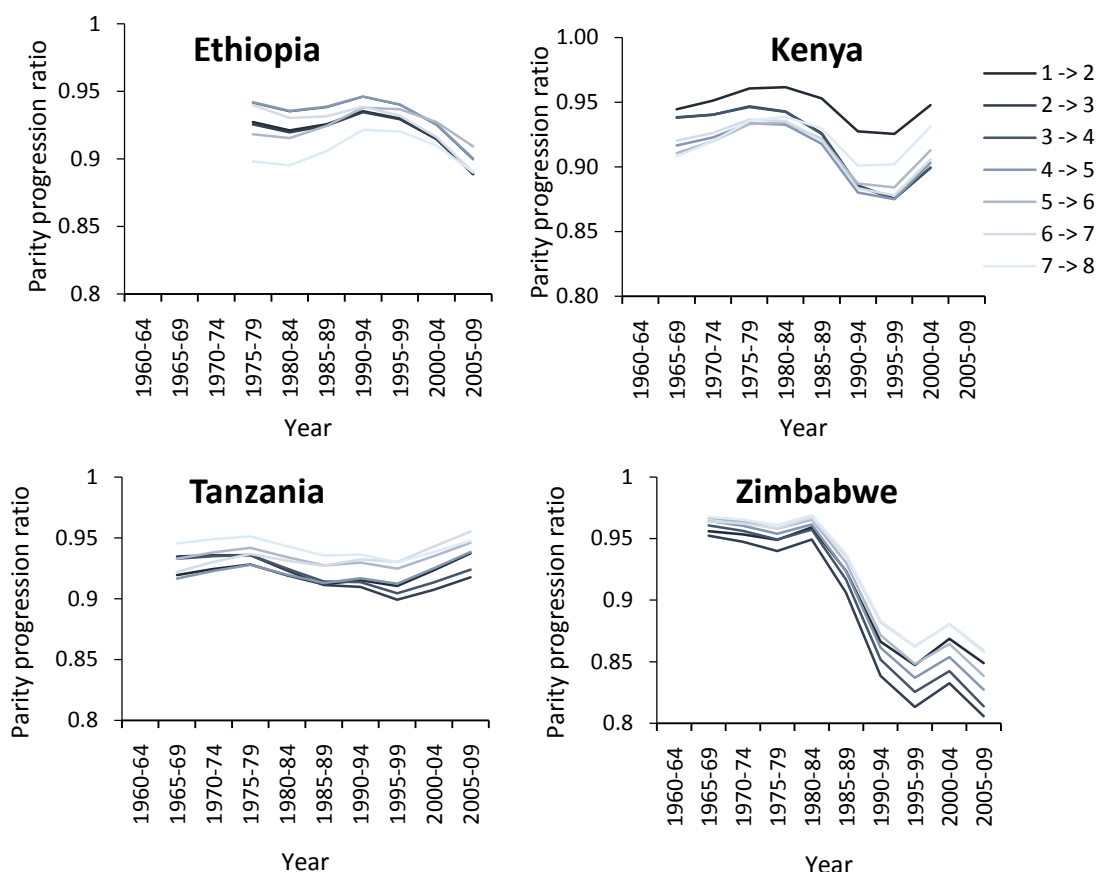
In Ethiopia and Zimbabwe, there has been a fall in parity progression among women of all parities. This decline has been greatest in Zimbabwe. In Kenya parity progression ratios fell and then rose again, a trend which is in keeping with changes to total fertility and with median birth interval lengths. In Tanzania, very little change over time has occurred. In Tanzania and Ethiopia, little variation in the progression ratios is observed between the parities. In Zimbabwe, there is greater divergence by parity. However, it is interesting to see that the fanning out of the parity progression ratios has only occurred since the early 1990s, after the progression ratios had already fallen significantly. Since then, the decline in parity progression ratios has been greater among women who have already had two or more children than women who have one child. In Kenya, progression ratios have differed by parity over the entire observation period. The decline in parity progression has been greater among women with two children or three children than women who

have only one child or women have four to six children. The fact that there has been some concentrations of the decline in parity progression ratios among middle-parity women in Kenya and in Zimbabwe since the mid-1990s is indicative of family limitation.

4.1.3 Residence

Birth intervals

Figure 12 presents trends in median birth interval length over time by residence. It shows that birth intervals are significantly longer in urban than rural areas and that the trend toward longer median intervals has been more rapid in urban areas. At the most recent survey, the median birth interval in urban areas had risen to 47-50 months in Ethiopia, Kenya and Tanzania and 70 months in Zimbabwe. With the exception of Kenya, where a slight decline in birth interval length was observed between 2000-04 and 2005-09, the rapid increase in birth interval length shows little sign of stagnation. By comparison, less change has been observed in most rural areas although the median birth interval now exceeds 34 months in all four countries. The greatest change in rural areas has occurred in Zimbabwe, where the median interval lengthened by 18 months. This accounts for the magnitude of change that was observed at the national population level (Figure 7). In rural Kenya there has been a slight shortening of the median birth interval since 1995-99. The median length of birth intervals in rural Tanzania has been stagnating since the late 1990s.

Figure 12   Trends in median birth interval length by residence
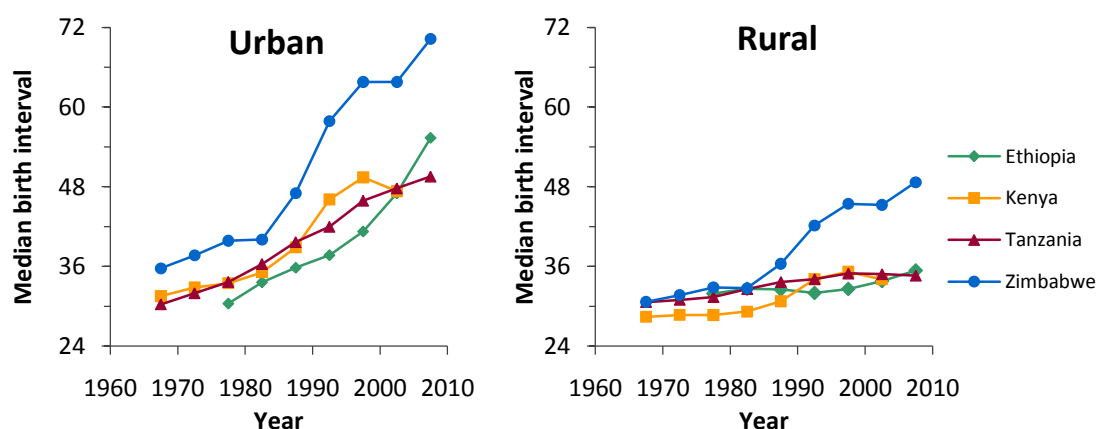
Note: Data is standardised for an ever-married woman, who has three children and is aged 25-29

### *Family building strategies*

Duration-specific fertility

An examination of duration-specific fertility rates by residence (Figure 13) shows there has been a fall in the birth rates at all interval durations, though most dramatically at shorter durations, in both rural and urban areas. Rural Ethiopia is an exception, with no decline in duration-specific fertility observed between 1975-79 and 2000-04. The decrease in duration-specific fertility has mostly been larger among urban women, and the differential trend is statistically significant in Kenya and Tanzania (see appendix 5). This differential decline in duration-specific fertility has been particularly large in Ethiopia and Tanzania. At the interval duration of 24 months, the fall in urban fertility has been five times greater in Ethiopia and two times greater in Tanzania than the decline in rural fertility.

In all four countries, urban fertility varies less by duration since last birth than rural fertility. Furthermore, the flattening out of the distribution has occurred more rapidly among urban women compared with rural women. Zimbabwe provides the clearest example of this: in 2000-04 between 24-30 months and 120-132 months following the previous birth duration-specific fertility drops by only 0.02 among urban women. In Zimbabwe, a change in the pattern of birth intervals in rural areas is also observed. Here fertility has also fallen more steeply at shorter durations of the interval. The change to duration-specific fertility in rural Zimbabwe is much greater than in the rural areas of the other three countries of observation. Although these trends in duration-specific fertility suggest a trend toward increasing postponement in urban areas, this is only statistically significant in Kenya.

Although the trends are too slight to be visible in Figure 13, the regression model output also suggests that spacing patterns differ between rural and urban women in Kenya, Tanzania and Zimbabwe countries, with urban women being more likely to space a birth for a longer period of time. Of these three countries, only in Kenya did this differential increase significantly over time.

Some evidence of family limitation exists in urban areas. In Ethiopia, there has been a reduction in the fertility rates at all durations of the birth interval, which is a pattern of change that results from increased stopping in a population (Timæus and Moultrie, 2013). However, the interaction between parity and rural/urban residence is not statistically significant. In Kenya, the interaction coefficients are significant, suggesting that there is some parity-specific change occurring to the duration-specific fertility of urban women. According to Timæus and Moultrie's (2013, 2008) suggested interpretation of the regression model , this indicates that urban women are more likely than their rural counterparts to be limiting their family size. However, the pattern of duration-specific fertility for urban areas for the most recent period resembles postponement, with a clear rise in fertility at longer durations. It may therefore be that it is parity-specific postponement rather than parity-specific limitation that is occurring in urban Kenya. The role of family limitation in urban Kenya will be explored more in the following section.

Figure 13   Birth interval duration-specific fertility rates by residence in 1975-79 and 2000-4
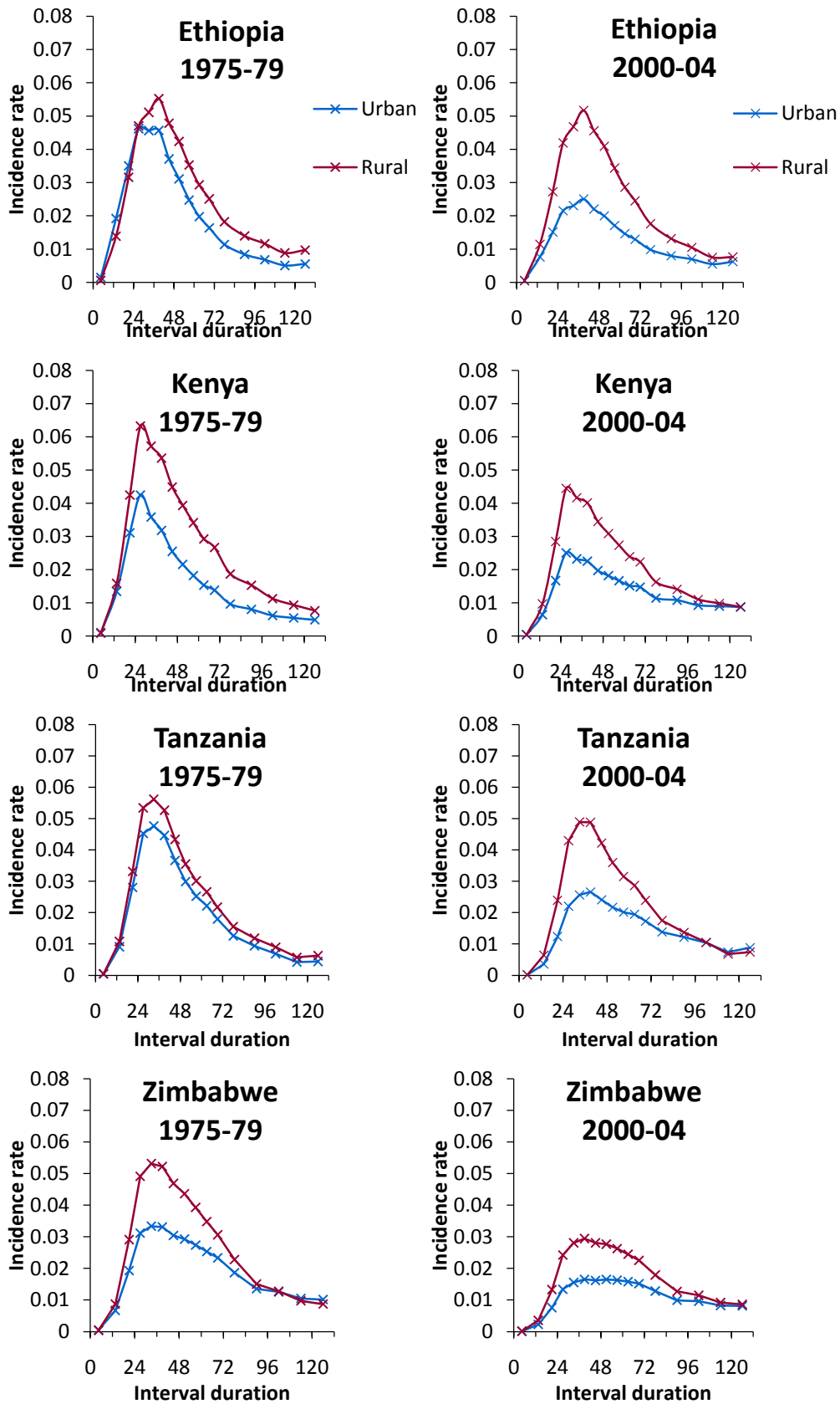
Note: Estimates presented for an ever-married woman, who has three children and is aged 25-29

Parity progression ratios

Figure 14 shows the parity progression ratios for urban and rural areas of both Ethiopia and Kenya. These analyses are only presented for these two countries since the patterns of duration-specific fertility and the interactions between residence and parity suggested family limitation occurring among these populations.

Figure 14   Parity progressions ratios for urban Ethiopia and urban Kenya
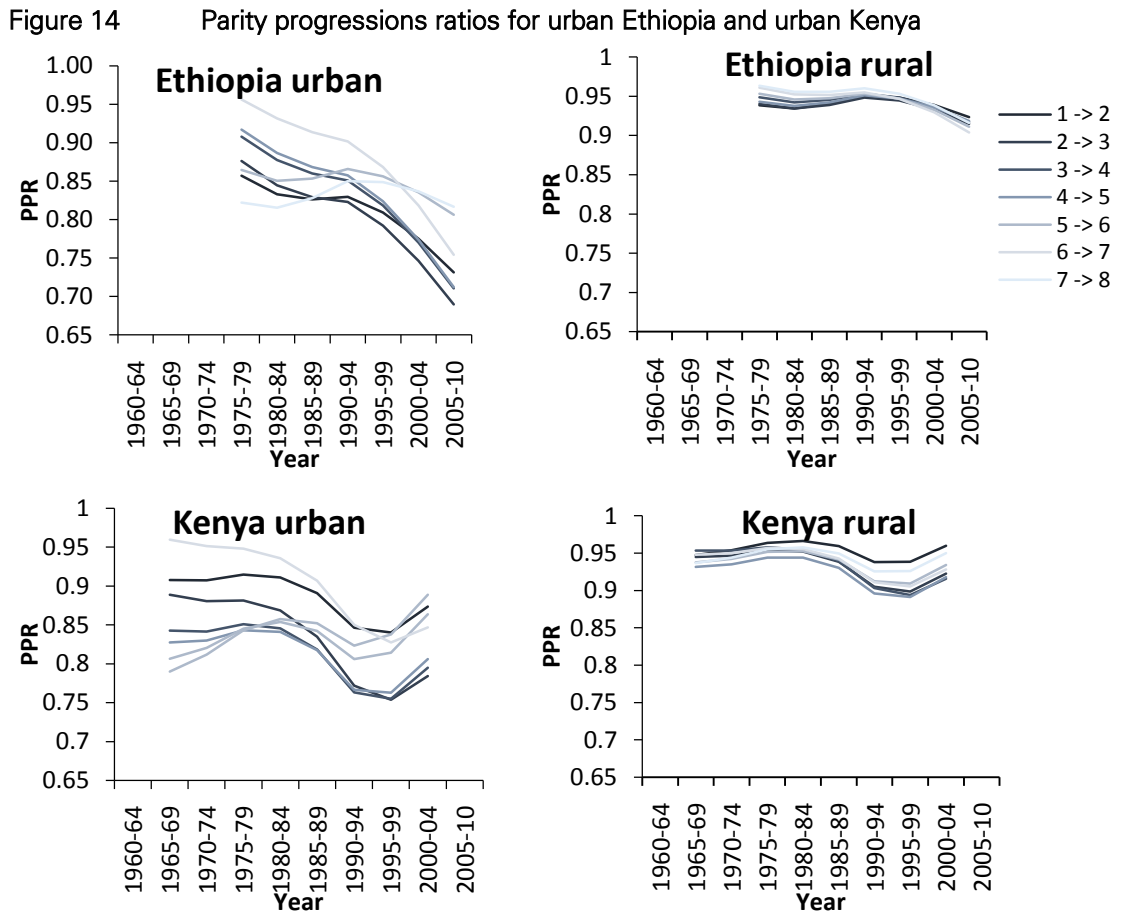
In urban Ethiopia, parity progression ratios have been falling since the mid-1970s and the pace of decline has accelerated since 1990-94. In contrast, almost no change has occurred to parity progression ratios in rural areas. The decline in parity progressions ratios among urban women is much greater than was observed at the national level. Although the progression ratios have fallen for women of all parities, there are signs of emerging differentiation by parity among urban women. Since 1990-94 the decline has been greater among women of parities 2 to 6, and smaller among women who have one child and among women who have 7 or more children. This fall in the proportions of progression among women at these middle parities is indicative of emerging parity-specific family size limitation.

There is also further evidence of parity-specific family size limitation in urban Kenya. Figure 14 shows that the decline in progression ratios that was occurring until the 1990s was greater among women of parities two, three and four. This is similar to what was observed at the national level in Figure 11, although, as with Ethiopia, a greater amount of differentiation by parity has occurred. Little change has occurred in the rural areas of both Kenya and Ethiopia.

4.1.4 Contraceptive use

Birth intervals

Figure 15 shows median birth interval length among ever and never-users of contraception. In all four countries, birth intervals are longer among women who had ever-used contraception by the time of the index interval. The differences between the two groups is 7 months in Tanzania, 9 months in Ethiopia, 13 months in Kenya and 14 months in Zimbabwe in the most recent time period. Birth intervals have lengthened most rapidly among the ever-users, although in Kenya there appears to have been a recent stagnation in birth interval length among this group of women. At the most recent point of observation, median birth intervals among never-users of contraception are between 30 and 31 months in Ethiopia, Kenya and Tanzania, compared with 43 months in Zimbabwe. In Ethiopia, Kenya and Tanzania, intervals among this sub-group of women have remained at an almost constant length over the observation period. Zimbabwe is an exception, where the median interval has lengthened by 14 months among never-users.

Figure 15   Trends in median birth interval length by ever-use of contraception
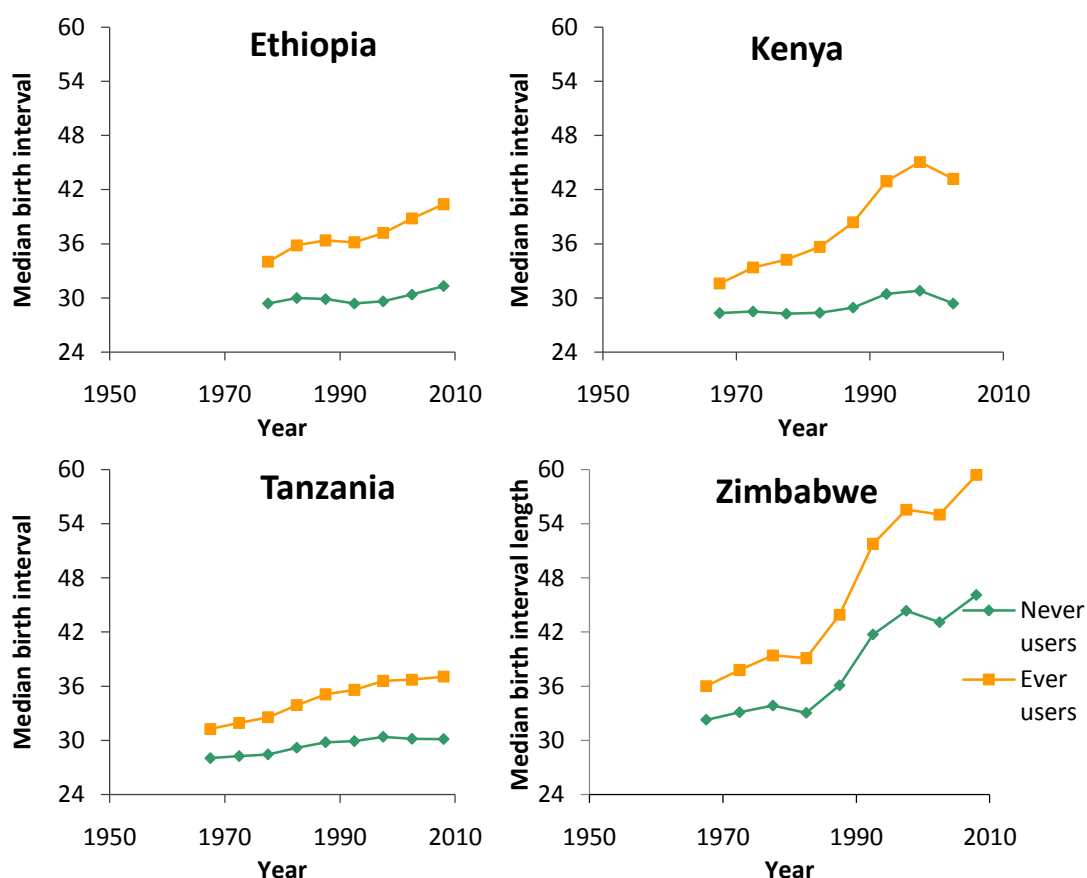
Note: Estimates presented for an ever-married woman, who has three children, is aged 25-29 and lives in an urban area

Family building strategies

Duration-specific fertility

Figure 16 shows the corresponding duration-specific fertility rates among ever- and never-users of contraception, standardised on age, parity and urban residence.

The duration-specific fertility rates of never-users of contraception have remained relatively constant between the two periods in all countries, with the exception of Zimbabwe. In comparison, the duration-specific fertility among ever-users of contraception has generally fallen at shorter durations of the interval and risen at longer durations.

In Ethiopia, Kenya and Tanzania, there is evidence of increasing postponement among ever-users of contraception. In all three countries, there has been a rise in the fertility at longer durations following the previous birth, which has resulted in an intersection of two schedules in 2000-04. This rise has been particularly dramatic in Tanzania. However, the output from the regression model (shown in appendix 6) shows that this change is not statistically significant in these three countries.

The fertility of both sub-groups of women is lower in Zimbabwe in both time periods. Furthermore, in 1975-79 there is already evidence of differential postponement among ever-users of contraception. In this time period, the fertility of ever-users was lower at shorter interval durations and higher at longer durations, relative never-users of contraception. This differential is also evident in 2000-04. The pattern of fertility among ever-users of contraception in this time period varies little by duration after 24 months following a woman's previous birth. The output from regression model 4 shows this increase in birth postponement to be statistically significant in Zimbabwe.

In all four countries the peak of the duration-specific fertility schedule has also shifted rightward along the *x*-axis in the more recent time period, suggesting that there has been a shift towards longer birth spacing patterns among women who have used contraception. This change is statistically significant in both Tanzania and Zimbabwe.

The interaction between parity and contraceptive use is not significant in all four countries, indicating that there is no evidence of a differential in parity-specific change among ever-users and never-users of contraception.

Figure 16   Birth interval duration-specific fertility rates among by ever-use of
                 contraception in 1975-79 and 2000-04
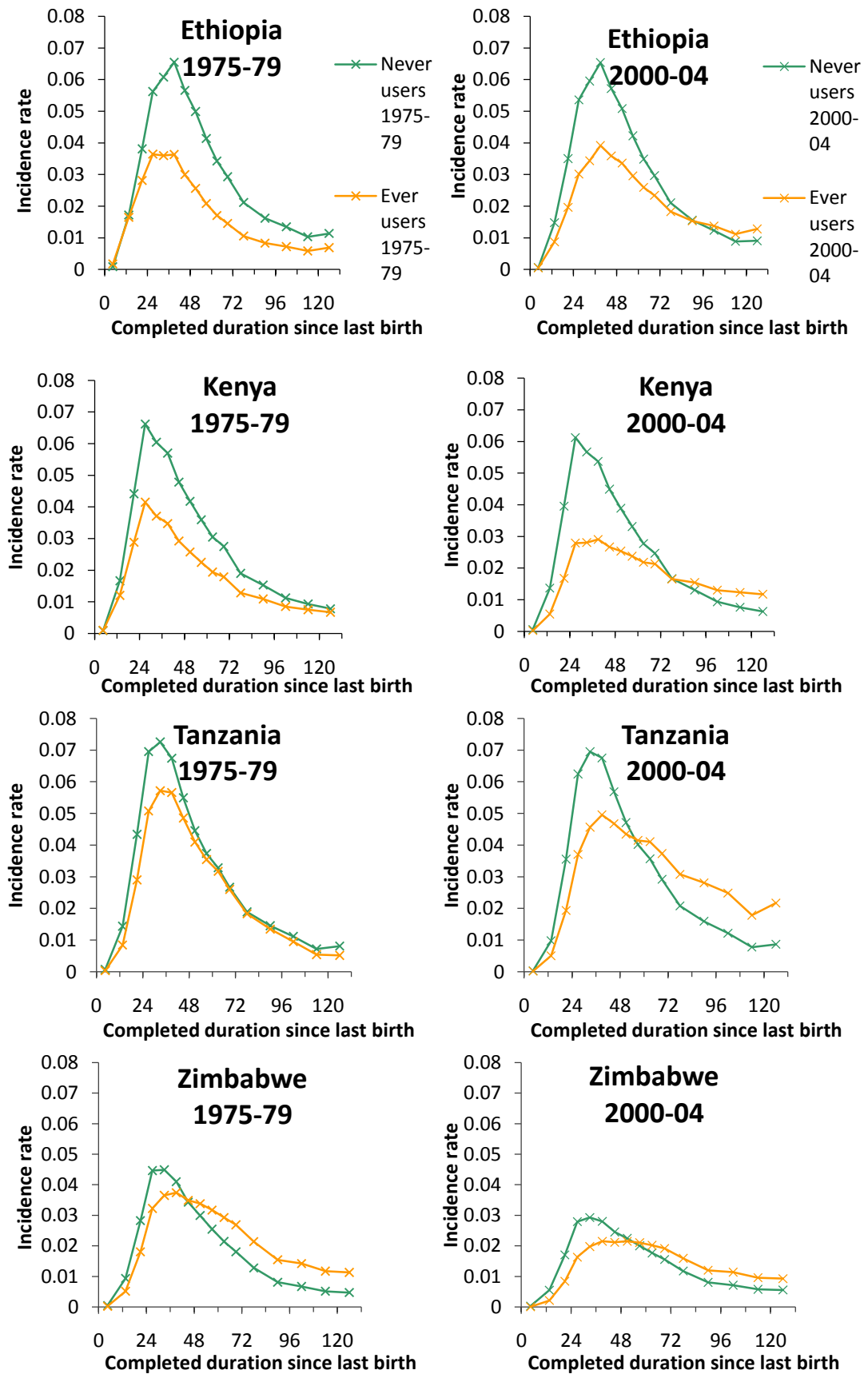
Note: Estimates presented for an ever-married woman, who has three children and is aged 25-29 and lives in
an urban area

4.1.5 Education

Birth intervals

Figure 17 shows median birth interval by education level. The birth intervals of women who have received no education and those who have received primary education are very similar in length. The difference between the intervals of the two groups in the most recent period varies between 8 months in Ethiopia and 4 months in Tanzania. There has been little change in this trend over time, although in recent periods the intervals of primary educated women have lengthened more rapidly than those of women with no education.

In all countries, the birth intervals of women who have attended secondary or higher level education have lengthened more rapidly than those for less educated women. This is particularly clear in Ethiopia. In 1995-1999 the median birth interval length among secondary educated women was 120 months. For the two most recent time periods less than 50 per cent of the intervals were closed, preventing the calculation of the median birth interval length. In the other three countries the differences between the median birth intervals of women who have attended secondary school and those with less education are smaller but still substantial: ranging between 14 months in Tanzania and 9 months in Kenya.

Figure 17 Trends in median birth interval length by highest level of education attended
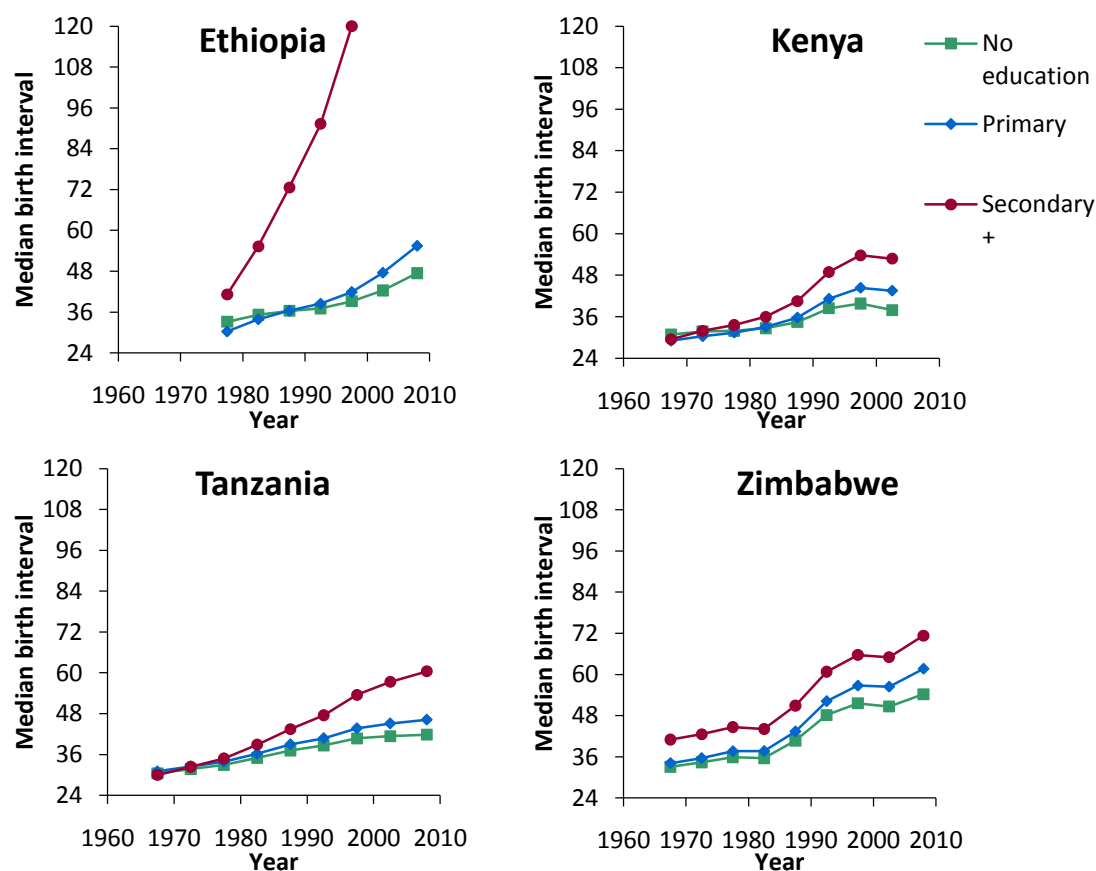
Note: Estimates presented for an ever-married woman, who has three children and is aged 25-29 and lives in an urban area.

Family building strategies

Duration-specific fertility

Figure 18 shows the duration-specific fertility rates for women of differing levels of education. These rates are derived from a model that is standardised on women aged 25-29, of parity three who live in urban areas.

Between 1975-79 and 2000-04, duration-specific fertility has declined among women of all educational levels in all four countries. As with Figure 17 above, little difference is observed between women who have never attended school and those who have primary level education, in either time period.

In Kenya, Tanzania and Zimbabwe secondary or higher educated women have lower fertility at shorter durations of the birth interval and higher fertility at longer durations. This is a pattern of change that results from increasing postponement of births. Indeed, the regression model shows significant coefficients for the interaction between birth interval duration squared, women of secondary level education and calendar time in Kenya and Zimbabwe. Thus, indicating that there is an increasing amount of postponement among secondary educated women. In Ethiopia, the coefficient for the two-way interaction between birth interval duration squared and women of secondary level education is significant, suggesting that in Ethiopia, these women are more likely to postpone a birth than women with primary or no education. However, this differential is not increasing significantly over time.

In all four countries, the addition of an interaction between education and parity does not improve the explanatory power of the model. This implies that parity-specific change to duration-specific fertility is not occurring more among women with higher levels of education. However, in Ethiopia, the pattern of change to duration-specific fertility for women who have attended secondary school or higher education appears to show a trend towards increasing family limitation. A comparison with the distribution of secondary or higher educated women in 1975-79 shows a decline in fertility has occurred at all durations of the interval. This will be explored further in the chapter 5.

Figure 18   Birth interval duration-specific fertility rates by highest level of education
                   attended in 1975-79 and 2000-4
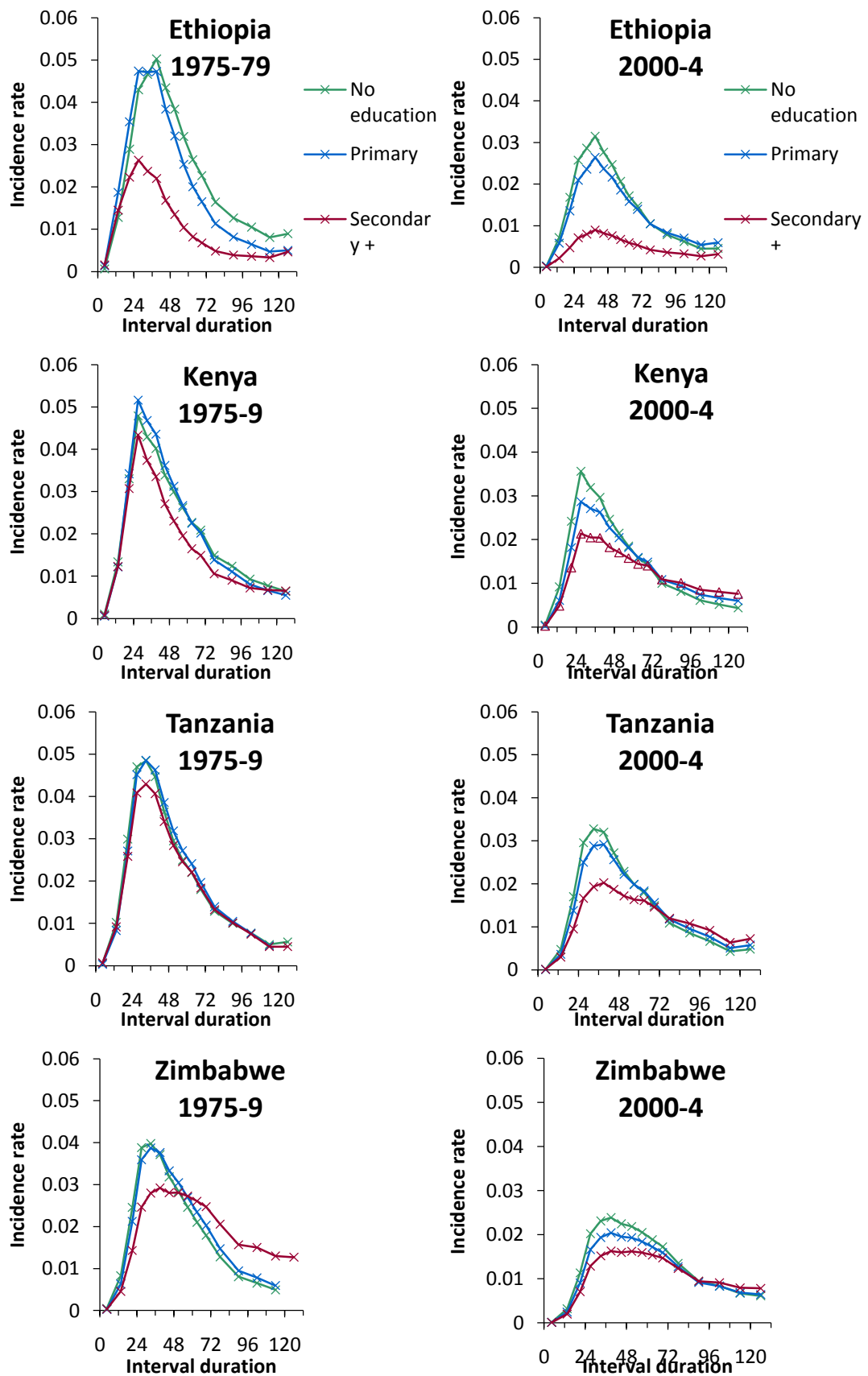
Note I: Estimates are presented for an ever-married woman, who has three children and is aged 25-29 and lives in an urban area

91

4.2 Summary by country

4.2.1 Ethiopia

Birth interval changes

Birth intervals for married women aged 25-29 who have three children have a median length of 36.8 months in Ethiopia. The country has witnessed an accelerating increase in the length of intervals since 1990-94. When the changes were examined by residence, intervals in urban areas were found to have increased steadily over the entire observation period. As expected, less change has occurred in rural areas, although the pace of change has increased since the mid-1990s. As in the other countries, a steady increase in the median birth interval length of ever-users of contraception was found. In contrast, less lengthening was found among never-users of contraception. Analysing birth interval change by educational level shows a rapid increase among women who have secondary or higher education, and to a much lesser extent among women who have primary or no education.

Family building strategies

Of all the countries under observation, we observe the least change in the family building strategies at the national level in Ethiopia. Almost no change has occurred to the pattern of duration-specific fertility in this country over the last three decades. In urban areas there is slight indication of family limitation, with a reduction in fertility at all durations of the interval, a trend not observed in rural areas. There has been a steep decline in parity progression ratios among urban women since the mid-1990s and the extent of this trend varies little by parity. However, in recent years this decline appears to have been less pronounced among low-parity women. In rural Ethiopia, the lack of change to duration-specific fertility is striking; in no other country has there been so little change. Among women who have ever-used contraception and those who have attended higher levels of education we find indication of increasing family limitation, characterised by a reduction in duration-specific at all durations of the birth interval. There has been little change to the patterns of birth spacing in Ethiopia.

4.2.2 Kenya

Birth interval changes

At the national level the median birth interval for the average woman (aged 25-29, married with three children) in Kenya stands at 33.2 months. The country has witnessed a moderate lengthening of birth intervals over time. In many respects, the intervals of Kenyan women are similar to those of Tanzanian and Ethiopian women. However, Kenya is the only one of the four countries to have witnessed a decline in birth interval length at any point. This reversal in the previously consistent trend of lengthening occurred between 1995-99 and 2000-04. As well as being observable at the national level, we also see it among all the sub-groups examined: birth intervals shorten in this period among urban as well as rural women, among those who had ever-used contraception as well as those who had never used contraction and among women of all educational groups.

Family building strategies

At the national level in Kenya, a statistically significant increase in the durations of birth spacing can be observed, indicated by a right-ward shift along the *x*-axis in the peak of duration-specific fertility rates over time. There is also some suggestion of increasing postponement, although this was not found to be statistically significant. Examining family building strategies at the sub-national level, we find that there have been changes to the birth spacing patterns among urban women and those who have secondary level education, with the peak of duration-specific fertility occurring at longer durations for the interval. Postponement also appears to be becoming increasingly important among these two sub-groups of women. There also appears to be evidence of some parity-specific family size limitation at the national level and in urban areas, with a decline in parity progression ratios that is concentrated among women of parities two to four.

4.2.3 Tanzania

Birth interval changes

Birth intervals at the national level stand at a median of 36.3 months for women aged 25-29 who have ever-been married and have three children. The pace of change has been fairly slow and has stalled in recent years. An examination of birth interval length by parity reveals very little increase among any of the groups. Indeed, Tanzania is the only country in this analysis where differential decrease in interval length by parity has occurred (among women of higher birth orders). We observe a steady lengthening of birth intervals among urban women, with very little change having taken place in rural areas. The birth intervals of Tanzanian women who have ever-used contraception have lengthened somewhat since the mid-1990s, although less than has been seen in the other three countries. Examining intervals by education revealed a steady increase among women who have secondary or higher education, and a more moderate increase among those who have primary or no education.

Family building strategies

At the national level, Tanzania has witnessed increases in the durations of spacing behaviour over time. As in Kenya, there is also indication of increasing postponement over time. This is not found to be statistically significant at the national level, but is for lower parity women. However, it is worth noting that this change is a proportionally smaller *increase* in the duration-specific fertility rates of women at lower parities. There is no evidence of family-limitation in Tanzania; there has been almost no change to parity progression ratios.

Compared with rural Tanzanian women, urban women have become significantly more likely to space a birth for longer periods than rural women over time. They also appear to be becoming more likely to postpone a birth, although this difference is not statistically significant. Similarly, ever-users of contraception are increasingly more likely to have longer birth spacing patterns, as compared with women who have never used contraception. The rise in fertility among ever-users at longer birth interval durations also suggests that they are becoming increasingly likely to

postpone a birth. There are signs that women who have secondary or higher education are becoming increasingly likely to postpone a birth, however this change is not statistically significant.

4.2.4 Zimbabwe

Birth interval changes

The increases in birth interval length have been most dramatic in Zimbabwe. In the most recent period, the median birth interval for the average woman (aged 25-29, ever-married with three children) stood at 52.4 months, which is between 16 and 17 months longer than in all three other countries under observation. There has been a noticeable increase in the pace of change since the 1980's. Unlike in Ethiopia, Kenya or Tanzania, significant lengthening has occurred across all sub-groups.

Family building strategies

Zimbabwe provides the clearest example of birth postponement in this analysis. For women who are two or more years into their birth intervals, the duration-specific fertility rates at the national level and among many of the sub-groups vary very little by time since a woman's last birth. At a national level, there is a strong trend towards increasing postponement over time, with the greatest increase in birth interval length occurring among lower parity women. There is also evidence at the national level of a recent move towards parity-specific family limitation: a greater decline in the parity progression ratios has occurred among women in the mid-parities (2-4). Zimbabwe is distinct in that both rural and urban areas women appear to be postponing births (although this trend is more pronounced among urban women). Ever-users of contraception were found to be significantly more likely to postpone a birth, while the changes in the duration-specific fertility rates of never-users are suggestive of increasing durations of birth spacing. Similarly, women who have attended secondary school were significantly more likely to postpone a birth, compared with their less-educated counterparts.

4.3 Discussion

This chapter aimed to explore differences and time trends in birth intervals and family building strategies in Ethiopia, Kenya, Tanzania and Zimbabwe. It sought to do so at a national level, and also by parity, residence, contraceptive use and education level.

National level

It has been shown that birth intervals in Ethiopia, Kenya, Tanzania and Zimbabwe are long (between 31 and 46 months) in each country and have been lengthening continuously since the 1970s or earlier. This phenomenon has been observed in a number of other studies, including those of Moultrie and colleagues (Moultrie et al., 2010, 2012; Timæus and Moultrie, 2008), and Casterline and colleagues (Bongaarts and Casterline, 2012; Casterline et al., 2011). Median birth intervals are significantly longer in Zimbabwe than in the other three countries analysed, confirming that extremely long intervals are concentrated in Southern Africa. However, birth intervals have also been getting longer in the other three Eastern African countries studied. To a certain extent, this is to be expected given the overall trends in fertility in the four countries. (Zimbabwe's fertility has consistently been lower than the other three countries under examination.) As Moultrie et al. (2012) have shown birth, intervals are lengthening most significantly in countries with lower total fertility rates and higher contraceptive prevalence. However, the difference between Zimbabwe's overall fertility trends and those of Ethiopia, Kenya and Tanzania's is not nearly as dramatic as the comparative trends in median birth interval length.

A change in family building strategies over time has been found to have occurred in Kenya, Tanzania and Zimbabwe. Kenya and Tanzania have both witnessed a trend of increasing birth spacing over the observation period. In Zimbabwe, a clear pattern of increasing postponement was found. While there is strong evidence of increasing spacing in both Kenya and Tanzania, the patterns of duration-specific fertility also reveal signs of emerging postponement. In contrast, Ethiopia is the only country where no change has occurred. The observed association between birth interval lengthening and changing fertility control motivations is consistent with the existing literature on this topic. Moultrie and colleagues (Moultrie et al., 2012; Timæus and Moultrie, 2008) have argued that extremely long birth intervals (such as those observed in Zimbabwe) cannot be explained by birth spacing in its traditional conceptualisation, but rather by increased birth postponement.

Parity-specific change

In addition to lengthening birth intervals, there is some evidence of parity-specific changes in fertility in the four countries. There has been some differentiation in median birth interval lengths by parity. In Ethiopia, Kenya and Tanzania there is little difference in the length of birth intervals among women of different parities. However, in Zimbabwe, birth intervals now vary considerably by parity: in the most recent period this range stands at 20 months. An examination of the trends over time suggests that parity differentials might become more important as birth intervals lengthen

95

further. Despite Tanzania being the only country to have witnessed statistically significant differential postponement by parity, the schedules of duration-specific fertility in both Kenya and Zimbabwe also suggest that postponement may be occurring more commonly among women of lower birth orders. The apparent concentration of birth interval lengthening and postponement among lower parity women challenges the conclusion reached by Moultrie and Timæus, who argue that these phenomena have occurred evenly across women of all parities (Moultrie et al., 2012).

Parity progression ratios were also explored. Little change was found to have occurred over time in Ethiopia and Tanzania. In Zimbabwe and Kenya a larger decrease in parity progression ratios has occurred. Until recently in Zimbabwe this decline was largely non-parity specific i.e. was occurring evenly among women of all parities. However, since the mid-1990s the decline has been greater among women of middle and higher parities than among women who have just one child. This suggests that there is a trend of increasing parity-specific family limitation in this population. There was also evidence of family limitation since the early 1980s at the national level in Kenya. Here, the decline in parity progression has been greater among women with two or three children, as compared to women who have one child or women who have four to six children.

Thus, there are emerging signs of parity-specific family size limitation at the national level in the study region, however these patterns of change are somewhat distinct from those observed in fertility transitions in other regions of the world. Typically, from the onset of transition the declines in Asia were largely concentrated among women of parities three to five or six (Brass and Juárez, 1983; Collumbien et al., 2001). The comparatively minor role of parity in the trends documented in this chapter lend broad support to the prediction made by Caldwell et al (1992) that the fertility decline in Sub-Saharan Africa will occur rather evenly among women of all ages and parities, although the situation appears to be more nuanced than this hypothesis suggests.

Residence

The examination of birth interval length by residence has revealed that birth intervals in urban areas are very long. Furthermore, the pace of change in urban areas has been significantly faster than that observed at the national level and shows few signs of levelling off or reversal. Birth intervals were also found to have been lengthening in rural Eastern Africa; however, the speed of change in these areas has been much slower. The disproportionate lengthening of birth intervals in urban areas further serves to highlight the significance of this phenomenon as it might be expected that birth intervals would shorten in urban areas. Urbanisation has shortened periods of lactational amenorrhea particularly in East and Southern Africa through increased supplementary feeding of infants and declining intensity of breastfeeding (Ndugwa et al., 2011). In addition, declines in post-partum abstinence have been greatest in urban areas (Egbuonu et al., 2005; Ndugwa et al., 2011).

There are different combinations of family building strategies occurring in the urban areas of these four countries. In all four countries fertility varies less by duration of the birth interval in urban areas than rural areas. In Kenya, Tanzania and Zimbabwe the intersection of the two fertility

schedules at longer durations of the birth interval strongly suggest differential postponement. As with the national level results, urban Zimbabwe provides the clearest example of this trend (although it is also the population that has experienced most change to birth intervals and duration-specific fertility in rural areas). Kenya is also found to have significant evidence of postponement in urban areas. In addition to postponement, the regression models revealed patterns of birth spacing have become longer in the urban areas of Kenya, Tanzania and Zimbabwe. There is also evidence of increasing parity-specific family limitation in the urban areas of Kenya with a fall in parity progression ratios among mid-parity women. In urban Ethiopia there has been a steep decline in the progressions ratios of women of all parities (although this decline has been less pronounced among women with one child), suggesting that fertility decline in this population is largely due to non-parity specific limitation.

Clearly, in the four countries under examination a woman's place of residence has important implications for her birth intervals and for her motivations for fertility control. This is an important finding: the current literature on birth intervals in Sub-Saharan Africa does not discuss rural and urban differentials in any detail. These results provide further evidence to support Shapiro and Tambashe's (2000) argument that urban areas are playing a key role in fertility decline on the continent. I would argue that the fertility transition is well underway in urban Eastern Africa, since birth intervals of 50 months or more can only be observed in populations where women are taking deliberate measures to control their fertility. The differential trends in birth intervals and family building strategies in urban and rural areas will be explored in more detail in the following chapter.

Contraception

This chapter has explored the relationship between birth interval length and contraceptive use. It has shown that median birth intervals have been consistently longer among those women who have ever-used contraception and that fertility decline has been concentrated in this group. The difference between these groups at the most recent period of observation is at least 8 months in all four countries being analysed. A recent decrease in the median birth intervals among this sub-group of women is observed in Kenya; however this is in line with a decline in birth intervals among all the sub-groups in this country. Little change is observed in the fertility of never-users of contraception, except in Zimbabwe where intervals have lengthened by 14 months among never-users.

The examination of duration-specific fertility revealed significant differences in both time periods in the patterns of duration-specific fertility between ever and never-users of contraception. The distribution of never-users peaks at shorter durations of the birth interval and has changed little between 1975-79 and 2000-04, while the pattern of ever-users has become much flatter across all durations of the interval. In Ethiopia, Kenya and Tanzania there has been very little change to the schedules of duration-specific fertility among never-users of contraception. In Zimbabwe, there

has been a twisting of the pattern of duration-specific fertility among never-users over time, with falling fertility at shorter durations of the interval and rising fertility at longer durations. This suggests increasing postponement of births over time among this sub-group.

Among ever-users of contraception in all four countries there has been a fall in fertility at two or more years following a birth and a rise in fertility at longer durations (8 years or more). This suggests increasing postponement of births over time. In addition, the rightward shift of the fertility schedule along the *x*-axis suggests that birth spacing patterns have become longer among ever-users of contraception. Finally, no evidence of a differential in parity-specific change to fertility between ever and never-users of contraception was found.

These findings reflect the findings of Moultrie and colleagues: that lengthening birth intervals across Sub-Saharan Africa are associated with contraceptive use (Moultrie et al., 2012). This relationship will be explored further, and the limitations of the contraceptive use measure will be discussed in chapter five.

Education

While little differences between length and the trends of the birth intervals of women who have never attended school and those who have primary level education, large differences are found between this two sub-groups and those women who have secondary or higher level education. Among secondary educated women in Kenya, Tanzania and Zimbabwe postponement is found to increasingly be the dominant motivation for fertility control. The distributions of birth intervals for this sub-group have fallen sharply at shorter durations and risen considerably at longer ones. In Ethiopia, the regression model showed greater amounts of postponement among women with higher levels of education. However, the pattern of duration-specific fertility also strongly suggests increasing amounts of family limitation among this sub-group. Indeed, increasing family limitation results in fewer birth intervals being closed, and this would explain the increasing proportion of open-ended intervals that prevented the median birth intervals from being calculated in 2000-04 and 2005-09.

These findings are largely in line with the existing literature on the relationship between education and fertility. There is a widely acknowledge negative relationship between a woman's years of education and her fertility. Education is known to raise the opportunity costs of bearing children. Educated women are more likely to encourage their own children to attend school, which requires a higher level of parental investment and reduces the availability of the child to assist with domestic tasks. Indeed, educated women are thought to want to invest more time and resources into each child in a number of ways, not just through education. Furthermore, the fact that women who have experienced some level of schooling themselves are more likely to live in nuclear families means that these costs are primarily borne by parents and rather than by the wider extended family. Education diminishes parental dependence on children in old age or early widowhood and reduces

infant and child mortality, which, in turn, is hypothesised to reduce the desired number of children (Kravdal, 2002).

In addition to these 'demand-side' factors, education is also theorised to reduce fertility through a number of 'supply-side' factors. Women who have attended school have a later age at marriage, which reduces their total number of childbearing years. It also increases their knowledge and acceptance of modern family planning methods as well as their knowledge of more traditional methods such as prolonged breastfeeding and post-partum abstinence. The literacy and numeracy skills that women gain in formal education increase their productivity and strengthen their decision-making autonomy (Kravdal, 2002).

However, this relationship is often non-linear. Research from across low-income countries has systematically shown that among women with just a few years of schooling there is little evidence of an association between education and fertility. On the other hand, among women with secondary or higher level education, the relationships between these two variables is systematically negative (Jejeebhoy, 1995). Thus it is not unexpected that little or no differential is observed between the birth intervals and duration-specific fertility patterns of women who have never attended school and those who have attended primary school.

Between-country trends and differentials

Despite a deliberate choice of four populations with differing socio-economic and demographic indicators, a striking lengthening of birth intervals has occurred in Ethiopia, Kenya, Tanzania and Zimbabwe. In addition to the work of Moultrie and colleagues (Moultrie et al., 2010, 2012; Timæus and Moultrie, 2008) and Casterline and colleagues (Casterline et al., 2011; Bongaarts and Casterline, 2012) this chapter provides further evidence that lengthening birth intervals are an important feature of the transition to low fertility in Sub-Saharan Africa. This existing literature has also shown this phenomenon is particularly prominent in Southern Africa. Indeed, in this study the intervals of Zimbabwean women are significantly longer than those of the other three countries, both at the national level and among the other sub-populations examined.

The patterns at the national level show that there is a strong similarity in the levels and trends of birth intervals between Ethiopia, Kenya and Tanzania. Similarly, the changes that have occurred to birth intervals in rural and urban areas are comparable between these three populations. An examination of trends among ever- and never-users of contraception shows common trends between Kenya and Tanzania, while the trends and differentials by education reveals strong similarities between Ethiopia and Tanzania. Kenya stands out as an anomaly in one respect: it is the only population to have witnessed a shortening of birth intervals in recent years that has affected all the sub-groups considered in this chapter.

The family building strategies that are driving the changes in birth intervals vary between the four countries. The changes to duration-specific fertility and birth control motivations in Ethiopia are

different to those observed in Kenya, Tanzania and Zimbabwe. The change at the national-level and by parity is negligible, while in the other three countries there has been a significant shift in the pattern of duration-specific fertility. More change has occurred among other sub-populations in Ethiopia: a fall in fertility at shorter durations of the birth interval has occurred among urban women, ever-users of contraception and those who have attended secondary or higher education. As was seen in Kenya, Tanzania and Zimbabwe, fertility has fallen at shorter durations following a woman's previous birth. However the rise in fertility at longer durations in Ethiopia has been significantly smaller than that observed in Kenya, Tanzania and Zimbabwe. Rather, the pattern of duration-specific fertility and the concentrated fall in mid-parity progression ratios among urban and more educated women in this population suggests that family limitation has taken off in recent years as contraception has been adopter largely irrespective of women's existing family size.

The family building strategies found in Kenya, Tanzania and Zimbabwe are similar. In all three countries a mixture of increasing birth spacing and postponement is driving the lengthening of birth intervals. Occasionally family limitation is also found to be playing a role. Of these three populations, Zimbabwe has observed the greatest fall in duration-specific fertility and consistently displays the least variation in fertility by length of time since last birth. However, the pattern of duration-specific fertility among all sub-groups in Kenya and Tanzania is becoming increasingly similar to that observed in Zimbabwe.

Conclusion

To conclude, this chapter sought to examine the extent to which lengthening birth intervals are a feature of fertility in Eastern Africa and to explore the family building strategies that might be driving these changes. This study has found long and lengthening birth intervals in all four countries, at the national level and accordingly in the four characteristics that have been analysed (parity, residence, contraceptive use and education level).

At the national level this trend toward longer birth intervals is being driven by a complex mixture of spacing, postponement and limitation. Small but increasing differentials in birth interval length by parity are found in Kenya, Tanzania and Zimbabwe, where there is a growing indication that this trend is being driven by differential postponement among lower parity women. The intervals of urban women are found to be significantly longer and to have lengthened much more rapidly than those of rural dwellers. Increasing postponement and spacing of birth appear to be behind this trend everywhere except Ethiopia. This will be explored in more detail in chapter five.

Turning to the results by ever-use of contraception, large differences in the median lengths of the birth intervals of never- and ever-users of contraception exist, with intervals being consistently longer among ever-users. The intervals of ever-users have lengthened rapidly while little change has occurred among never-users. This supports Moultrie et al's (Moultrie et al., 2012; Timæus and Moultrie, 2008) argument that the lengthening of birth intervals is largely being achieved through increasing contraceptive use. The results for education show longer birth intervals among women

how have secondary or higher level education. It is shown that the lengthening of birth intervals is due to increasing amounts of postponement among more educated women, although in Ethiopia family limitation appears to be more important.

Lengthening birth intervals is undoubtedly a phenomenon affecting all four study populations. While the amount of change has been greatest in Zimbabwe, long birth intervals are becoming an increasingly important feature of fertility in Ethiopia, Kenya and Tanzania. Kenya appears to be the only country where any decrease in intervals has occurred in recent years. In terms of the regional patterns of family building strategies, strong similarities are found between Kenya, Tanzania and Zimbabwe. In these countries shifts in birth spacing and postponement appear to be the dominant fertility control strategies driving changes in duration-specific fertility. Ethiopia stands out as being slightly different; family limitation appears to be the more important driver of fertility change in this population. In particular, the limited differentiation of parity is also of interest. This will be explored more in chapter 5.

5 Differential Birth Intervals

5.1 Introduction

This chapter follows on from the previous analysis of birth intervals of Ethiopia, Kenya, Tanzania and Zimbabwe at the national level. Trends in birth intervals and family building strategies are explored using DHS data in the same four countries for urban and rural areas separately. The same explanatory variables are examined in this chapter as were analysed in the previous chapter; namely, parity, contraceptive use and education. Type of place of residence now becomes the main variable of interest. In chapter 4, the three different measure of birth interval duration (interval duration, interval duration squared and the log of interval duration) were allowed to vary by the explanatory variable and by calendar period. The results were then standardised on age, marital status, parity as well as urban residence, and contraceptive use in the later models. In this chapter, the three measures of interval duration are allowed to vary by residence, the explanatory variable and calendar period. The results are standardised on age, marital status and parity.

The chapter is structured in a similar fashion to the previous one: it begins with the results for parity, then contraceptive use and ends with the results for education. Within each section the levels and trends in median birth interval are examined and followed by a discussion of the family building strategies that are behind these changes. Following this a country-specific overview is given. A discussion of this chapter's results is then given.

5.2 Results

For easy reference, Table 9 shows all the estimates of median birth interval lengths at the national level and among all the sub-groups presented in the chapter.

5.2.1 Parity by residence

Birth intervals by parity and residence were analysed in model 6. However, no differences in the trends of median birth intervals by residence were found in any of the four countries. Similarly, no significant differences in the family building strategies by residence were found (see model 6, appendix 8). Therefore, no results are presented here.

Table 9   Median birth interval lengths (months) among ever and never users of contraception and among women of different educational levels, by residence, country and five-year period

				Five-year period				
				1965-69	1975-79	1985-89	1995-99	2005-09
CONTRACEPTIVE USE	**Ethiopia**	**Urban**						
			Ever-use	-	38.1	48.2	55.8	70.5
			Never-use	-	30.2	33.1	34.9	40.2
		Rural						
			Ever-use	-	36.7	38.7	39.3	42.6
			Never-use	-	31.9	32.4	32.0	33.7
	Kenya	**Urban**						
			Ever-use	41.7	46.0	52.5	62.7	-
			Never-use	29.1	29.4	30.8	34.3	-
		Rural						
			Ever-use	27.1	31.8	34.3	41.3	-
			Never-use	28.0	28.0	28.8	30.6	-
	Tanzania	**Urban**						
			Ever-use	44.1	49.9	60.9	67.6	69.6
			Never-use	29.3	31.6	35.5	39.1	41.2
		Rural						
			Ever-use	38.1	40.1	44.7	47.2	47.7
			Never-use	30.5	31.0	32.8	33.3	32.9
	Zimbabwe	**Urban**						
			Ever-use	38.5	42.5	48.7	63.8	69.4
			Never-use	30.4	34.3	40.1	58.4	69.6
		Rural						
			Ever-use	32.3	34.8	38.6	47.6	51.2
			Never-use	29.5	30.5	32.3	37.7	38.7
EDUCATION	**Ethiopia**	**Urban**						
			No education	-	31.9	34.7	36.9	43.7
			Primary+	-	28.1	36.9	47.1	71.5
		Rural						
			No education	-	32.0	32.6	32.5	35.1
			Primary+	-	30.1	32.0	33.1	36.8
	Kenya	**Urban**						
			No education	31.4	31.3	33.2	36.9	-
			Primary+	30.9	34.1	40.2	51.6	-
		Rural						
			No education	29.0	28.7	29.6	32.1	-
			Primary+	27.6	28.6	31.1	35.8	-
	Tanzania	**Urban**						
			No education	32.1	33.7	37.0	39.6	39.8
			Primary+	31.9	35.6	42.7	50.4	54.7
		Rural						
			No education	31.7	32.3	34.2	35.0	34.2
			Primary+	32.1	33.0	35.3	36.8	36.4
	Zimbabwe	**Urban**						
			No education	29.8	33.4	38.9	50.1	53.2
			Primary+	35.9	40.4	47.7	64.4	70.2
		Rural						
			No education	29.7	31.5	34.5	41.2	42.3
			Primary+	30.9	33.3	37.0	46.1	49.2

5.2.2 Contraceptive use by residence

The trends in birth intervals and family building strategies by contraceptive use and residence were analyses in model 7, the full output of this regression model are shown in appendix 9.

Median birth Intervals

Figure 19 shows differential trends in birth interval length by residence and ever use of contraception. The results presented are standardised on an ever-married women of parity three and aged 25-29. In all four countries birth intervals are longest among urban women who have ever used contraception and shortest among rural women who have never used contraception (with an overlap between urban ever-users and never-users in Zimbabwe). In the most recent period, the birth intervals of urban ever-users are of a similar length in all four countries. Birth intervals have lengthened over time among both ever and never users of contraception in both rural and urban areas in Ethiopia, Tanzania and Zimbabwe. Kenya is an exception: in 2000-04 intervals appear to have been decreasing among ever- and never-users of contraception in urban areas and levelling-off among rural never-users. Only among rural ever-users of contraception were birth intervals still lengthening.

Figure 19   Trends in median birth interval by ever-use of contraception and residence
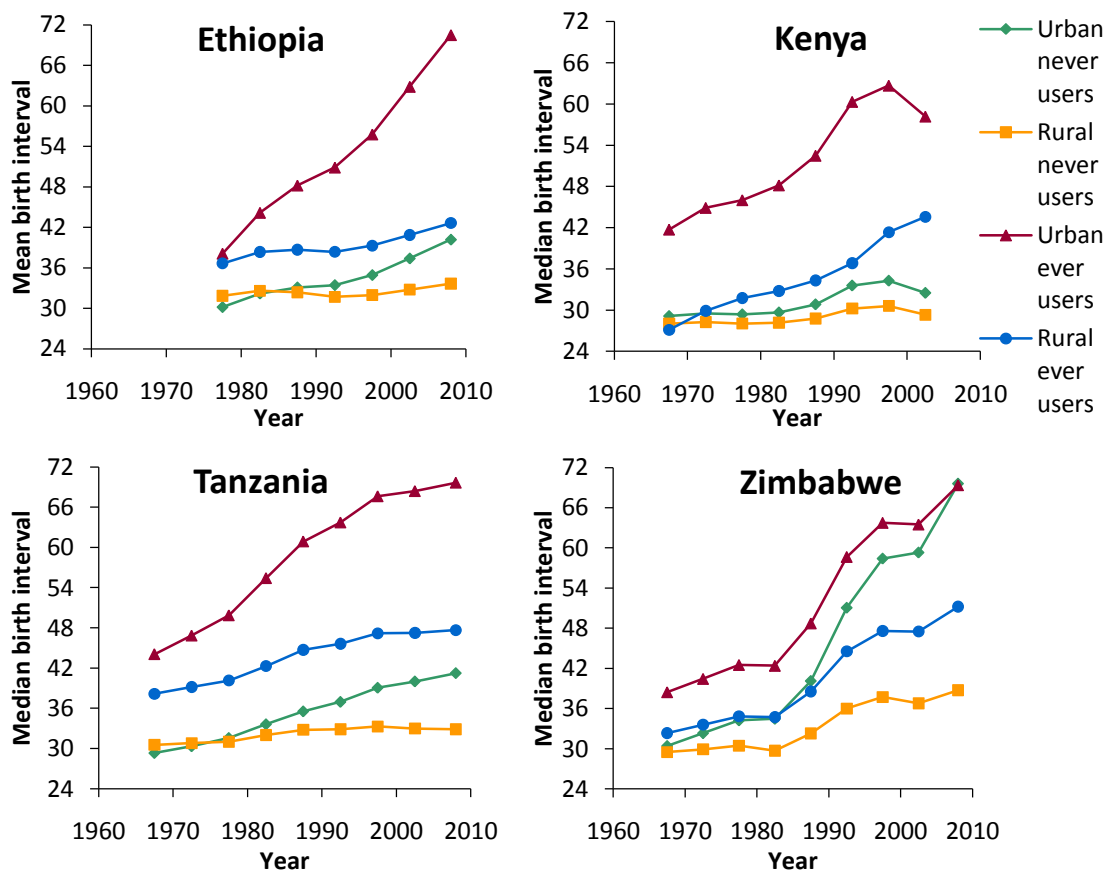
Note: Data is presented for an ever-married women, who has three children and is aged 25-29

Ethiopia

In Ethiopia, birth intervals among ever-users of contraception in urban areas have lengthened by 32 months between 1975-79 and 2005-2009 and currently stand at 71 months. The changes in birth interval length in the other groups have been less rapid. Almost no lengthening has occurred among rural never-users of contraception. The birth intervals of never-users of contraception in urban areas and those ever-users in rural areas have increased more rapidly since the mid 1990's and the intervals of these groups of women currently stand at 40 and 43 months, respectively.

Kenya

As previously mentioned, Kenya is the only country studied where birth intervals appear to be shortening among some groups of women. Between 1995-99 and 2000-04 the median birth interval length of urban ever-users of contraception shortened by 6 months, and measured 58 months at the most recent period of observation. Similarly, the median birth interval among urban never-users of contraception declined by 2 months in the same period. A levelling-off of the median interval is observed among rural never-users of contraception, which now stands at 29 months. In contrast, the median interval of ever-users of contraception in rural areas has continued to lengthen, from 27 months in 1965-69 to 44 months in 2000-04.

Tanzania

In Tanzania, little change has been observed to birth intervals in rural areas. Among ever-users of contraception, the median interval lengthened by 10 months over the observation period, compared to 2 months among never-users of contraception. More change has been observed in urban areas. Among ever-users of contraception the median interval has increased from 29 months to 70 months between 1965-69 and 2005-09. The median birth interval of urban never-users of contraception has levelled off in recent years and currently measures 41 months.

Zimbabwe

Consistent and rapid lengthening of birth intervals has been observed among both ever and never-users of contraception in both rural and urban areas of Zimbabwe. This trend is most significant among urban women. Zimbabwe is the only country where the median interval of urban never-users of contraception is longer than that of rural women who report at least one episode of contraceptive use. In 2000-04 the median intervals of urban ever-users and never-users stand at 69 and 70 months respectively. Comparatively less change has occurred in rural areas. The median length of intervals has increased from 32 months in 1965-69 to 51 months among women who have had at least one episode of contraceptive use. Among rural women who have never had any contraceptive experience, intervals have increased from 29 to 39 months in the equivalent period.

It is interesting to note that, once the data have been stratified by type of place of residence and contraceptive use, the intervals of urban Zimbabwean women who have had at least one episode of contraceptive use are not the longest of all women in the analyses, as was observed when stratifying by contraceptive use or by residence in chapter 4. Indeed, there is little variation in the median

length of the intervals of this group of women, with the difference between the shortest intervals in this group (Kenya) and the longest (Ethiopia) being only 12 months. This is because of compositional differences in the populations: more urban women have ever-used contraception in Zimbabwe than in the other three countries.

Family building strategies

Duration-specific fertility

Figure 20 shows the duration-specific fertility distributions of ever- and never-users of contraception separately. In all countries, in both rural and urban areas, two distinct shapes of birth interval distribution emerge in the more recent period. The duration-specific fertility distributions of both rural and urban ever-users of contraception are suggestive of increasing postponement (with the exception of Ethiopia). Less change is observed among women who have never used contraception in either type of place of residence. In all four countries, the duration-specific fertility distributions of never-users of contraception have a clear peak at shorter durations. In addition, the fertility of these women is often lower than ever-users of contraception at longer durations of the birth interval. As a result, there is a crossing over of the duration-specific fertility rates of the two ever-user groups with the never-user groups at longer durations of the interval. This suggests that in both rural and urban areas, women who are postponing a birth are more likely to have had some contraceptive experience.

Ethiopia

In Ethiopia, the fertility of urban women has fallen, particularly among women who have had at least one episode of contraceptive use. The peak of the duration-specific fertility distribution has also shifted rightwards along the *x*-axis, indicating increased durations of birth spacing in these two sub-groups. Indeed, the four-way interaction between residence, contraceptive use, the log of interval duration and calendar time is found to be statistically significant (as shown in appendix 9), suggesting a change in the effect of contraceptive use on birth spacing is modified by a woman's place of residence. Thus, urban ever-users are increasingly spacing births for longer periods while rural ever-users are not. Duration-specific fertility has also fallen among urban women who report never having used contraception; however, among this group there no evidence of increased spacing. It is interesting to find that extremely long birth intervals are found among urban contraceptive users in Ethiopia, but that no evidence of differential postponement is found among these women. It is possible that increasing family limitation may explain these long intervals that do not appear to be a result of increasing birth postponement, this will be explored more through the analysis of parity progression ratios.

Kenya

In Kenya, we observe strikingly little variation in fertility by duration among urban ever-users of contraception. Among rural ever-users of contraception, the peak in fertility that was observed in 1975-79 at 24-29 months has also fallen, resulting in very little variation in fertility between 30-35

months and 42-47 months of the birth interval. This suggests that ever-users of contraception are more likely to postpone their next birth than never-users. However, the differences between the patterns of duration-specific fertility in both types of residence for the two sub-groups also suggest that postponement is a more common family building strategy among urban ever-users of contraception (although this differential is not statistically significant.) However, the regression model does contain a significant four-way interaction between contraceptive use, residence, calendar time and the log of interval duration. This suggests that urban ever-users of contraception have significantly different birth spacing patterns from rural ever-users of contraception. Less change has occurred to the pattern of duration-specific fertility among never-users of contraception in both types of place of residence. There has been a fall in the peak fertility at 24-29 months of the birth interval among both groups of women. This decline been greater among urban ever-users.

Tanzania
The duration-specific fertility rates for urban and rural ever and never-users of contraception strongly resemble those observed in Kenya. As a result of a fall in fertility at short durations and an increase at longer durations, the fertility of urban ever-users of contraception varies very little over the duration of the birth interval. This strongly suggests that urban ever-users are more likely than the other sub-groups to be postponing a birth, however this difference is not found to be statistically significant in the regression model (shown in appendix 9). The fertility of rural women who have ever-used contraception has also fallen at shorter durations and increased at longer durations. In addition, peak fertility among these women in 2000-4 occurs at slighter longer durations than in 1975-79, which indicates an increase in durations of birth spacing. Again, though, this difference is not statistically significant. The peak of the duration-specific fertility rates of urban never-users of contraception has also fallen in Tanzania. No change to the fertility distribution of rural never-users of contraception has occurred.

Zimbabwe
The fertility of all sub-groups in Zimbabwe has fallen dramatically between the two time-periods. It is the only country to experience large changes in the fertility of rural never-users of contraception. In addition, it provides the clearest example of two contrasting fertility distributions by contraceptive use. The patterns of duration-specific fertility among rural and urban ever-users of contraception are indicative of increasing amounts of postponement: since 1975-79 the duration-specific fertility of both sub-groups has fallen at shorter durations of the interval. As a result, in 2000-04 the fertility of both sub-groups varies very little between 30-36 months and 60-72 months following a woman's previous birth. However, the even flatter distribution of urban ever-users of contraception suggests that they are more likely to postpone a birth than their rural counterparts. This differential is statistically significant.

In 1975-79 the duration-specific fertility schedules for never-users of contraception (in both rural and urban areas) have a clear peak at 30-35 months following a birth, as compared with ever-users of contraception. By 2000-04, this peak in fertility had fallen for both sub-groups. However,

compared with ever-users of contraception, the continued peak in the fertility schedules suggests that both urban and rural never-users of contraception are less likely to be postponing a birth. The peak of fertility among urban never-users of contraception has shifted from 24-29 months following a birth in 1975-79 to 30-35 months in 2000-04. No such change has occurred among rural never-users. This suggests that urban never-users tend to space their births longer than their rural counterparts.

Figure 20   Birth interval duration-specific fertility rates among urban and rural residents by ever-use of contraception in 1975-79 and 2000-4
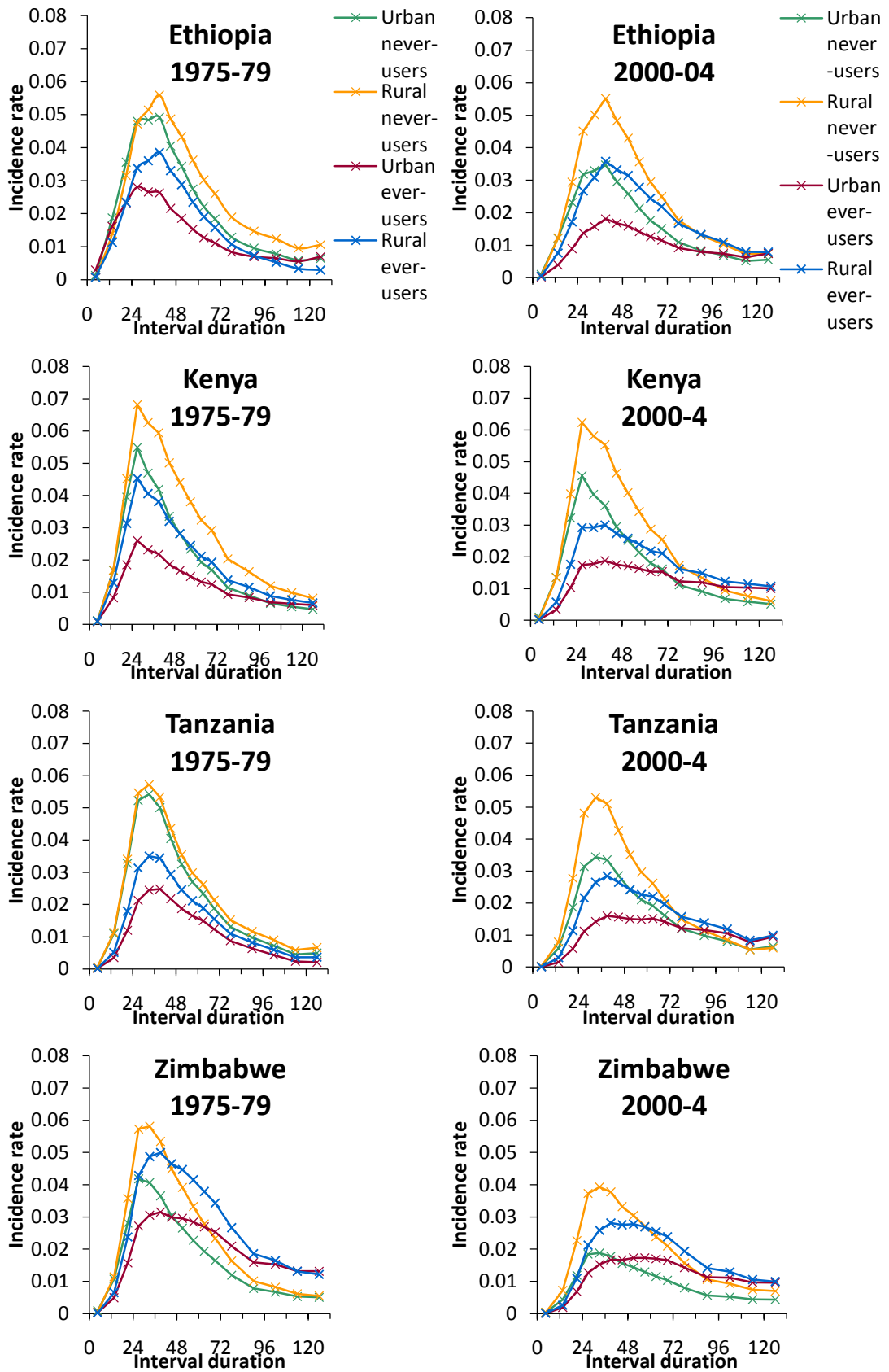
Note: Data is presented for an ever-married women, who has three children and is aged 25-29

Parity progression ratios

The overall decline in fertility among both rural and urban ever-users of contraception without any significant duration effects in both rural and urban areas of Ethiopia suggests that family limitation may be an important family building strategy among these two sub-groups. To explore this further, parity progression ratios are presented in Figure 21. Declines in parity progression ratios have occurred among ever-users of contraception in both urban and rural areas while declines in the parity progression ratios of never-users of contraception have only occurred in urban areas. The changes among rural ever-users are not suggestive of parity-specific limitation since the lines for each parity are clustered closely together. In contrast, in urban areas there is more divergence by parity, particularly among ever-users of contraception. The differential fall in parity progressions ratios among urban ever-users is suggestive of increasing parity-specific family limitation: the decrease has been concentrated among women who have two, three and four children. The parity progression ratios of women with one child have declined much less. The ratios for women of higher parities appear to be increasing over time, suggesting that the motivations for use among this small but growing group have changed. (Although this trend may be a result of the small number of high parity urban women who have had at least one episode of contraceptive use). Among urban never-users the differentiation by parity is comparatively less.

Figure 21   Parity progression ratios by 120 months by parity among ever and never-users of contraception in urban and rural Ethiopia
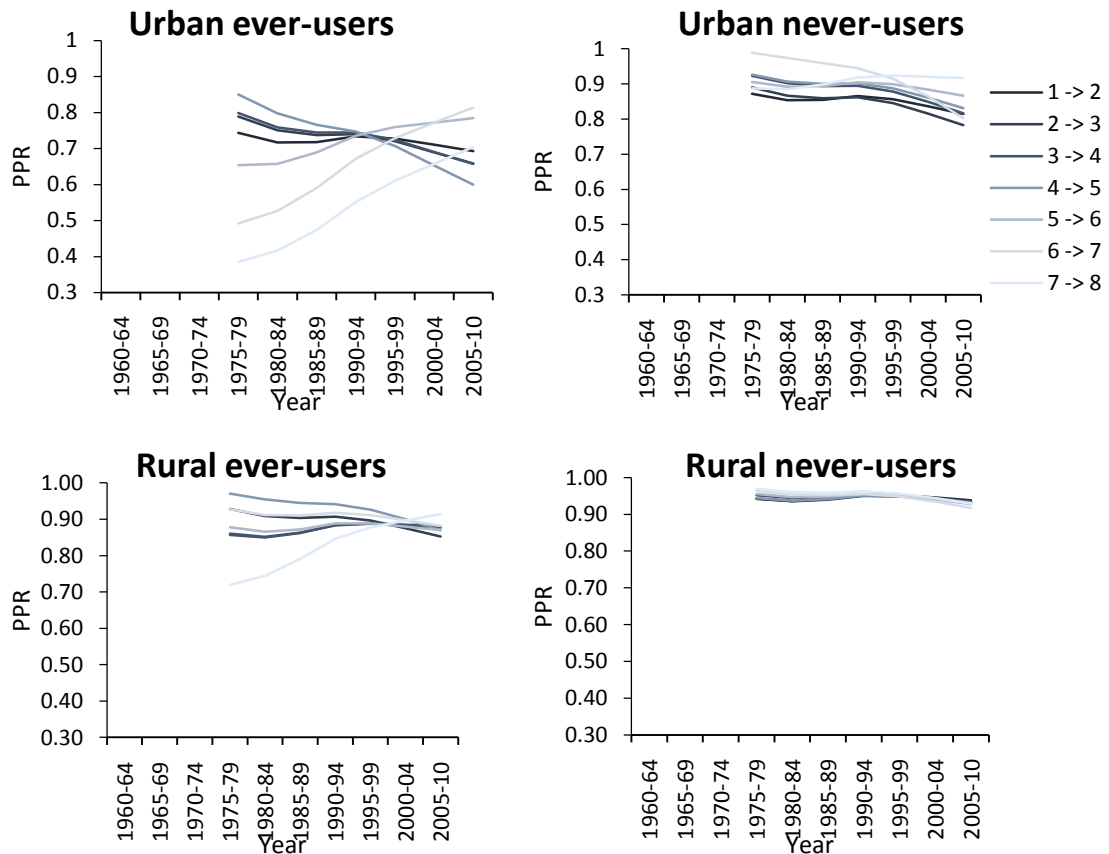
## 5.2.3 Education by residence

The trends in birth intervals and family building strategies by education and residence were analysed in model 8. The full output of this regression model are shown in appendix 10.

Median birth intervals

Figure 22 illustrates birth interval length by mother's highest level of education and type of place of residence. These models failed to converge with a three-level categorical variable for education in both Kenya and Zimbabwe. It was therefore necessary to recode education into a binary variable. Birth intervals are found to be longer and lengthening more rapidly among women of all levels of education in urban areas than in rural areas in all four countries. The differences between the levels and trends within the four sub-groups vary significantly between the four countries.

Figure 22   Trends in median birth interval by highest level of education attended and residence
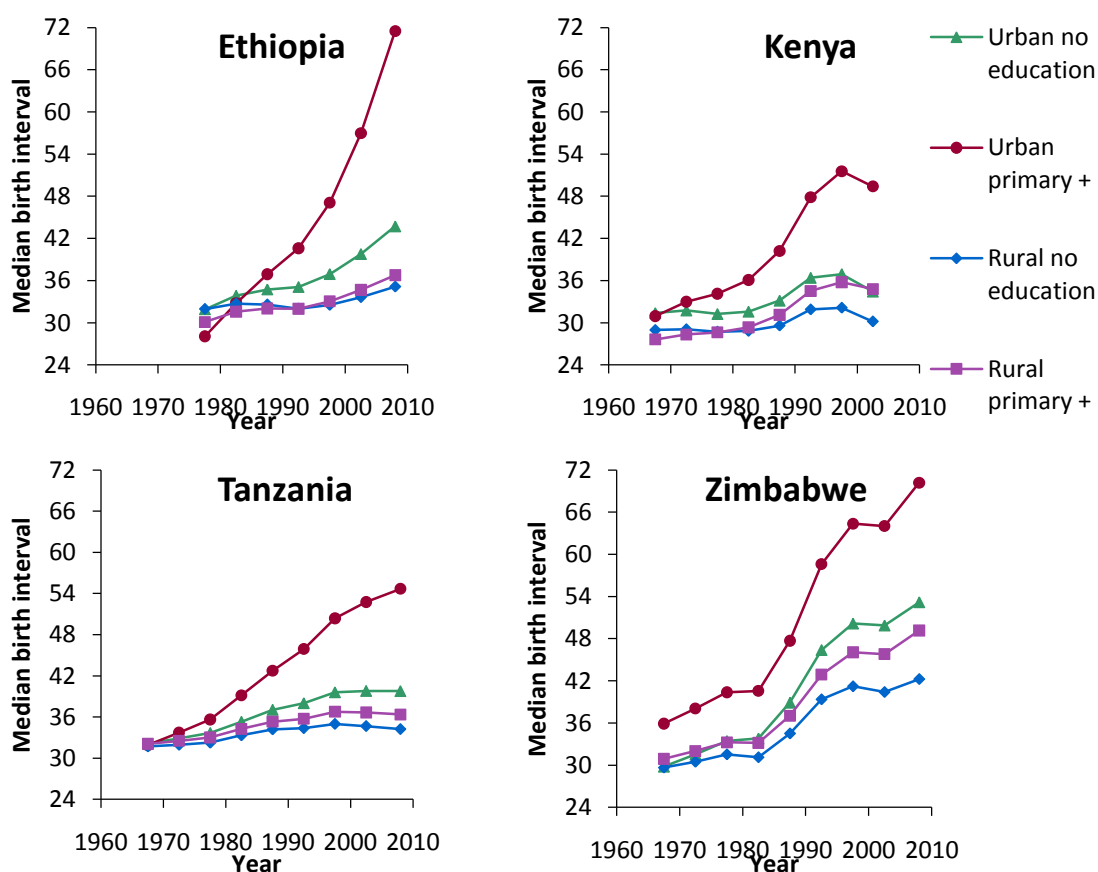
Note: Estimates are presented for an ever-married woman, who has three children and is aged 25-29

Ethiopia

In Ethiopia, the median birth interval length varies very little between rural women who have never attended school and rural women who have. In 2005-09 the difference between the median interval of the two sub-groups is two months. There been minimal change among rural women of either education level. The median birth intervals of rural women have lengthened by 3 months among women with no schooling and 7 months among those with some schooling. Intervals

among urban women have lengthened more. This is particularly true for women in urban areas who have attended school; whose median interval has increased by 43 months. The increase among urban women who have never attended school is smaller: 12 months over the observation period.

Kenya

As with many of the results for Kenya, birth intervals are found to have decreased among both educational groups in rural and urban areas in the most recent period of observation. In the longer term, however, a large change in median interval length occurred among urban women who have attended school. Among this group, intervals have lengthened by 19 months to 49 months in 2000-04. Little difference in the median length of birth intervals exists between urban and rural women who have never attended school and rural women who have attended school. In 2000-04, the difference between the median birth intervals of these three sub-groups was 5 months. The pace of change was almost identical among both rural and urban women who have not attended school. The median interval lengthened by 1 month among rural women with no education and by 3 months among urban women with no education. The median interval among rural women with some schooling increased by 7 months over the observation period. In addition, between 1995-99 and 2000-04 the decrease in median interval length among this sub-group of women was much less than in the other three sub-groups.

Tanzania

In Tanzania the same patterns of change have occurred among sub-groups as were observed in Ethiopia and Kenya. Less lengthening occurred to the median birth intervals of rural women of both educational groups. There was a 3 month increase among rural women with no education, and a 4 month increase among rural women with some schooling. Similarly, the median interval of urban women with no education increased by 8 months between 1965-69 and 2005-09. Since 1995-99, there has been a stagnation in the trend of lengthening of the median intervals of these three groups. In contrast, the median interval of urban women who have attended school has increased by 23 months, from 32 months in 1965-69 to 55 months in 2005-09.

Zimbabwe

Zimbabwe is the only country where significant increases in median birth interval length are found among all the sub-groups. As in the other countries, the rate of increase in birth interval length is greatest among urban women who have some level of schooling. The median interval for this group of women currently measures 70 months. Among rural women who have attended school, the median birth interval measures 42 months. The extent of fertility change among urban and rural women who have no schooling is greater in Zimbabwe than in the other three countries. Their median intervals have increased by 23 and 13 months respectively.

As with Figure 19, Figure 22 shows that once the data have been stratified by type of place of residence and education level, the intervals of urban Zimbabwean women who have ever-attended school are not the longest of all women in the analyses, as they have been in earlier results. The

birth intervals of women who have primary, secondary or higher level education in urban Ethiopia are 2 months longer than the equivalent women in Zimbabwe. As with Figure 19, this is due to compositional differences in the populations: more urban women went to school in Zimbabwe than in the other three countries.

Family building strategies

Duration-specific fertility
Figure 23 shows the duration-specific fertility rates by educational status for all four countries in 1975-79 and 2000-4. In all four countries there has been a significant fall in the duration-specific fertility rates of urban women who have some level of formal schooling. Comparatively less change has occurred to the fertility distributions of both educational groups of women in rural areas.

Ethiopia
In Ethiopia, the overall shape of the fertility distributions of the four groups has changed very little, although the levels of fertility of the two groups of urban women have fallen. This decline has been greatest between 9-17 months and 66-71 months of the birth interval. As a result of this change, the duration-specific fertility distributions of both the urban women who have attended school and those who have never attended school have become flatter. However, in neither of these groups is there the rise in fertility at longer durations that has characterised increased birth postponement in the other countries being studied. The lack of rising fertility at long durations suggests that urban educated women may be limiting their family sizes. However, the regression model shows no statistically significant residential-educational differentials in family building patterns. The changes in family limitation will be explored further through the analysis of parity progression ratios in Figure 24.

Kenya
In Kenya, the patterns of duration-specific fertility of women who have attended school changed between 1975-79 and 2000-04. In rural Kenya, the fertility of both women who have attended school and those who have never attended school has fallen, particularly at shorter interval durations. The fertility schedule of urban women who have some level of schooling strongly suggests these women are postponing births: the peak that was observed at 24-29 months in 1975-79 has dropped dramatically and a significant rise in the fertility has occurred from 60-65 to 120-132 months of the birth interval. In contrast, little change has occurred to the fertility schedule of urban women who have never attended school. Indeed, in the regression model the four-way interaction between residence, education, time period and interval duration squared is statistically significant, suggesting that the effect of education on the change in birth intervals over time differs between rural and urban area and that urban educated women have become more likely to postpone a birth.

Tanzania

As in Ethiopia and Kenya, the duration-specific fertility of both educational groups of rural women in Tanzania have changed little. The fertility distributions of the two groups of urban women have undergone greater change. There has been a decline in fertility at shorter durations for both educated and uneducated women, with the greatest change occurring among women who have attended school. This suggests that more postponement is occurring among educated urban women. Similarly, both groups have witnessed a rise in fertility at longer durations of the birth interval. Again, this change has been greater among urban women who have some formal schooling. However, none of the differentials in duration-specific fertility discussed in this paragraph were found to be statistically significant.

Zimbabwe

In Zimbabwe, fertility has fallen at shorter durations in all four groups. This is most obvious among urban women who have attended school: their fertility rates vary least by duration. The regression model confirms that the effect of urban residence upon interval duration squared is modified by education level. Thus, suggesting that women in urban areas with some education are more likely to postpone a birth than women in urban areas with no education. Among rural women who have never attended school there is has been rightwards-shift in the fertility distribution, suggesting increased durations of birth spacing in this sub-population. However, this change is not statistically significant.

Figure 23   Birth interval duration-specific fertility rates among urban and rural residents by level of education in 1975-79 and 2000-4
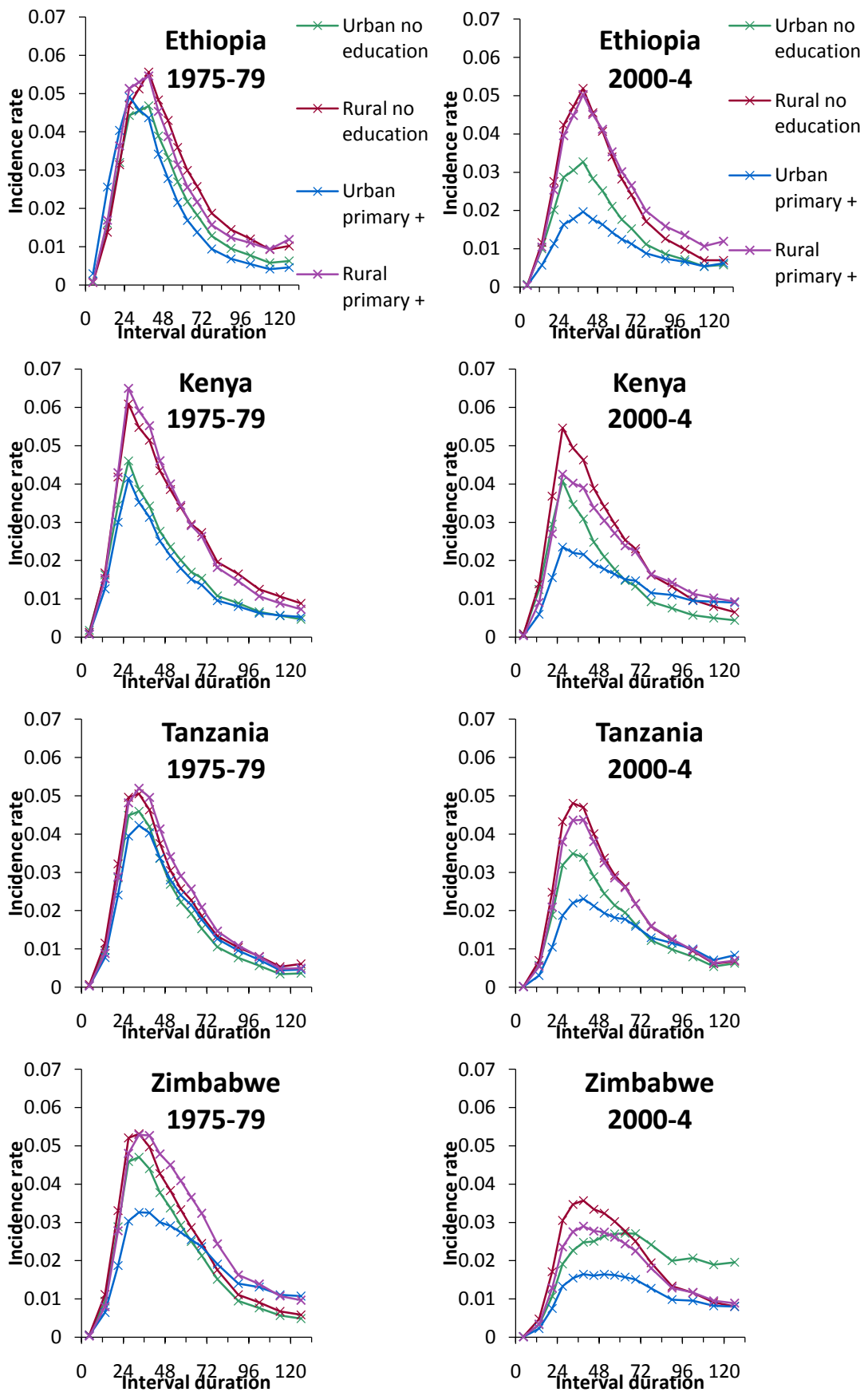
Note: Data is standardised for an ever-married woman, who has three children, is aged 25-29 and has ever-used contraception

115

Parity progression ratios

To explore family limitation further, the trends in parity progression by 120 months following the previous birth are presented for women who have and have not attended school in urban and rural Ethiopia.

Figure 24   Parity progression ratios by 120 months by parity among women with some education and women with no education in urban and rural Ethiopia
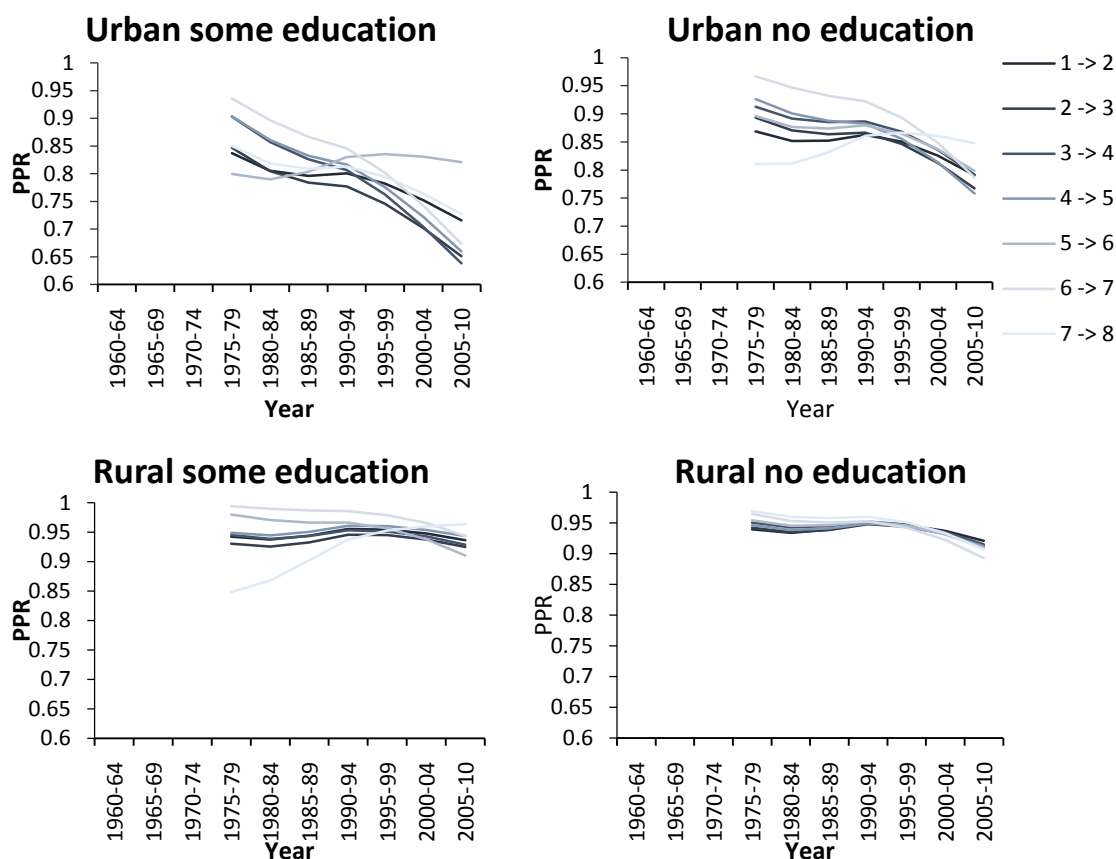
Figure 24 shows that there has been very little change to parity progression ratios among rural women of either educational status. There has been a marked decline in the parity progression ratios among both groups of urban women since the mid-1990s. Among urban women who have attended school this decline is somewhat differentiated by parity. A steeper fall in parity progression has occurred among mid- and high-parity women (although women of parity 5 progressing to parity 6 are an exception in this regard). There has also been a fall in the parity progression ratios among women with one child, although since the mid-1990s this has been smaller than that of higher parity women. A much smaller decline in the parity progression ratios is observed among urban women who have never attended school. Almost no differentiation by parity is found among this sub-group. Figure 24 suggests that in urban Ethiopia women's tendency to stop childbearing has largely been parity non-specific. However, there are signs that in more recent times family limitation has occurred to a greater extent among mid-parity women in the more educated sub-group.

116

5.2.4 Summary by country

Ethiopia

Birth interval changes
Very little change has occurred in the median length of birth intervals in rural areas, in either contraceptive use sub-groups or the education sub-groups. In contrast, striking lengthening occurred among urban contraceptive users and urban educated women. The intervals of urban contraceptive users have risen to 70 months and those of urban educated women are 85 months. The intervals of these two sub-groups are the longest in any group in the four countries examined.

Family building motivations
Ethiopia is the only country where no evidence of increasing postponement among particular sub-groups in urban areas was found. This is surprising given the magnitude of the lengthening to birth intervals that has been observed. In the case of contraceptive use by residence, a dramatic fall in peak fertility at shorter durations of the interval has occurred among ever-users, especially among urban women, but no rise in the rates at longer durations. Similar changes are found for education by residence; a dramatic reduction in peak duration-specific fertility has occurred among urban women but we do not find the twisting of the fertility distribution that suggests postponement. Rather, the trends of falling parity progression ratios suggest that family limitation is driving the long birth intervals found among women in urban areas of the country. In recent years there has been increasing differentiation by parity: the decline in progression to higher parities has been smaller among urban women with one child who have ever-used contraception and urban women with one child who have attended school, than among women with two or more children.

Kenya

Birth interval changes
As in the previous chapter, this chapter has shown that there have been big increases in median birth interval lengths over the decades in Kenya. Median birth interval length has declined recently in almost all sub-groups for contraceptive use and education. Rural women who have had at least one episode of contraceptive use are the only sub-group to have had lengthening intervals in recent periods. Similarly, only a marginal decline in median birth interval length occurred among rural women who have attended school between 1995-99 and 2000-04.

Family building motivations
Evidence that different women have different motivations for controlling their fertility is found in Kenya. Urban women who have ever-used family planning are more likely to postpone births and space their births for longer durations. Turning to the duration-specific trends by education and residence, changes to the fertility distributions of educated women were found. The peak fertility at shorter birth interval durations of women who have primary, secondary or higher education in both rural and urban areas has declined significantly. However, urban women who have attended school

were found to be significantly more likely to postpone a birth than women in any of the other sub-groups.

Tanzania

Birth interval changes
The differential pattern of birth interval lengthening in Tanzania is similar to that observed in Ethiopia. In both countries, very little change has occurred in rural areas or among urban women who have never used contraception or never attended school. Nevertheless, the intervals of rural women who have never attended school are consistently shorter than the intervals of those rural women who have attended school. This can be contrasted with sustained, more dramatic increase in the intervals of urban contraceptive users (whose intervals are 70 months) and women who have ever attended school (intervals measuring 56 months).

Family building motivations
As in Kenya, the changing fertility distributions of contraceptive users in both urban and rural areas suggest that these groups of women are postponing births. The fertility of urban ever-users now varies very little by duration beyond 24 months following the previous birth, suggesting that they are more likely than their rural counterparts to postpone a birth. The fertility distributions of women who have never used contraception have lost their peak at shorter durations of the interval, although no clear change in family building motivation is identifiable. The results for education by residence exhibit similar relationships between the subcategories to those found for contraceptive use by residence. However, as with birth intervals, the duration-specific fertility of rural women who have attended school is now much lower than those women who have never attended school. There is some indication of increased postponement and differential birth spacing patterns among urban women who have attended school.

Zimbabwe

Birth interval changes
Zimbabwe is the only country to have experienced a sustained increase in birth interval length in all sub-groups. Particularly surprising is the rapid lengthening of the intervals of urban women who report never having used contraception, which were found to be the same length as urban women who have ever used contraception. Of all the countries examined, Zimbabwe shows the longest intervals for the different sub-groups of rural women.

Family building motivations
Among ever-users of contraception the duration-specific fertility distributions clearly suggest a growth in postponement, while the distributions of never-users strongly suggest increased birth spacing. It is interesting to note that birth spacing still appears to produce very long intervals. Examining differential trends by education reveals that urban women who have some schooling are increasingly more likely to postpone a birth than urban women who have no education. However,

the fertility-distributions of both sub-groups are now extremely flat. Urban women who have never attended school have also experienced increased birth spacing over time.

5.3 Discussion

This chapter sought to build upon the results of the previous one, by exploring the dynamics of fertility for rural and urban areas separately. In chapter four, large differences in birth interval length were observed between rural and urban areas, with the differential between the median birth interval length ranging between 13 and 22 months. Birth intervals were found to have lengthened rapidly in urban areas in all the countries analysed in this study, with the most rapid change having occurred since the mid-1980s.

The aim of this chapter was to analyse whether differential levels and trends in the birth intervals and duration-specific fertility rates differ between sub-groups of women in the rural and urban areas of the four study countries. The role of different family building strategies in these changes was explored. This was done for various explanatory variables: parity, use of contraception and education. No statistically significant results were found for birth intervals or duration-specific fertility among women of different parities between rural and urban areas.

5.3.1 Contraceptive use by residence

It has been shown that median birth intervals have been consistently longer among those women who have used contraception in all four countries being analysed and that the pace of change has been significantly faster for births that occurred after the mother had first used contraception. This implies that, not only has the proportion of women that have used contraception increased over time, but that such women have been using contraception increasingly more effectively and for longer periods of their lives.

Birth intervals are consistently longer among urban women who have ever-used contraception and shortest among rural women who have never used contraception. The pace of change among urban ever-users has been rapid and has shown little sign of levelling off, except in Kenya. The median birth intervals of ever-users of contraception in urban areas in the four countries are remarkably similar. They exceed 70 months in all countries except Kenya. This is an important finding which suggests that the behaviour of contraceptive users in urban areas does not vary significantly between the 3 populations. Interestingly, significant lengthening of birth intervals among urban women who reported never having used contraception has also occurred in all four countries. In Zimbabwe, the intervals of urban never-users are now the same length as those of urban ever-users.

In all countries, the patterns of duration-specific fertility among contraceptive users are much flatter than the distributions of never-users, which still have a clear peak at shorter durations following the previous birth. As with birth intervals, the duration-specific fertility curves also vary by a woman's type of place of residence; the fertility of both urban users and never-users of contraception is lower at all durations than the fertility of rural women. The changes in the schedule of duration-specific fertility birth intervals among urban ever-users of contraception strongly suggests postponement has become particularly common among this group of women. In addition, a

significant shift to longer spacing is observed among urban ever-users of contraception in Ethiopia, Kenya and Zimbabwe. It was surprising to find no evidence of the adoption of postponement among urban contraceptive users in Ethiopia, among whom birth intervals were found to be the longest. Rather, the very long birth intervals found among urban ever-users of contraception in this country appears to have resulted from family limitation, which until recently has been largely parity non-specific.

In general, these findings confirm what Moultrie et al (2012) have argued: that birth interval lengthening and postponement has largely been achieved by increasing and more effective use of contraception (with the exception of never-users in Zimbabwe). Either way, given that factors such as extended breastfeeding or post-partum abstinence cannot explain the further lengthening of birth intervals in populations where most women already take two or more years to conceive, it is clear that intervals are lengthening because women are actively taking steps to ensure that they do. Thus, despite Yeakey et al.'s (2009) ambivalent conclusion on the role of contraception in birth spacing, this study suggests that contraceptive use can have a major impact on birth interval length. It has been argued that contraceptives may simply replace the impact of traditional birth control practices, rather than serving to lengthen the amount of time between pregnancies. Smith (1985) hypothesised that in countries with high fertility the effect of family planning methods would be unlikely to be greater than that of breastfeeding. This research provides further evidence that contraceptive use can serve to lengthen birth intervals.

While contraception undoubtedly plays an important role in the observed lengthening of birth intervals, it cannot be the only important factor since intervals have also lengthened among women who report never having used a family planning method. Although it is not possible to account for this trend with any certainty, four factors are likely to be playing a part. The first is the weaknesses associated with the measure of contraceptive use that will be discussed in 5.3.5. However, the disproportionate increase in the length of the birth intervals among urban never-users relative to their rural counterparts suggests that either, secondly, some of them are covert users of contraception or that urban-specific change in other proximate determinants of fertility has occurred. Third, therefore, abortion is likely to be playing an important role in these trends, particularly in urban areas. However, there no way to measure this, since underreporting of this phenomenon is so high. Fourth, changes to women's exposure to conception through intercourse may be an important factor in specific countries. In particular, the proportion of women in Zimbabwe who are widows has increased rapidly during the past two decades (ZIMSTAT and ICF International 2012). This may explain much of the increase in the duration of birth intervals among never users of contraception in this population.

5.3.2 Education by residence

The birth intervals of women who have attended school in urban areas are found to be much longer and to have lengthened more rapidly than the intervals of urban women who have never

attended school and those of both groups of rural women. Considerable variation in birth interval length is found across the four countries for the urban educated women (birth intervals range between 56 months in Tanzania and 85 months in Ethiopia). Indeed, it is well recognised that the impact of education upon fertility varies by context: schooling differs in quality and context between countries. In addition, it is important to take into account the impact of societal norms and culture. It is hypothesised that the impact of these contextual factors may vary by educational attainment, for example, more educated women are more likely to act in a way that counter local norms. Conversely, the effect of completed primary education versus incomplete primary education upon fertility has been found to be dependent on whether that country has achieved mass education (Diamond et al., 1998). Given this, it is not surprising that a significant cross-national variation is found in the impact of education on fertility among women in rural and urban areas.

In general, the fall in fertility has been greatest among urban women. Furthermore, it is clear that more educated women in urban areas have different duration-specific fertility patterns from urban women who have never attended school. In Kenya, Tanzania and Zimbabwe, fertility among urban educated women is low at shorter durations following a previous birth and significantly higher at longer durations than the fertility of urban women who have never attended school (and both sub-groups of rural women). Thus, postponement appears to have become the most important family building strategy among urban, educated women. The fertility distributions for Ethiopian women differ in shape from those for the other three countries. Here, a greater fall in the peak of fertility is witnessed at short and medium durations of the interval, but no rise in fertility is found at longer durations. No intersection between the distributions of urban educated women and rural educated women is found, suggesting that urban educated women are more likely to be limiting their family size. An exploration of parity progression ratios among the different rural and urban educational sub-groups in Ethiopia further suggested that family size limitation is driving the observed changes to duration-specific fertility observed among urban women, especially urban women who have attended school.

The modifying effect of residence on birth intervals and duration-specific fertility, specifically the dramatic changes in fertility among urban uneducated women, points to the importance of community-level effects of education. The indirect effects of education are widely acknowledged in the literature; knowledge and attitudes are known to be directly passed between individuals through observation and communication in a process referred to as 'social learning'. Less directly, behaviours and attitudes are imitated by individuals because of a desire to avoid sanctions or to gain social approval. At the most abstract level, society and institutions can be influenced by individuals' behaviour and resources, which in turn transmit ideas and norms to other individuals (Kravdal, 2002). These processes of social learning and social influence are likely to be greater in urban areas, where levels of education are higher.

The fertility of uneducated women can be influenced by exposure to educated women through the transmission of knowledge of contraception, breastfeeding and post-partum abstinence practices. Less educated women are also more likely to imitate women who are more highly educated than themselves and whose fertility preferences are likely to be lower. At a broader level, a rise in educational status brings more autonomy for women, which, in turn, may influence others. Furthermore, a more highly educated workforce is less likely to be dependent on agriculture, which is hypothesised to reduce the importance of having larger numbers of children to assist with domestic tasks (Kravdal, 2002). Indeed, Kravdal (2002) found that in a number of Sub-Saharan countries the average educational level among a woman's peers in an enumeration area has a strong fertility-reducing impact at the individual woman's level, which acts above and beyond the effect of her own educational status. This was found to occur among more and less educated women, but the strength of the effect increased with higher levels of education. This may explain why there has been such significant change among women with no education in both rural and urban Zimbabwe. Zimbabwe has the highest level of education of the four countries: 70 per cent of women have attended secondary school or higher education (ZIMSTAT and ICF International 2012).

5.3.3 Between-country trends and differentials

The exploration of differential trends in median birth intervals by contraceptive use revealed similarity between the trends, levels and relationships between groups in all four countries, in particular between Ethiopia, Kenya and Tanzania. In Zimbabwe, as compared to the other three countries, more lengthening has occurred to the median intervals of all four sub-groups. Furthermore, significant lengthening occurred to the intervals of urban never-users of contraception is restricted to Zimbabwe.

While there were strong similarities in the levels and trends in the median birth interval, greater regional variation was found in the family building strategies that have been driving these changes. In Kenya, Tanzania and Zimbabwe, differential trends in the spacing and postponement of births account for the differences in birth interval length that were observed between ever and never-users of contraception in urban and rural areas. In Zimbabwe, however, the fertility of all four sub-groups was much lower than their equivalents in Kenya and Tanzania. Moreover, duration-specific fertility among urban never-users of contraception only fell markedly in Zimbabwe. Ethiopia stands in contrast to the other three countries. Here increasing family limitation, indicated by falling parity progression ratios, rather than increasing birth postponement, appears to be driving the differences in birth interval length between ever and never-users of contraception in urban and rural areas.

The differences and trends in birth intervals and family building strategies between women of differing educational levels in rural and urban areas followed similar patterns between the countries. As with contraceptive use, the patterns of change and the relationship between the four sub-groups was similar between Ethiopia, Kenya and Tanzania. However, the median birth interval of educated urban women in Ethiopia is now much longer than in Kenya, Tanzania and Zimbabwe.

As with the contraceptive use sub-groups, a greater amount of lengthening has occurred to the median birth intervals of both educational rural sub-groups in Zimbabwe. There was a rapid trend of birth interval lengthening observed among urban women who have primary, secondary or higher education. Together with the findings for contraceptive use, this suggests that place of residence has a strong effect on fertility in Zimbabwe.

The family building strategy driving the lengthening of birth intervals in Ethiopia stands apart from the strategies that explain the observed changes in birth interval lengths in Kenya, Tanzania and Zimbabwe. In Ethiopia, increasing family limitation seems to account for the increase in interval length among educated women in urban areas. In Kenya and Zimbabwe, a combination of postponement and spacing appear to be causing the changes in birth intervals. There are emerging signs of increasing postponement among more educated urban women in Tanzania.

Thus, in the majority of countries differential trends in birth spacing and birth postponement explain the differential trends in birth intervals between urban and rural areas. In general, an association exists between longer birth intervals and the dominance of birth postponement as a fertility control strategy. This falls in line with what Timæus and Moultrie (2008) have argued: the emergence of very long birth intervals cannot be readily accounted for by birth spacing (according to its more traditional conceptualisation) but rather, it's the widespread postponement of births explains this trend.

On the other hand, this chapter has shown that urban Ethiopia differs somewhat from the other populations. Although long birth intervals are emerging, especially in urban areas, few signs of postponement are visible. Rather, family limitation appear to be driving this change. However, the parity differentials are remarkably small. In urban Ethiopia, the desire to stop childbearing appears to have spread rapidly through the population, irrespective of women's existing family size. It is not surprising to find these differences in this population. Fertility in Addis Ababa is known to be exceptionally low (Gurmu and Mace, 2008; Kinfu, 2001). Not only is the low total fertility rate unique in Sub-Saharan Africa, but the ways in which it has been lowered are also unique to the continent. Women were found to be marrying much later in the city, and fertility within union was also found to have dropped. Atypically for Sub-Saharan Africa, very few children are born outside of marriage within Addis Ababa. Furthermore, unlike elsewhere in the region, the initial declines to fertility owed very little to increased use of modern contraceptive methods (Kinfu, 2001). Thus, it is perhaps to be expected that Ethiopia stands as an exception in this analysis.

5.3.4 Study strengths

A major strength of this study has been its methodology. Previous work has used the Brass Juarez (Brass and Juárez, 1983) paired-cohort truncation approach (Timæus and Moultrie, 2008; Moultrie et al., 2012), while this study has used a regression model approach. The regression method approach is more powerful and more flexible. As a result of using this approach the analysis has been able to test hypothesises on differentials and trends in birth intervals and duration-specific

fertility which other methods of analyses could not. Importantly, the regression model approach allowed me to distinguish statistically significant trends and differentials from those that are statistically insignificant. In addition, the use of multiple rounds of DHS surveys resulted in large sample sizes which allowed me to take a period-cohort approach.

5.3.5 Study limitations

Measure of residence

These findings must be interpreted within the limitations of the data on residence. During the interview, information is gathered on a woman's current type of place of residence, her childhood type place of residence and her current type of place of residence. Therefore, potential exists for the misclassification of residence at the time when women's children were born; one cannot assume that women currently living in urban areas were living in an urban area for all of their previous births. Indeed, between 17.4 per cent (Zimbabwe) and 27.3 per cent (Tanzania) of respondents' previous places of residence differed in type from their current type of place of residence. However, with the exception of Ethiopia (where rural-to-urban migration was more than twice the magnitude of urban-to-rural migration), there was very little difference between the proportions of women who had moved from rural to urban areas and those who had moved from urban to rural areas. The aggregate effect of misclassification of residence in our results is likely to attenuate urban-rural differentials in fertility.

Measure of ever use of contraception

Although it is clear that the lengthening of birth intervals is concentrated among those women who have used contraception, our analysis does not enable us to measure the impact that contraceptive use has on duration-specific fertility. The DHS individual questionnaire data only allow one to identify when in her birth history a woman first used contraception and it cannot be assumed that all women who have used contraception to delay one birth will continue to do so throughout their reproductive lives. Thus, the variable does not necessarily reflect whether women used a method during a parity-specific exposure period. Moreover, the mapping of the woman's reported number of living children at her first use of a method is somewhat approximate and overestimates that parity in cases in which one or more of the women's children died after the birth of their younger sibling or siblings. Therefore, a respondent's exact parity at first use is not always known. Furthermore, in the most recent surveys for Ethiopia, Tanzania and Zimbabwe, the key question was not asked and so this variable had to be imputed for lifetime ever-users, so the estimates of the effect of ever-use of contraception in the recent past in these countries are even more approximate.

A study of women's patterns of contraceptive use using the detailed calendars collected by some DHS showed that levels of contraceptive discontinuation are high. For all contraceptive methods, discontinuation probabilities at one year were high in Ethiopia, Kenya and Tanzania (varying between 46 and 42 per 100 use-episodes) but were significantly lower for Zimbabwe (16.7 per 100 use-episodes). As a result, periods of use are short in Ethiopia, Kenya and Tanzania (varying

between 16.3 and 19.1 months) but are much longer for Zimbabwe (30.7 months). Furthermore, reported switching to another method after contraceptive discontinuation is low in the four East African countries examined in this study (at the lowest 34 per cent in Tanzania, highest 44 per cent in Ethiopia) (Ali et al., 2012). With the exception of Zimbabwe, these patterns of use, discontinuation and switching do not seem to be entirely consistent with the results from the birth interval analysis. High levels of contraceptive discontinuation and low levels of switching would be expected to result in short birth intervals. It is possible that abortion has a role to play in this apparent contradiction.

5.3.6 Conclusion

This chapter has undertaken a detailed examination of the rural-urban differentials in fertility that were identified in chapter four, since literature has shown that differential residential fertility trends in Sub-Saharan Africa are particularly large. Furthermore, since these large differentials suggest that fertility decline is well underway in urban areas, towns and cities were thus hypothesised to be an appropriate lens to examine changes to birth intervals and family building strategies.

Among both ever-users of contraception and women who have attended formal schooling, urban dwellers were found to have much longer birth intervals than their rural counterparts. The differentials between these two groups range between 15 and 22 months among contraceptive users, and between 16 and 44 months women who attended school. This represents further evidence in support of Kirk and Pillet's (1998) statement that rural-urban fertility differentials in Sub-Saharan Africa are not merely due to compositional differences between the two populations. Furthermore, it suggests that very long birth intervals are an important phenomenon of the fertility dynamics of urban areas.

In general, differential increases in postponement and birth spacing are driving the lengthening of birth intervals in the four countries. In particular, dramatic changes to the distributions of duration-specific fertility among urban ever-users of contraception and urban educated women were found, suggesting increasing postponement among these sub-groups. This finding lends further support to Moultrie and colleagues (Moultrie et al., 2012, 2010; Timæus and Moultrie, 2008) suggestion that birth postponement is a significant feature of the fertility transition in Sub-Saharan Africa. However in contrast to this, in urban Ethiopia increasing family limitation was found to be the most likely family building strategy to account for the emergency of extremely long birth intervals among ever-users of contraception and among women with primary, secondary or higher education. In contrast to the fertility declines observed in other regions of the world, this has not been focussed on 2-5 child families, rather family limitation in urban Ethiopia appears to be largely parity non-specific.

Results section II:
Reproductive intentions

Introduction

Section objective

This section of the research aims to explore a group of urban women's childbearing intentions and reproductive decisions. It is hoped that the results from this qualitative study will give a complementary perspective to the quantitative analysis on urban fertility dynamics presented in the earlier chapters. Since this PhD has a particular interest in birth interval lengthening, special focus will be given to women's intentions and decisions about the timing of their births.

The more detailed objectives for this section are as follows:

1. To explore how the urban environment influences conjugal and family relationships
2. To analyse women's views on the control of childbearing
3. To explore their perspectives on birth spacing and family size

Structure of the section

This section of the PhD is divided into two chapters. The first chapter begins with a detailed background to Nairobi, and then Korogocho and Viwandani. Following this I present the first section of study results, which examines the nature of conjugal and familial relationships and how they affect childbearing intentions and decisions. The chapter ends with a discussion of these findings.

The second chapter gives an analysis of how childbearing is controlled within the study communities. It starts with an examination of the extent to which women feel that childbearing is something that can be controlled. It then discusses women's reported desired family size and how this relates to the perceived costs of raising children, attitudes to contraceptive use and the nature of personal relationships. The chapter ends with a presentation of women's perspectives on birth spacing and the extent to which they justify their intended birth intervals using reasons that are related to the age of their youngest child. The chapter ends with a discussion of the results on the control of childbearing.

6 The urban environment, conjugal and family relationships

6.1 Background

6.1.1 Nairobi

Nairobi is the capital of Kenya, the regional hub of East Africa and also an economically and politically important city for the whole continent. It is home to one of the largest stock exchanges in Africa, the Nairobi Stock Exchange, UNEP and UNDP and numerous multinational corporations are headquartered in the city. Nairobi is a rapidly modernising and dynamic city: green spaces are quickly being filled in with expensive apartments, the wealthy suburbs have large and busy shopping malls stocking international goods, a series of intersections and flyovers have recently been completed and a four-lane highway now encircles the inner suburbs. Nairobi's three million citizens are cosmopolitan: as well as being home to Kenyans of many different tribal origins, there are large numbers of East Asians brought to Kenya as immigrant workers during British rule, a growing immigrant and refugee Somali population in Eastleigh and significant numbers of expatriates and British-Kenyans who remained after independence.

A polarised and segregated city

Despite its modernity, the most striking feature of Nairobi is the degree of socio-economic inequality and spatial polarisation that exists between its citizens. At the turn of the century, 60% of Nairobi's population lived in the city's numerous informal settlements, and yet these settlements, together with other low-income estates occupied just 5% of the residential land (Alder, 1995).

The extreme spatial segregation in Nairobi is rooted in the city's colonial history. No settlement existed here prior to the arrival of the British, who decided to make Nairobi the headquarters of the Kenya Uganda Railway in 1899. The railroad climbed from Mombasa at the coast, to Kisumu, which was then a part of Uganda, on the shores of Lake Victoria. The site of Nairobi was chosen because of its proximity to the Nairobi and Mgabathi rivers, the cool climate of the highlands and the wealth of flat land that was apparently free for requisition for settlement and railway construction. In 1907, Nairobi was made capital of Kenya; in 1950 it became a city (Mitullah, 2003). From its inception, Nairobi grew as a segregated city: Europeans inhabited the hills in the northern and western parts of the city, where the climate was most favourable. Large numbers of Asian immigrants were employed to assist with the construction of the railways and many of them then settled and set up small businesses in the city. The Asian enclaves were created in the central and northern parts of the city. During the early days of Nairobi's growth, there was practically no African settlement since Africans were regarded as temporary inhabitants and the colonial

government believed that the creation of public housing would encourage excessive migration. The severe lack of housing for Africans led to the emergence of squatter settlements on the periphery of the city, which grew despite attempts to demolish them by the colonial powers (Olima, 2001; Mitullah, 2003).

The unequal distribution of Nairobi's land began with racial divisions but, while there remains a legacy of this, income differentials are arguably now the biggest drivers of residential segregation in the city. Highly educated and wealthy African citizens have moved to the European suburbs in upper Nairobi and middle-income Africans have joined the Asian neighbourhoods of Parklands, Eastleigh and Nairobi South. The urban poor remain confined to the informal settlements and low- income neighbourhoods of Eastlands. Nevertheless, race and income remain closely correlated in Nairobi and virtually no Europeans or Asians live in the poorer suburbs (Kingoriah, 1980 cited in K'Akumu and Olima, 2007).

Nairobi's informal settlements: their growth and persistence

Nairobi's informal settlements are rooted in the specifics of racial segregation of land use associated with the colonial development of the city. More generally, they are a consequence of the British imposed colonial capitalist system, which encouraged Kenyans to become surplus workers on settler farms or migrate to new urban centres, thus alienating them from the control of their own land (Kobia, 1991 cited in K'Akumu and Olima, 2007). However, urban poverty and the development of informal settlements are also very much a result of the nature of post-colonial urban life in Kenya. The majority of the settlements that are in existence in Nairobi today were established after Independence. Post-independence, the restriction of African migration into Nairobi was ended and the city's population grew rapidly from 350,000 in 1963 to over 3 million in 2009 (Oparanya, 2010). Much of this growth has occurred in informal settlements; for example, Korogocho and Kawangware grew 220% during the intercensal period of 1969-1979 (K'Akumu and Olima, 2007).

The rapid growth of informal settlements is not solely a product of rapid urban growth rates but also a result of Kenya's poor national housing policy framework. Some attempts have been made by the Nairobi City Council (NCC) and international aid agencies to provide housing for rent or sale to low-income groups, for example the Dandora community development project which constructed 6,000 serviced plots of 100-160m² each, with water and sewerage connections, waste disposal services, road access and security lighting. However, the majority of plots were not allocated to those in the lowest income groups and many had absentee landlords. Other housing schemes have failed to provide for the poorest of the urban poor for similar reasons: excessively high construction and building standards and the strict restrictions on the use of the homes for business and informal sector activities mean that these flats are unaffordable for those who were intended to be their main beneficiaries (Obudho, 1997).

Corruption and the nature of the political economy of Nairobi also explain the persistence of the severe housing problems in the city; the NCC was ranked the fifth most corrupt public sector organisation by Transparency International (Mitullah, 2003). Land grabbing is common in Kenya: powerful elites are able to sidestep regulations that ensure the proper allocation of land, which has resulted in spiralling prices, soaring rents and the growth of illegal housing developments. The practice impacts upon ownership of the land and structures of informal settlements: despite most settlements being built on government land, they operate like the formal real estate market. Most homes are privately owned, with the majority of landlords belonging to Nairobi's political elite. Their social power allows them to bypass regulations and build to extremely high densities on their plots; for example densities of 250 housing units per hectare are now common in the informal settlements, compared to 25 units per hectare in middle-income areas (Syagga et al, 2001 cited in Dafe, 2009). The poor application of housing laws also allows landlords to charge profitable rents on very poorly constructed structures. Informal settlements are excluded from official suppliers of water, electricity, sewerage and waste collection services; this serves to maintain the status quo as private providers fill this service gap to the benefit of the politically powerful who control their access to these markets. The fact that the landed and political elite benefit so extensively from the existence of Nairobi's informal settlements helps to explain why slum upgrading programmes have failed to effectively improve the circumstances of the people living in these environments (Dafe, 2009).

6.1.2 Korogocho and Viwandani

Korogocho is one of the largest informal settlements in Nairobi. It is located 12 kilometres from the city centre in Kasarani division. The Africa Population and Health Research Center (APHRC) Nairobi Urban Health Demographic Surveillance Site (NUHDSS) covers seven villages Highridge, Grogan "A", Grogan "B", Gitathuru "C", Nyayo/Kisumu Ndogo, Korogocho "A" and Korogocho "B". Korogocho was developed in 1978 on City Council reserved land between the banks of the Nairobi and Gitathuru rivers, on land originally privately owned by an individual called Baba Dogo. The majority of the Korogocho villages were founded when the government removed and resettled people from informal settlements in wealthier areas of Nairobi, such as Highridge estate in Muthaiga suburb, and Grogan and River Road areas in the CBD (Gathuthi et al., 2010). Korogocho is bordered by the Dandora rubbish dump on the south and east sides. In most of the villages, the houses are made of mud and timber walls with roofs being assembled from tin. Houses are constructed in rows with an average of six dwelling units (rooms) per structure. Korogocho is one of the most congested slum areas of Nairobi with over 250 dwelling units per hectare (Emina et al., 2011).

Viwandani comprises of a collection of settlement villages in the Makadara division of Nairobi, 7 kilometres from the city centre. The APHRC NUHDSS in Viwandani covers 5 villages: Paradise, Jamaica, Lunga-Lunga, Donholm and Kingston. The Lunga-Lunga and Jamaica settlements were established during the 1960s, while Paradise, Kingston and Dunholm grew up in the 1980s. The

land on which Viwandani is built is of mixed ownership; some is unregistered, while other parts are privately owned. A significant proportion of the Viwandani settlements are built upon utility reserved land; all five villages are constructed on land designated as high voltage electricity wayleave and Paradise village is also located on a sixty metre railway reserve. There have been numerous serious fire outbreaks in Viwandani as a result of its proximity to gas pipelines and electricity lines (Karobia, 2011). Residents of Paradise, Lunga-Lunga and Jamaica face a long-standing threat of eviction by Kenya Pipeline and Kenya Power and Lighting companies, while Kingston village is undergoing reconstruction after demolition in 2001 (Pamoja Trust, 2009). Viwandani is bordered by Nairobi's industrial area to the north and by the Ngong River, which is heavily polluted with industrial effluents, to the South. Most houses in Viwandani are made of iron and tin sheets and are built in rows with an average of six dwelling units (rooms) per structure (Emina et al., 2011).

Who lives in Korogocho and Viwandani?

The informal settlements are home to urban residents who earn small incomes and have few material assets (Mitullah, 2003). The majority of people living in the informal settlements of Nairobi were not born into these communities; most migrated during their early years of adulthood with the hope of earning better money. In Viwandani, 95% of residents are migrants and almost all have entered the settlement from rural areas. Korogocho is a more settled and established community, and about 25% of residents were born and raised in the settlement. Despite high levels of population mobility in both settlements, Korogocho and Viwandani become long-term homes for many people. In Korogocho, residents stay for an average of 14 years and more than half of the population have lived there for over 10 years. In Viwandani, the average duration of stay is 8 years and more than a quarter of residents have lived there for ten years or longer (Emina et al., 2011).

Earning a living

Most residents of informal settlements earn an income through small businesses in the informal sector. The informal sector is characterised by the ease with which a worker can enter as the requirements for capital input and skills are low. The majority of workers have not undertaken official vocational training, but instead learn their trade through informal apprenticeships. Businesses operate outside of official rules and regulations, they do not pay taxes, and thus workers within the sector lack job security and incomes are generally irregular (Alder, 1995).

The formal employment sector has grown in Nairobi as the city's economy has strengthened. However, this growth has not met the increased demand for jobs brought about by the city's rapidly increasing population. In Korogocho and Viwandani, only a minority are involved in salaried employment of an established or stable business: 16% in Korogocho and 30% in Viwandani. In both settlements approximately half of men and women rely on unstable sources of income (unestablished business or casual employment) and 27% are economically inactive. Half of women are classified as being economically inactive in both settlements, as compared to 9% of men

(Emina et al., 2011). The greater proportion of people in formal employment in Viwandani is due to the settlements proximity to the city's industrial area.

Women working in the informal sector tend to make money from small-scale jobs such as selling groceries, running hair salons, being shop attendants and washing clothes. More marginalised activities such as hawking, the selling of *chang'aa* (illegal liquor) and sex work are also important sources of income, particularly for women who are the heads of households. These activities yield subsistence earnings and are a response to the difficult socio-economic conditions of the informal settlements; women engaged in this work often have no other source of income. Men who work in the informal sector undertake manual labour and construction work, garbage collection, work in bus transport, or engage in illegal activities such as burglary and drug trafficking. *Jua Kali* (literally meaning hot sun in kiswahili) are productive businesses, usually conducted in the open air, such as metalworking, mechanics and carpentry that employ many men from informal settlements. *Jua Kali* play a significant role in Nairobi's economy and provide products and services to residents of both the informal and formal areas of the city (Alder, 1995).

Income and poverty

It is difficult to gauge the income and expenditure of those people working in the informal sector because people almost always report higher expenditure than their income. At the same time, income levels are usually understated as respondents do not wish to disclose their real earnings to officials (Alder, 1995). However, the following figures give at least a rough description of the financial status of households in Korogocho and Viwandani. Importantly, they illustrate the variety of household circumstances that exist within these settlements.

A survey conducted prior to the commencement of the Korogocho Slum Upgrading Programme found that average household incomes in the different villages of Korogocho varied from 4,000 to 28,600 KSHS (US $46-$327) per month, while expenditures varied from 3,250 to 13,560KHS (US $37-$155). In some villages, average household spending is in excess of incomes, implying the need for borrowing from external sources (Gathuthi et al., 2010). No data on household income and expenditure is available for Viwandani. Food is the greatest cost incurred by households in informal settlements and in some of the poorest areas accounts for 75% of expenditure. Education and rent are also major household outgoings (Mitullah, 2003; Gathuthi et al., 2010).

APHRC used NUHDSS data to estimate transitions in-and-out of poverty of households that were in the surveillance area at two points in time. Overall, there was a reduction in the number of households that were living below the poverty line (estimated to be 2,913 KSHS at the time of survey) from 55% in 2006 to 35% in 2009. Data for the households observed at both dates show that, during the same period, a larger number of households lifted themselves out of poverty (47%) than fell into poverty (30%)(Emina et al., 2011).

Basic urban services and the physical environment

One of the defining features of informal settlements is the poor provision of basic urban services. Accessing water is a major problem for most households as water sources are wholly inadequate and unreliable. NCC often provide stand pipes which are metered and then franchised out to kiosks. In Korogocho and Viwandani the majority buy their water from such kiosks, which are very expensive. Often the water is contaminated by refuse and sewerage. Drainage within informal settlements is poor and large pools of stagnant water are commonly found in alleyways and open spaces. Drainage problems in Viwandani are particularly severe. During rainy season, large parts of the settlement become flooded. During data collection for this study, a number of homes had to be abandoned.

The provision of sanitation services is also grossly insufficient. It is estimated that 94% of people in informal settlements lack access to adequate facilities. Only 1% of households have a private toilet in their home, while the vast majority share pit latrines with other households. In Korogocho, on average, each household shares a pit latrine with fifty others. While well-built pit latrines pose no dangers to health in other suburbs of Nairobi, in the densely populated informal settlements they facilitate the spread of diseases, particularly in Viwandani where many are located on the Ngong River. The lack of toilet facilities encourages the use of "flying toilets", which are plastic bags used for defecation and then disposed of with other household rubbish. This is particularly hazardous as the NCC does not collect waste in the informal settlements on a regular basis, so there is an inevitable build-up of huge rubbish piles in public places.

Population health

Population structure and growth

The population pyramid of APHRC's demographic surveillance areas of Korogocho and Viwandani is shown in Figure 25. It shows that the settlements have very youthful populations: a third of the total population is aged less than 15 years, while almost 70% is aged between 15 and 64 years. Compared with Nairobi as a whole, Korogocho and Viwandani have more males; the sex ratio is highest in Viwandani where there are 144 males per 100 females. Viwandani has more adult men than Korogocho, while Korogocho has more children aged less than five; this is likely due to the more mobile population in Viwandani.

Figure 25   Population pyramid of APHRC's DSS in Korogocho and Viwandani in 2009
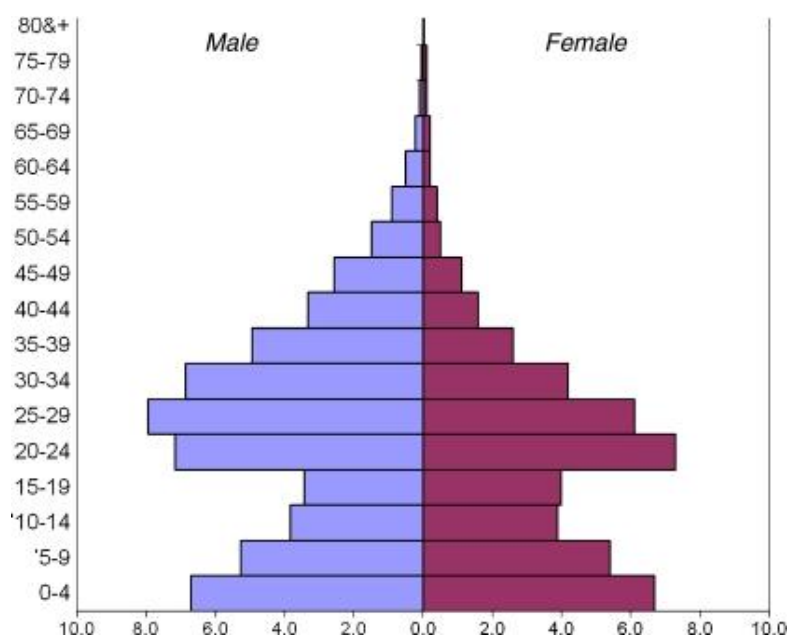
Source: Emina et al., 2011

Table 10 shows the NUHDSS annual population between 2003 and 2009. Over this time the total population of the surveillance area increased by 16% from 67,208 in 2003 to 78,156 in 2009. Growth was more rapid in Viwandani (18%) than in Korogocho (14%). The striking difference between the number of people counted at the beginning of the year and the total monitored by the end of the year is a reflection of the mobility of these populations (Emina et al., 2011).

Table 10.   The population of APHRCs DSS in Korogocho and Viwandani, 2003-2009

Year	Population monitored during the year			Population on 1st January		
	Korogocho	Viwandani	NUHDSS	Korogocho	Viwandani	NUHDSS
2003	29,708	37,496	67,204	23,328	26,105	49,433
2004	32,469	40,739	73,208	25,373	30,009	55,382
2005	32,329	35,994	68,323	26,409	26,673	53,082
2006	32,690	36,987	69,677	26,877	28,563	55,440
2007	32,186	38,998	71,184	26,996	30,163	57,159
2008	31,904	41,182	73,086	25,741	31,605	57,346
2009	33,880	44,276	78,156	26,277	34,392	60,669
Mean number	32,167	39,382	71,548	25,857	29,644	55,502
% Change 2003–2009	14.04%	18.08%	16.30%	12.64%	31.74%	22.73%

Source: Emina et al., 2011

135

Morbidity and mortality

Children

The nature of the environment in informal settlements has significant health consequences and both Korogocho and Viwandani have high levels of mortality. Health is particularly poor among children aged less than five. The lack of proper sanitation facilities and an inadequate water supply result in high levels of diarrhoeal diseases. Poor quality housing and high levels of overcrowding result in numerous pneumonia cases. Often households have no choice but to use the same room for cooking and sleeping, and the widespread use of kerosene and charcoal for fuel is likely to also contribute to poor respiratory health (Kyobutungi et al., 2008; Gulis et al., 2004). In 2000 it was found that over 40% of young children living in informal settlement had had a cough in the two weeks preceding the survey, while over 30% had had an episode of diarrhoea. Furthermore, because of poor access to healthcare, few women give birth in health facilities and 66% of children are not fully vaccinated (Emina et al., 2011). As a result, the mortality of children under five was 79 per 1000 in 2009; this rate is four times higher than in the rest of the population of Nairobi (Kyobutungi et al., 2008).

Young people and adults

Young people making the transition from childhood to adulthood in the settlements also suffer as a result of their environment: struggles with school fees, the lack of employment opportunities and early and risky sexual activity (such as unprotected sex and multiple sexual partnerships) make them particularly vulnerable to poor health. The levels of HIV infection in these communities is higher than in other areas of Nairobi, and this difference is greatest among young people (Ziraba et al., 2008). Young girls growing up in informal settlements are particularly vulnerable to risky sexual behaviours. A large proportion of girls in the Korogocho and Viwandani become mothers at very young ages: a third of 18-19 year old women have had a child. For both sexes, the reliance on informal sector primary level schooling means that many children do not progress to secondary school (Kabiru et al., 2011; Zulu et al., 2002).

Injuries due to interpersonal violence are the second most common cause of death among those aged five or above (the most common being AIDS and tuberculosis) (Kyobutungi et al., 2008). Informal settlements are characterised by high levels of insecurity and violence, which result from high population mobility at the community level and poor quality education along with unemployment and alcohol and drug use at the individual level. Since informal settlements are so marginalised, the police and justice system have almost no presence within these communities. As a result, "mob justice" is often used as a way to manage social problems. Death due to injuries is 5% higher in Korogocho and Viwandani than in Sub-Saharan Africa as a whole (Kyobutungi et al., 2008).

Fertility

Figure 26 compares the total fertility rates (TFR) for Korogocho and Viwandani (together and separately) with Nairobi, urban Kenya and Kenya as a whole. The TFRs shown are for women aged 15-49; the rates for the NUHDSS are calculated on a yearly basis, whereas those for the DHS cover a three-year period.

Figure 26   Total fertility by selected background characteristics, NUHDSS 2003-2009
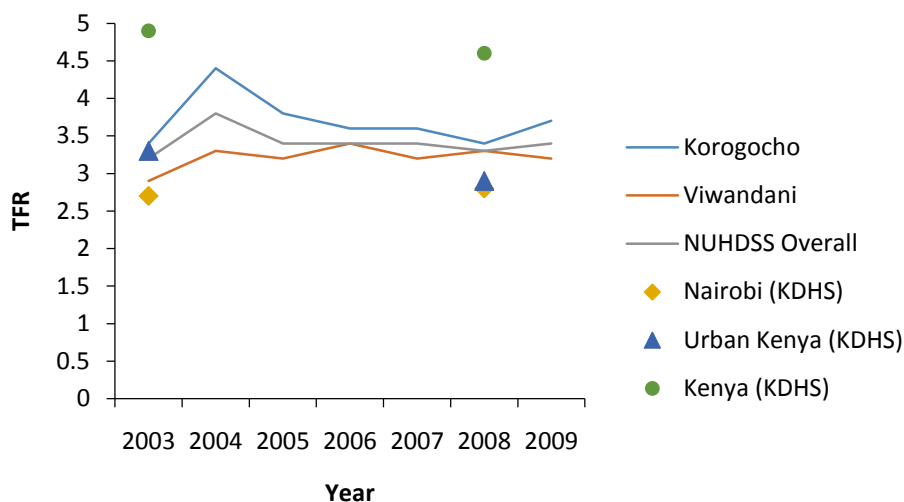
Source: Emina et al., 2011

Total fertility in the two settlements has fluctuated between 3.2 and 3.8 children per woman between 2003 and 2009, with an average of 3.4 children per woman. Fertility in the NUHDSS is consistently higher than for Nairobi as a whole, but lower than fertility in Kenya as a whole (which was 4.9 children per woman and 4.6 children per woman in 2003 and 2008, respectively). Fertility has been consistently higher in Korogocho than in Viwandani (by 0.5 children on average). The birth rates in both settlements have remained fairly constant since the establishment the of the DSS, which is consistent with regional and national trends since the mid-1990s (Ezeh et al., 2009; Westoff and Cross, 2006).

6.2 Results

6.2.1 Traditional expectations and the reality of conjugal relationships

High levels of migration into the informal settlements of Nairobi from rural areas mean that there is a mixing of social values: conservative expectations about childbearing and relationships exist in parallel with more liberal attitudes commonly found in urban environments. As a result of this, and of the high levels of poverty within these communities, a strong contrast exists between the traditional aspirations women have for their relationships and for family building, and the reality of their everyday lives.

Marriage is seen by the majority as the most appropriate institution for childbearing and childbearing outside of marriage is supposedly disapproved of within these communities. The words 'disrespect' and 'discrimination' were very frequently used by respondents in all the discussions to describe attitudes towards women who give birth outside of marriage and to the children that are born outside of marriage. The practice of bridewealth exchange means that, traditionally, children are born into the husband's side of the family, and have rights to that family's land. Children born outside of marriage are perceived to be outsiders because patrilineal tribal organisation means that, even if they are raised by the woman's own family, they are often not accepted as being a part of that clan or tribe. This appears to occur despite the fact that it is often the woman's mother who takes care of a child who was born outside of formal union. It is also common to hear that children who follow their mother into the family of a new husband are poorly treated by him and his wider family.

In reality, however, childbearing outside of marriage is very common in these communities, and a large number of respondents in this study had given birth at some point in their lives to a child fathered by a partner to whom they were not married.

Women also want to give birth within marriage because marriages are thought to be more stable and committed than partnerships.

> "Mod: [...] What is the importance of marriage for having children? Is there any importance to people in getting married before having children?
>
> ALL: Yes.
>
> R3: Yes it is important.
>
> Mod: Of what importance is it?
>
> R3: So that you may first know your husband's background and how they relate. To know whether this person has relatives who can help you if you ever encountered problems. [...] It is important because when you are married, even if you are young, you will be able to discuss how you are going to raise the children. When the children come they will find you together. You will be able to plan.
>
> Mod: Okay. Uh huh.

> R4: It is important to stay for a while before you have a child in that family so that when you have a child you will have a good life. You will have had a foundation because in the course of waiting you will have gotten to know each other. This is so that, by the time you have a child, you will be able to raise the child. [FGD 6, Viwandani]

There was almost universal agreement among the respondents that marriage is the best institution in which to raise children. Even those unmarried women stated that they would prefer to have a husband to assist them. There was only one participant who expressed ambivalence towards marriage for child raising. The importance of marriage for childbearing was often articulated in terms of the reliability of husbands compared with boyfriends: unmarried men are thought to feel less obligated to remain with their partners or to assist with the upbringing of a child. On a number of occasions we were informed that a child born to an unmarried woman often ends up being the sole responsibility of the woman, or her mother. As illustrated in the discussion above, marriage is also thought to allow women the time to get to know their husbands and to build up mutual trust with them. The sense of partnership and collaboration that women described coming with marriage is thought to allow them to plan and raise their children better.

Nevertheless, the formality of marriage does not offer much protection against relationship instability; many marriages within these communities are fraught with mistrust and suspicion. The following quote shows four respondents in FGD 2 talking about the decline in the stability of marriage in their community (Viwandani):

> "R3: Things have really changed nowadays [...] You may find that a couple who got married separating after three months. Men have become really unfaithful and even women are having many affairs; a lack of trust is making marriages break up.
>
> R4: In fact you will find that the women who are married are the ones who are moving around [having affairs] even more than the unmarried ones. You find that the ones who have a husband move around with other men more than those who are unmarried.
>
> Mod: What do you mean?
>
> R4: She is more promiscuous than someone who is not married.
>
> Mod: Ooh. Uh huh.
>
> R1: What I can add to that is that in the past marriages were firmer than today. If there is love… you know these men who have affairs are doing so because they don't have love for their wives. This is because if you love someone completely you cannot disrespect her. You have to stay with her but since there is no love, you don't see the importance of that person and that is why people have affairs outside marriage. Even women have become promiscuous; they don't see their husbands as important in their lives. A woman has too much love and wants to love every person; it is not like in the past.
>
> Mod: Ooh so you mean that the man is having affairs because the wife does not love him?
>
> R1: He doesn't love the wife.

Mod: He doesn't love the wife?

R1: Yes. [...] Because you cannot disrespect someone you love.

Mod: Disrespect in what ways?

R1: Having an affair or disagreeing in any way because you have that love in your heart.

Mod: Mh hmh.

R3: I also wanted to say that marriages in the past used to last but nowadays they cannot. In the past people used to trust each other and everyone was frank. If a husband wanted to marry another wife, he would come and tell her that he wants to marry another wife but nowadays it is like a secret. Instead of telling your wife that you want to marry another wife, you go and put up another wife elsewhere. So when the wife comes to know about it, obviously the marriage will break.

Mod: Okay. Uh huh.

R4: I will say that even the men's desire can cause this. You may find that you give your husband everything including love but he still goes out and has an affair with other women.

Mod: Mh hmh. So men and their greed?

R4: Yes.

Mod: Uh huh.

R5: Nowadays things have changed; it is not like in the past.

Mod: Mh hmh.

R5: A man just wants it to be known that he is married and has a wife. In case someone asked him he may say that he has a wife and children. However, for example if I am married, I will just be a housewife while my husband goes around with other women and might even have children. Now one day when he dies for example is when they come out so they don't place any importance to it." [FGD 2, Viwandani]

Although lengthy, this extract illustrates important perspectives on the nature of relationships in these communities; both changing marital patterns and declining trust between partners are mentioned. These comments are very similar to those given in other discussions; women often shared animated exchanges about the difficulties of marriage and the common occurrence of extra-marital relationships. It is important to consider these comments as a record of what women perceive about relationships in their community, rather than a record of their own experiences (none of our respondents gave any personal accounts of marital instability). However, I judge this to be due to participants' unwillingness to talk about this topic in a group context, rather than because they had not had first-hand experience of extra-marital relationships (either their own or their husbands). Indeed, a large proportion of our participants had been divorced and survey data from Nairobi's informal settlements has shown that the proportion of women who are divorced or separated is higher than anywhere else in Kenya (APHRC, 2002). Furthermore, the women were unlikely to give personal accounts as the moderator asked questions in such a way as to encourage

the respondents to describe behaviour within their community rather than give details of their own experiences.

Finally, marriage is perceived to improve the quality of a child's upbringing, as married couples are thought to be more economically secure. The respondents spoke about the lone-parent mothers struggling to provide for the basic needs of their children, even purchasing enough food was reported as being difficult. In FGD 5, where the majority of women were not married or in relationships, respondents related their struggles to their lone-parent status. A number of these women engaged in sex-work in order to ensure the survival of their families, and felt that they would not be forced to do so if they had marital partners. There remains a strong ideal within these communities that a husband should be the sole bread-winner in the family, while a women's role is to raise the children. It was common to hear women in the FGDs say that working mothers are unable to bring up their children properly. And yet, as will be discussed subsequently, the vast majority of women in these communities make important financial contributions to their households through paid work.

6.2.2 Gender roles and women's paid work

One of the most significant changes that has occurred to relationships in these communities is to gender roles. Households face almost constant economic uncertainty as employment opportunities in the informal settlements are rare, often temporary, and poorly paid. This is compounded by the high cost of living in an urban area, where household self-sufficiency is impossible and everything must be purchased. In order to meet the financial needs of their families, many women take on paid work.

The money that women earn is of vital importance to their households: women with husbands or partners are expected to shoulder a significant amount of the household expenses, particularly those that are related to the raising of the children. It is relatively common to find married women who are responsible for their children's food, clothing, school fees and occasionally the household rent. Moreover, those women who head of lone-mother households provide for the whole budget, with minimal financial assistance from their family members. Women's involvement with paid work has resulted in conflicted gender roles; women report that men have more respect for women who work and can take financial responsibility for some aspects of the household, but are concerned, on the other hand, about the consequences of this economic independence. Some women described men within their communities as feeling threatened by women's new economic independence and power within the household. Women also feel uncomfortable about their additional responsibilities outside of the home, believing them to divert their attention away from the needs of their children.

The changes in gender roles within these communities serve to destabilise relationships, and the unstable nature of relationships pushes women to desire economic independence within their relationships. While women pool their income with their husbands or partners, many also express the need to have private access to money. There is a strongly held belief among women that men

cannot be relied on for financial support. Partly this is because men are normally employed as casual labourers, so their income is unreliable. Moreover, even when they do have work, their incomes are often not enough to cover the household expenses. However, women's desire to be economically self-sufficient also stems from the unstable nature of relationships within these communities: women want to be able to provide for themselves and for their children if a relationship breaks down.

The popularity of *chama* (Kiswahili word for association) schemes in the informal settlements of Nairobi is a clear indicator of women's desire for financial independence. *Chama* are women's financial cooperatives, where a group come together and contribute a fixed amount of money on a regular basis and the total collection is given to one member on a rotational basis until everyone has received it. *Chama* harness individual commitments to savings and serve as a safe storage of incomes in places where formal sources of credit and insurance are not available (Biggart Woolsey, 2001). Many of the respondents spoke of the importance of *chamas* for the economic wellbeing of their households and they often spend their collection on the needs of their children.

6.2.3 The extended versus the nuclear family

Ties of kinship are often what draw women, or their husbands, into migrating into a particular informal settlement. The majority of the participants in this study had one or more members of their extended family living close by, either sharing a house with them or living in the neighbourhood. The extended family forms an important support network in a social environment where levels of financial insecurity are high. For women, this support comes predominantly from their own family members, and is most important during times of difficulty or family emergencies. For example, if a woman needs to undergo a caesarean section operation, her relatives may cover hospital fees or might assist her with school fees if she was unable to raise them herself. In addition, it is common to find women whose children were being raised *ushago* (away from Nairobi in the countryside) by their own mothers. This was sometimes because they were unable to afford to care for them in Nairobi, but often because these children had been born outside of marriage and would have faced discrimination otherwise.

While the connections between the woman and her own family are her most reliable support network, most Kenyan tribes are characterised by a patrilineal kinship system. This means that it is the wider family on the husband's side that have the greatest expectations and a sense of ownership over a woman's childbearing capabilities. Thus, it is common for in-laws to comment and criticise on these matters. As will be discussed in the following sections, the husband's family is concerned with the number of children a woman bears, with her demonstration of commitment to her husband and also her previous relationship history. It is common for husband's families to strongly disapprove of their men marrying women who have previously been married, and children from previous marriages are often very heavily discriminated against. Women are expected to bear

enough children to continue the family lineage, but not so many that it makes the inheritance of limited family land problematic.

Despite the pressures exerted by the extended family and the assistance that they often provide, the nuclear family unit is viewed as being largely independent from the wider family network. When asked about the assistance that their extended family members provide, the respondents in FGD 5 (Korogocho) all agreed that households should stand autonomously and that the assistance of others cannot be relied on:

> "R3:   However, life nowadays is not about [extended] family. It is up to you to look after your family and your [extended] family members to look after their family members.
>
> ALL: [In agreement]".

Similar views were expressed in other discussions. For example, when asked whether extended family members can influence decisions that a couple might make about having children, R7 told us:

> "Currently there is no one who can tell you to have four or five children; the economy is really bad. The economy is really bad and you need to educate them. I have four children and I need to feed them and send them to school, so I will have to stick with those [not have any more]. But one cannot tell me that when this one grows up I should give birth to another one. Will she feed them for me? If she will, I will give birth. [Group laughter]" [R7, FGD 1, Korogocho]

These excepts illustrate that, despite the instability of conjugal relationships in these communities, important household and familial decisions are considered to be the responsibility of a couple, and the influence of the extended family members over these matters is resisted.

6.3   Discussion

In summary, this study suggests that the characteristics of urban areas, and particularly of the informal settlements, affect the structure of households; both through changing the nature and expectations of conjugal relationships and gender roles, and also through increasing the physical distance between members of an extended family.

The results have revealed a mismatch between women's expectations of marriage as a stable relationship within which to bear children and the reality of conjugal relationships in these communities. Women subscribe to the norm that childbearing outside of marriage is wrong and leads to lack of respect and that marital relations are more secure than other relationships, both personally and financially. Yet in reality, childbearing outside marriage is very common, marital breakdown is high and marriage does not guarantee financial security.

Cities in Sub-Saharan Africa are places where seemingly different agendas converge somewhat uneasily, where different social, political, economic and cultural messages and values conflict, co-

exist and intermingle (AbdouMaliq, 1998; Agadjanian, 2001). As Agadjanian (2001) describes of Maputo, this urban environment is not merely a product of indigenous cultures and exposure to western values and beliefs. Rather, it is the multifaceted outcome of local traditional cultures, colonial urban history and newer, post-colonial interpretations of it, and recent socio-cultural additions brought about by globalisation. Indeed, because this social and economic diversity exists within a relatively small spatial area, urban populations also exhibit a larger range of behaviour models than rural populations, and the opportunities for social learning through example or conversation are likely to be greater (Montgomery et al., 2004). This diversity and the contesting and redefinition of social values and norms explain the tension between women's expectations of marriage and the more liberal reality of increased acceptance of premarital and non-marital childbearing found in this study. In particular, this discordance is likely to be particularly great in informal settlements as many women were raised in rural areas and are therefore likely to hold conservative values about family. Upon entering urban areas, migrants are suddenly exposed to new values. Many women appear to adopt these, while continuing to subscribe to values that are rooted in rural, more traditional societies.

The socio-economic environment of life in Nairobi, and in particular the informal settlement, has resulted in changing gender roles. The monetisation of consumption has meant that many women now take paid work, in particular because they often have to take responsibility for costs related to the raising of children. Just as women themselves are ambivalent about what the consequences of these changes will be, they also believe that their partners are uncertain about what their employment and new responsibilities mean for childrearing. In addition to the reduced control exerted by extended family members, the need to negotiate new gender roles is likely to be a major contributing factor to the unstable nature of relationships within the informal settlements of Nairobi. However, the association between gender roles and relationship breakdown works both ways: women's increased participation in the labour force is also a product of the unstable nature of relationships and their increased chances of being lone-parents.

In Maputo, Mozambique, men have been shown to be concerned that their role as primary decision-makers within the household is being destabilised by their growing incapacity to provide for all of the household needs and by women's increasing autonomy in society (Agadjanian, 2006). Similarly, in this study, women reported that men are also cautious about what the consequences of these changes may be and are thought to feel threatened by women's new independence and authority in the home. However, perhaps because of the high levels of household poverty within informal settlements, they also recognise and often accept (reluctantly) the necessity of women earning an income. Women themselves also feel unsure about their economic responsibilities, and are concerned that they may interfere with raising children, which they continue to regard as their primary role within the home. Although the changing natures of relationships and gender roles have led to the high levels of relationship breakdown, it is important to place these findings within the context of poverty and social exclusion that characterises the informal settlements. High levels

of crime, poor health, alcoholism and substance abuse in Korogocho and Viwandani put households and families under enormous pressure and increase the risk of relationship breakdown and separation.

There is a strong belief in these communities that the nuclear family has become increasingly independent from wider networks of extended family. This is occurring despite the fact that the extended family remains substantively important for financial support, and its members continue to feel that they have rights over matters of childbearing. However their power is undoubtedly being eroded in this urban environment. Women feel that individual households and couples should be self-sufficient. As a result of this, important household and family decisions are the regarded as being the responsibility of the couple and not the extended family.

It has been argued that as societies modernise, they become increasingly differentiated and the nuclear family becomes the dominant household form. In particular, exposure to formal education and wage employment in urban areas leads this process of nuclearisation to be more prominent in urban areas than in rural areas, where the extended family remains the more common household form (Burch, 1967 cited in Amoateng et al, 2007). Although modernisation theory has largely been developed from data gathered in the West, evidence suggests that, despite enormous difference in socio-economic circumstances and cultural backgrounds, the nuclear family is becoming increasingly dominant in urban Sub-Saharan Africa (AbdouMaliq, 1998; Agadjanian, 2001). Traditionally, the authority of extended family has rested on access to the resources and security that it makes available to its members. However, the economic hardship of urban areas is increasing the number of demands placed upon family networks to assist individual members. It is this pressure, combined with reduced access to resources (land in particular), which has contributed to their weakening. The authority of the extended family network is diminished as it is increasingly unable to fulfil the demands of its members and, in this context, individuals are required to identify opportunities independently (AbdouMaliq, 1998). In Maputo, the increased physical distance between members means that extended family networks are increasingly being replaced by non-familial social ties (Agadjanian, 2001). In the case of this study, the environment of the informal settlement means that social contact and financial connections between family members often remain common. However, much as AbdouMaliq describes, the social authority of these networks is decreasing as nuclear families seek to act independently. As Agadjanian (2001:249) describes of Maputo, the nuclear family is increasingly becoming the "locus of social life" in Korogocho and Viwandani.

6.3.1 Conclusion

This chapter has given an examination of conjugal and familial relationships and how they affect childbearing intentions and decisions. Childbearing sits at the centre of relationships in these communities and the decisions that women make about having children reflect the nature of conjugal relationships in this social environment. The higher costs of raising a child in an urban

environment and women's dual roles as income earners and childrearers increases the opportunity cost of bearing a child. This has affected the amount of time that women desire to leave between their births. It also has implications for the number of children women desire to have. As a result of women's greater responsibilities in the household, either because they are single-parents or because of their need to earn an income, women in Korogocho and Viwandani assert greater independent decision-making when it comes to matters concerning the family.

While changing gender roles and relationship instability push women to leave longer spaces between their births and limit their family size, other social influences encourage more traditional family building behaviours. Within the wider community, becoming a mother is seen as a validation of womanhood and bearing children improves a woman's social status. Similarly, within their husband's extended family and their tribal groups, women are expected to demonstrate a commitment to their husband's ancestral lineage and their marriages through giving birth. In addition, the backdrop of social and financial uncertainty that is omnipresent in poor urban communities means that womens' plans for their families have to be adaptable. The myriad of often contradictory and conflicting influences on women's decisions about relationships and childbearing mean that women have to be strategic in their choices and actions. They attempt build their family in a way that satisfies their own desires, those of their partner and their extended family members (both their own and those on their partner's side). A full discussion of women's childbearing decision-making will follow in the next chapter.

7 Controlling childbearing

This chapter will discuss the ways in which women in Viwandani and Korogocho desire to control their childbearing. These results will be discussed in two sections: the first concerns the number of children women desire to have in their lifetime and the second concerns the time women wish to leave between births.

7.1 Results

7.1.1 Planned versus accidental childbearing

A discussion of the control of childbearing is predicated on the fact that childbearing within these communities is something that is consciously considered and is thought to be manageable in at least some respects (Coale, 1973). It was abundantly clear during the focus group discussions (FGDs) that having children was something that women had consciously thought about. The respondents were able to answer all the protocol questions (the majority of which were focused on factors that women consider important for childbearing) without difficulty and it was very rare to hear them describe events as being "up to God" (van de Walle, 1992). It was also clear that they have a strong wish to plan their families, despite unplanned pregnancies being common in their communities.

In places where levels of poverty are high, people's ability to control their lives is compromised; and there was abundant evidence of this in this study. Both Korogocho and Viwandani are insecure environments with high levels of violence and crime and it is not rare for women to be raped in the narrow alleyways between dwellings. Conception as a result of sexual attack was mentioned during the discussions, particularly by respondents from Grogan neighbourhood of Korogocho where levels of insecurity are highest.

Having a child outside of a marriage or co-residential relationship is disapproved of within these communities, yet a large number of respondents in this study had become pregnant while still at school or living with their parents, and it was common to hear these conceptions being described as accidental. In addition to children born outside marriage, women also described some births born within marriages or stable relationships as accidental. Sometimes this is due to a failure (or perhaps misuse) of a family planning method, however women also described conceptions that were a result of their husbands' desire for them to stop family planning use as being unwanted.

Despite the frequent occurrence of unwanted pregnancies, women demonstrate a strong desire to be able to plan for a birth. The wide-spread use of modern contraception in these communities is testament to that. Survey data from Korogocho and Viwandani show that in the first twelve months following a birth 62% of women who were not amenorrheic and not abstaining from intercourse were using a modern method (Ndugwa et al, 2011). Not only is the prevalence of contraceptive use high, but the women who participated in this study demonstrated a confident

knowledge of the methods that were available to them, and debated the merits of traditional versus modern and long-term versus short-term techniques. However, as the following quote shows, a planned birth is not merely seen as one whose timing is facilitated by the use of a family planning method, but one they feel prepared for:

> "You could want to have a baby but not have a job and not have anything [...] If you are married, maybe your husband is just a hustler. [...] You may want to have a child but you cannot because when that child is born it will just be suffering. You want to have a child but there are so many problems so that when that child arrives your husband feels that you have imposed an additional burden on him. But you will need to settle down and have a good job as well as your husband, so that when the child comes he will have a good life; you will not be rushing to the neighbours. So it is good for someone to plan to have a child." [R4, FGD 6 Viwandani]

And as R2 adds a little later in the same discussion:

> "[...] Thus if I want the child to have a good life I should have a good relationship with my husband so that I can tell him that I am pregnant. This is so that even as we go on with life he will have the knowledge that his wife is pregnant and will not later have doubts about it. There should be discussions between me and him." [FGD 6, Viwandani]

It became clear during the analysis of these data that women's sense of preparedness comes from their perception of their financial status and whether they feel they will be able to afford to raise the child. It also comes from their perception of the quality of their relationship; women aspire to have discussed and agreed on a pregnancy with their partner.

7.1.2 Desired numbers of children

The importance of family size
Women in Korogocho and Viwandani express certainty about the number of children they desire in their lifetime. In the FGDs, women often mentioned their desired family size without being prompted directly by the moderator:

> "Mod: [...] So, how do you feel being a mother or being called a mother?
>
> [...]
>
> R5:   You are happy when you are called a mother because when you look at your child, you feel proud. And when he calls you mother, you are happy having a child [...] but life today has made two or three children enough [...] Take me for example, I have no need to have more; I feel these children are enough for me." [R5, FDG 4 Viwandani]

Women attach great importance to family size, with regard both to their own family and to those of their peers, because there is a widespread sense that smaller families are now more desirable. Women spoke of a time in the past when large family sizes were ideal, and those that did not give birth regularly and frequently were not well respected and risked losing their husbands. However, women in these communities believe strongly that the value of large families has declined because the costs of raising children are so high in this particular urban environment.

148

The changing costs and benefits of childbearing

Raising children in the informal settlements of Nairobi has very different costs and benefits from raising children in wealthier suburbs or in rural areas. Comparisons with rural areas are the most relevant in this context, as the majority of inhabitants moved to Nairobi during their early adult years from rural areas (Emina et al., 2011). Most households in Korogocho and Viwandani live in poverty; incomes are low and unpredictable and, unlike in a rural environment, all household goods and food must be purchased rather than grown or handcrafted. Dwellings are generally of poor quality and very small, so large families are difficult to accommodate. The tenure of housing in the informal settlements of Nairobi is often very complex; however, most people in Viwandani and Korogocho do not own their homes, so rent is a further cost to be met. This situation is quite different from that in rural areas, where land and housing are family owned. In addition, there is strong desire to ensure that all children in a family gain a good education, as there is strong awareness that education brings the biggest chance of upward social mobility in an urban environment. Most women included in this study aspired to send their children to secondary school (which are fee paying), and often to a private primary school (where classrooms are less overcrowded than in the government schools).

In addition to the financial costs of childbearing in the informal settlements, women are also concerned about the impact the social environment will have upon their children. For example, R5 in FGD 5 describes the lack of control women feel that they have over the upbringing of their children:

> "You will then find that when I have raised my child, even if they say that your child will be how you raise him, that is not the case here. I may raise him well and my neighbour a different way but these children will eventually meet and advise one another. You may find that although I have raised my child well not to become a street urchin, not to abuse gum or run away from school, you find him doing all those things."

And as R2 explained earlier in the same discussion, this sense of lack of control over child raising and of lack of social opportunity makes having children less desirable:

R2:   It is important to have children but when you look at our village here in Korogocho, there is no importance of having children.

Mod: Really?

R2:   Because you will find that you have three children and among them you have a thief, a prostitute and a street urchin [...] Given the situation here in Korogocho, having a child is not important.

Mod: It is not important.

R2:   I mean you give birth to fulfil God's laws but here in Korogocho there is nothing worthwhile in what you are doing.

The benefits of bearing children in the urban context more generally are also much reduced. While the social benefits of childbearing remain strong for a mother, such as respect and honour from

family and community, the economic benefits are considerably diminished. Children are unable to contribute to the provision of food as families do not have land close by to grow their own crops. The pressure to educate children means that most do not work and so are unable to make significant financial contributions to a household. School attendance reduces the practical advantages of having large numbers of children. Children are no longer present in the household during daytime hours and are thus less likely to be able to provide assistance to their mothers by supporting them to raise younger siblings. Although even in rural areas it is unlikely that these benefits of bearing large numbers of children outweigh the costs, the increase in the net cost of children in urban areas may help to explain why large family sizes are regarded as undesirable among women in these communities.

Most migrants in low income countries move to urban areas in search of improved job and livelihood opportunities and existing evidence suggests that Korogocho and Viwandani are no different in this respect (Emina et al., 2011). The increases in the costs of bearing children (through education) and reduced benefits from raising them (through their reduced economic contributions) are thus likely to be an unanticipated side-effect of rural to urban migration.

Pressures for smaller family size

Women also fear that having large numbers of children will put pressure on their conjugal relationships. When asked about whether she felt having another child might put pressure on her relationship or improve it, R4 in FGD 5 explained:

> "I feel that if I give birth to many children (I already have two) it will bring a lot of problems in that household because that love will be a bit suppressed [...] Thus, you ought to hold onto the two because if you exceed that, it will be bad [...] If you have many children he will abandon you. [...]
>
> You should have a number that you are able to take care of, so you are not making him suffer because of those children, because of so many expenses. One may need clothes and the other one has to be sent to school. I mean, the expenses become too much. However, if you plan for the children that you will be able to raise, you should stick by that." [FGD 5, Korogocho]

This was a very typical response to this question; many respondents felt that large families put their relationships in danger. This strain is associated with the costs related to raising children, and also with the changing nature of relationships and family in Korogocho and Viwandani. Despite women perceiving that they bear the largest burden of childbearing, many men provide significant financial assistance; often covering at least the cost of rent and school fees. Women perceive that men may leave such demands become too great.

The pressure to have smaller families also exists outside conjugal relationships; women who have large families are discredited within their community:

> "Family planning is good because [...] it also saves you from embarrassment so that people will not say that you gave birth to so many children, that you are not able to take care of them" [R3, FGD 6, Viwandani]

It is not simply a few pioneering couples or even the current childbearing generation that subscribe to the value of smaller families. The expectation for women to have fewer children also comes from older community members. For example, a number of respondents informed us of how their older relatives, especially their mothers, have discouraged them from having more children:

> "she [my mother] does not want me to have another child because she can see how my family is. She tells me to raise this one first. And, if my husband changes then I can give him another child. But, if I see that he is not changing, then there is no need for me to give him another child. [...] Thus she tells me to use family planning and live with this one child; [she tells me that] that I should not have another [one] considering my home-life." [R4, FGD 6 Viwandani]

Children were often described as "burdens" in this context. This pressure from older generations to have small families suggests that a major social change is underway and the recognition of the changing balance between the costs and benefits of raising children is widespread within these communities.

Flexible aspirations

Interesting implications arise from the fact that women's desired family size is so strongly shaped by their economic circumstances. The small number of children that the majority of women desire is often portrayed as a something which is forced upon them by their limited household incomes, and that, if circumstances were different, they would desire more children:

> "R4:   When you look at life now for example, commodities are very expensive [...] When you look at the cost of the uniform for one child until he finishes form four, you cannot afford it. With this life here in Korogocho you don't have a good job, your income is low and so you look at it and see there is no need.
>
> R3:   You may also find that you are jobless and your husband is jobless too. [...] Thus you are forced to use family planning, because with what will you raise the child when you get one?
>
> Mod: Mhmm.
>
> R4:   But if you have a good job and you are earning good money, [...] you will continue to give birth because you know you can manage." [FGD 5, Korogocho]

I believe that this quote (and other similar ones not shown) illustrates that, ultimately, the women of these two communities still subscribe to traditional, pronatalist values and that large families are still seen as the ideal. Women's desired family size is that which they believe is achievable given their household circumstances and the state of their relationships, whereas their ideal family size is what they would hope for if there were no constraints. Thus, there is a conflict between women's values; they want large families but believe that it is more important to invest in the well-being of each child. It is this conflict that results in a disconnect between ideal and desired family size in these communities.

The circumstantial nature of women's childbearing aspirations also affects the time when women decide upon their desired family size. During the FGDs, a contradiction emerged between women's reported patterns of contraceptive use and what they said about planned births. Contraception is widely used in this community, both for delaying a birth and for limiting the number of children in a family; however many women also reported that planning was something that they did *after* they had become pregnant. For example:

> "You plan after it has happened. After getting pregnant is when you start to plan. You start to struggle to get money for clothes and maternity. But I don't plan before I get pregnant" [R2, FGD 5, Korogocho]

Yet, this same respondent told us later on that she has used a variety of family planning methods. In part, this contradiction can be explained by the fact that women in these communities use the word plan in two contexts: it can be used to describe the process of financially and practically preparing oneself for the arrival of a baby. It can also be used to describe the use of family planning methods to control one's fertility. However, it seems that this contradiction is also a product of the disconnected nature of women's ideal and desired family sizes. I believe the following quote best explains this. When the moderator asked the respondents in FGD 1 whether it is possible for a woman to say how many children she wants for the rest of her life, R4 explained how she believes reproductive intentions emerge in her community:

> "...One doesn't say that I want to give birth to five children; one usually says after they are already born. That is when one sees that the expenses for the children have got so high, this is when she decides not give birth anymore. But the decision does not come at the beginning; it is usually after they have given birth" [R4, FG1 Korogocho]

The quote suggests that women begin childbearing without a desired family size in mind, and, given that children and motherhood are still highly valued within these communities, are likely to want to bear as many children as their circumstances will allow. Thus, the desire to limit births comes to the forefront later as the expenses of raising a large family become increasingly apparent.

This flexible approach to family planning makes sense in an environment where there are many influences and expectations about family building, and where there are high levels of financial and social uncertainty in women's lives. The respondents in this study narrated stories to us of how having another child can strengthen a relationship between a couple through imparting a sense of responsibility to the man and encouraging him to commit to providing for the household. Motherhood can also improve a woman's social standing in a community: respondents in all the discussions said that women gain respect when they have a child. But bearing another child is also perceived to be very costly and women fear the expenses that an additional birth will bring:

> "Mod: Do people fear the costs before they have children?
>
> R4:   Yes they fear.
>
> Mod: Uh huh.

R4:   Because when she is thinking about giving birth, she looks at how life's budget keeps going up. And when she looks at the income that she gets, she feels it will not be enough to satisfy those needs. And so, even if she is planning with her partner, she will still look back at these issues. She will feel that even if she wants to add another child, how will it be by the time this one gets to the level that she wants? How will it be?" [FGD 6, Viwandani]

This excerpt demonstrates women's typical concern with the costs of raising a child (although this concern does mean that they will not conceive at some point in the future, as will be discussed later). As a result of these contradictory considerations women have regarding childbearing, they need to act in a way that minimises risk and maximises opportunities, which I believe explains their flexible aspirations for childbearing.

Contraception use

Patterns of contraceptive use among women in Viwandani and Korogocho reflect this flexible approach to their aspirations for family size and the contradiction between the importance of small family sizes in an impoverished community and the pronatalist values that still influence women's ideals about childbearing.

Contraceptive use in this community is widespread. Women report that accessing family planning services is easy and there is no discrimination in provision on the basis of age or marital status. In both communities there are monthly family planning clinics where contraception is provided free of charge. Figure 27 below shows a poster advertising this clinic in Viwandani settlement.

Figure 27   Advert for monthly family planning clinic in Viwandani

In addition to the local provision of contraception, women also report that they access services from other providers (for example, Marie Stopes) in other districts of Nairobi. The widespread use of contraception in this community, for stopping childbearing as well as for spacing births, shows that women are committed to limiting their family sizes. In addition to the use of hormonal methods, a number of respondents in this study had undergone sterilization. Although poor health during pregnancy or problematic labour was often used to justify this, it nevertheless signifies a high level of commitment to stopping childbearing, particularly as tubal ligation has faced resistance in many Sub-Saharan communities (Bertrand, Mathu, Dwyer, Thuo, and Wambwa, 1989; Chibalonza, Chirhamolekwa, and Bertrand, 1989; Dwyer and Haws, 1990 cited in Agadjanian, 2006). Despite widespread concerns about the side-effects of modern contraceptives, many women continue to persevere with them. It is common to find women who have switched between a number of methods because they felt that the side-effects were intolerable, but did not want to fall pregnant:

> "I used Norplant and it affected me. I swallowed the pills and I added weight. I used the injection and I was bleeding from 1st of this month to 1st of the next and I felt I should not use it anymore. I then went back to the pills and they used to cause me headaches and so I stopped using them. Currently I am using an injection and I haven't seen any side effects." [R3, FGD 5 Korogocho]

Such switching between methods, in particular in cases when a large number have been used, indicates that, despite their concern about the impact of hormonal contraceptives on their bodies, some women are certain they do not want to have more children.

On the other hand, numerous women have had more children than their desired family size.

> "Okay, you can plan for yourself but God's plan may be different. Take me for example, I had planned to have two but now I have three" [R3, FGD 2 Viwandani]

This situation is likely to arise as either a result of a mismatch between a woman's desired family size and that of her partner (this will be discussed later), or because of the failure of or lack of use of contraception. As explained already, great concern exists about the side-effects of contraception in these two communities among both women and men, and these side-effects were often cited as the reason women stopped using a method. Some of these women then go on to use another method, but many revert to using traditional techniques, often in the knowledge that that they are likely to conceive without the reliable protection of a modern method.

Since access to services and supplies appears not to be an issue within these communities, such women are less committed to limiting their family size than those women who continue to switch methods or decide to tolerate the side effects. A number of women in the FGDs spoke of the possibility of becoming pregnant after having reached their ideal family size. Sometimes they regarded this as being problematic, but frequently they portrayed it as something that they had no control over, or as something that was positive.

> "It is also important that you and your husband get the number that you can raise...but if you get one [child] by bad luck, or by good luck... let's not say it is by bad luck because it is by good luck; God has blessed you with a child" [R7, FGD 4 Viwandani]

Similarly,

> "Mod: [...] How many [children] would you prefer?
>
> R7: Four. Currently I have four, but if God was to bless me with bad luck then I will just give birth" [FGD 4 Viwandani]

Furthermore, the respondents in this study commonly used the phrase "lucky child", which is used to mean that a child will come with its own wealth. This belief that a child can bring good fortune and wealth to a household suggests that a shortage of economic resources does not always lead to women wanting to halt childbearing. It is likely that such beliefs explain why some women believe that becoming pregnant after reaching ones' desired family size is not problematic. This contradiction can be explained by the more traditional attitudes towards childbearing that remain important in these two communities. While the urban environment pushes women to have fewer children, there are strong cultural beliefs about the value of children that they also continue to subscribe to. As discussed above, there is a widespread attitude that large family sizes are more desirable and are what most couples aspire to, and it is only problematic economic circumstances that stop women from bearing more children.

The continuing prevalence of pronatalist beliefs may seem at odds with the popular desire for smaller family sizes, and is certainly contrasted by reports from participants that women with large families are regarded as irresponsible. However, the fact that a large number of informal-settlement dwellers were born in rural areas, where family sizes are bigger and the benefits of large numbers of children are higher may well explain the continuing pronatalist attitudes described here. Korogocho and Viwandani settlements are communities in transition, where traditional expectations about families and relationships coexist, conflict and intermingle with more modern values that arise as a result of urban circumstances. These values are not about family size per se, but rather about the investments that parents are expected to make in their children, for example through education. The importance of 'child quality' in turn makes smaller families more desirable. Evidence from the FGDs suggests that women who desire large families and women who want to invest heavily in childrearing are not two separate groups. For example, this respondent reports that she would like to have more children, but at the same time is using contraception:

> "...Religiously we're not supposed to use those things [modern methods of contraception]. [...] And that is why you find that many women are giving birth year after year. However, I said that God will forgive me. It is not my wish; I would really like to have children. [...] However, not a number of children that I will not be able to raise. I cannot say that women who are married must not have an abortion. [...] We can; there are very many women who do that. [...] But why should I have an abortion? I would rather prevent myself from getting pregnant. [...]I ask God to forgive me because I will use them." [R3, FGD 5, Korogocho]

155

Such cases illustrate that there is not one group of women who are avid users of modern methods of contraception and another who believe that controlling childbirth is morally wrong. Rather, that women can and do subscribe to both values simultaneously, despite the fact that they are conflicting.

Decision-making and household authority

In addition to lack of, or improper use of contraception, the power dynamics and conflicted gender roles within relationships in these communities also explain why some women have more children than they desired for themselves. There appears to be great variation in the extent to which couples talk openly about having children; in the FGDs some women reported making decisions together with their partners, whereas many others said that they act independently. However, it is clear that women are generally expected to take the lead on decisions about childbearing. They are expected to understand the limits of their household resources and decide how many children can be provided for and, as discussed above, women who have large numbers of children risk destabilising their relationships. However, women also show a keen desire to take full responsibility for planning their families as they feel that they carry the burden of bearing and raising children alone. In part, this is a reference to their physiological role in childbearing (pregnancy, labour and breastfeeding). But it is also a reference to the fact that women in these communities are increasingly expected to provide for many of the financial costs of raising children.

Women also demonstrate their independence over decisions about childbearing through their use of contraceptives, which are almost universally regarded as solely the business of women. Men are generally not consulted and a significant amount of use of hormonal methods reportedly happens in secret without a partner's knowledge. Interestingly, many respondents described the secret use of family planning as something that women are forced to do, rather than it being an act of defiance. Many women implied that they would prefer to be able to have an open discussion about their reproductive intentions:

> Mod: Do husbands and wives discuss about family planning?
>
> R3: Husband and wife?
>
> Mod: Yes.
>
> R3: Yes.
>
> Mod: They do?
>
> R3: You have to discuss it because if you want to have a child or you have had a child, which are the best ways? What is the best time to start family planning; you have to discuss this.
>
> Mod: Mhmm.
>
> R5: Yes, you have to discuss but you go secretly. If your husband does not want you to but you feel that you need to continue using, you go and do it secretly. [...] But the most important thing is that the two of you should

> discuss family planning so that you may know when to have another child.

Mod: Mhmm. Eh heh.

R2:   You see, your husband might ask you if so and so are doing it, when you tell him that you should do family planning. When it comes to that objection, you just keep quiet.

Mod: Mhmm. When you keep quiet, does it end there or do you go and do it secretly?

R2:   You keep quiet, but you do it secretly.

For many women, secret use occurs because of their assumption (rather than explicit knowledge) that their partner disapproved of contraceptive use. Commonly, women believe that their partners are concerned about the perceived side-effects (often contraceptives are thought to impact upon a woman's sexual desire) or believe their partner wants them to continue childbearing.

Despite strong evidence of female independence with regard to matters concerning the family, the transcripts also show that there are conflicts of interest within couples and that some men do exert authority over these decisions. Women state that the payment of bridewealth and a man's belief that he is the main bread-winner in the household can often lead him to feel that he has the final say about childbearing, in particular with regard to the number of children. A man is particularly likely to put pressure on a woman if his own family expect her to bear more children, a situation which is not uncommon as that the majority of tribal communities are organised patrilinearly and women are expected to bear children in order to continue the ancestral lineage. Although there is no specific number of children that women are expected to have, any less than three appears not to be enough:

> "In my community when you get two children all eyes are on you. When the husband goes and two months pass by yet you are not pregnant, she [the mother-in-law] starts to insult her son's choice of wife. She will not accept two children for her son." [R2, FGD 6 Viwandani]

Naming traditions also allow extended family members to pressure women to bear a certain number of children, particularly within the Kikuyu tribal culture (the Kikuyu are the most populous tribe in Kenya). According to these traditions, children are named after their grandparents, and the expectation is that the husband's parent's names are taken first. This encourages woman to bear enough children to allow their own parents and their in-laws to be recognised in this way. In particular, it creates pressure for women to have another child if they have only given birth to girls or boys. If a woman's partner (or his extended family) desires more children than she does herself, she may end up having to bear another child:

> "R2:   He [a husband] insists that he wants a son so that the boy can be named after his father. By bad luck, you get a girl, which you already have. In your mind, maybe you had planned that you want two children given what you have gone through. And so after that it becomes a huge conflict. You will have to reach his level [meet his expectations] and so

157

you find yourself having children that you never wanted in the first place. You end up having a family you did not want because you are in search of a boy.

Mod: So then you just continue to have children even if you do not want to?

R2:   You just continue giving birth so as to reach his expectations

Mod: Oooh

R2:   And if you do not reach his expectations he will leave you and go for other women out there to try some more." [FGD 5 Korogocho]

As this quote illustrates, women often fear that refusing to become pregnant again might result in their relationships breaking down and thus, may end up conceiving again even if they have already reached their desired family size.

Similarly, a woman may end up overshooting her desired family size if her husband is unhappy about her use of modern contraceptives. While women in these communities are knowledgeable about the contraceptives available to them, the facts that matters of childbearing are considered women's business and that most reproductive health programmes are targeted to women mean that men are likely to have poor knowledge and understanding of the use and side-effects of family planning methods. It is common to hear of women who have discontinued use of a contraceptive method because their partner was concerned with the side-effects (both real and imagined) or because he was against the idea of fertility control. Such women revert to the use of less reliable traditional methods and often end up conceiving again.

7.1.3 Timing of births

Traditionally, demographers have argued that women time their births as a result of the considerations that are related to the age of their youngest child. They may be worried about the impact of a short birth interval on the health of their existing children or on their own-wellbeing. They may also wish to delay conceiving in order to avoid the increased pressure that would result from having to care for two very young children simultaneously, particularly if childcare conflicts with other activities. Similarly, they may wish to postpone pregnancy while breast feeding their youngest child. In some societies, engaging in sexual intercourse in the post-partum period is regarded as deviant, thus women may also wish to delay conception in order to avoid the social censure that can arise from short birth intervals (Timæus and Moultrie, 2008).

Most of the respondents in this study stated that they thought women should wait three or more years between births, with the majority saying that five years was the ideal time to wait. When explaining their reasons for their preferred waiting time, women focused on factors relating to the health of the child and of themselves as mothers, on household finances and on wider influences from extended family members and the community. Some of these reasons are strongly associated with the age of the youngest child; however, most of the respondents' discussion focused on reasons for delaying a pregnancy that were not associated with the age of their youngest child.

This section examines the factors that influence the decisions that women make about the timing of a birth. It looks first at the reasons that are related to the age of the mother's youngest child and then at the reasons that are independent of age the of the youngest child.

Reasons related to age of youngest child:

Difficulties of raising children

Much discussion focused on the practical difficulties of raising children when they are young. The respondents discussed how basic household chores, such as the washing of clothes, are more difficult to do when they have small children. A number of respondents stated that they want the youngest child to be able to eat and walk independently before becoming pregnant again. Partly this is because it allows them more energy to dedicate to the smaller child, and partly because the older child is then able to assist the mother with raising the younger child. The strong preference for five-year birth intervals may be explained by the fact that women feel that once a child reaches the age of five it is less dependent on the mother.

Women from all walks of life are likely to want to delay a pregnancy in order to not have to raise two very young children simultaneously. However, the circumstances in Korogocho and Viwandani mean that women are likely to struggle more with small children. Dwellings are typically a single small room that has few amenities that might serve to lighten the domestic workload. The lack of sanitation and drainage infrastructure and use of open stoves inside the main home means that young children have to be constantly minded in order to avoid contact with things that might endanger their health. In addition, women in these communities perceive themselves to receive little assistance with the raising of their children. This is likely to be a concern that is specific to urban women, as those in rural areas often have more extended family members in close proximity to help with these duties.

As discussed earlier, there are large numbers of female-headed households within informal settlements; however, even within relationships it is common for women to feel that they are unsupported by their partner. The amount of assistance that male partners give in the raising of children in this urban environment is unlikely to be significantly different from rural areas. In most East African societies, responsibility for caring for children falls primarily to the mother. However, the unstable nature of relationships and the women's increased responsibility for income generation in their homes are likely to lead them to perceive a greater sense of burden from motherhood.

A great majority of the respondents also reported feeling that they lack support from their extended family, despite many of them stating that they do receive practical and financial assistance from wider family networks (normally from their own, rather than their husband's relatives). Many respondents believed that they are expected to be self-reliant mothers, as this quote (also shown in section 6.2.3) illustrates:

> "R1:   [...] I am usually helped by my sister.

Mod: Your sister?

R1:   Yes. My sister and I help each other

R3:   However, life nowadays is not about [extended] family. It is up to you to look after your family and your [extended] family members to look after their family members

All: [In agreement]" [FGD 5, Korogocho]

This sense of isolation is likely to be experienced by women in many different urban settings; it is related to the increased independence in urban areas. Compared with rural areas, households in urban areas are likely to be located at greater distance from those of extended family members. This increase in physical distance results in diminished social, emotional and financial ties.

Health of mother and child

The women expressed a lot of concern about the toll that childbearing and breastfeeding takes on their bodies. Short birth intervals are widely believed to be hazardous to a mother's health. It is believed that taking a break in between births is necessary when a woman has experienced difficulties with pregnancy or labour. In addition, more generally, women want to give their bodies time to recover and to allow them to maintain their physical strength for the rest of their childbearing years.

> "I feel that 5 years are good because when you give birth continuously as a mother your health deteriorates. Thus, for me, five years is okay. The child will have grown and you will have returned to good health." [R2, FGD 1, Korogocho]

Another reason that women were keen to space their births was to protect the health of their youngest child. In particular, they wanted to avoid becoming pregnant before their youngest child is weaned, as pregnancy is widely believed to be detrimental to the health of the child that is breastfeeding:

"R3:   the child will get sick.

R6:   There are two different hormones that are not supposed to interact. There are hormones that are produced when one is pregnant and one is not supposed to breastfeed.

[...]

R5:   It will affect him [the child which is breastfeeding]

[...]

R3:   If a child has started crawling, he will slow down. Become somewhat retarded.

R1:   He will start to get diarrhoea, vomit[ting] and such kinds of diseases.

[...]

R3:   If the child had already started to crawl, he will slow down and go back to sitting until [the time when] you give birth." [FGD 3, Korogocho]

160

Because of this belief, women appear to stop breastfeeding their child if they become pregnant, and they are aware that this compromises the health of that child.

Concern the about the impact of childbearing on their health also causes older women to worry about long birth intervals. This fear is partly due to women feeling that they will not have the energy and strength to raise a child as they get older, and it is also because they fear that they may not be capable of bearing the number of children they desire before reaching menopause.

Reasons unrelated to age of youngest child:

Economic costs of childbearing

Concern about the economic costs of childbearing is something that can be found throughout the world. However, the economic circumstances of households in Korogocho and Viwandani are particularly severe: unemployment is high and income sources are very unstable. Respondents in this study spoke frequently about how tight their household budgets are, about the financial uncertainty that their families face, and the lengths that they go to ensure that their children have an adequate quality of life. Considering their financial status is something many that women in these communities do before conceiving another child, and household income has an impact on when women feel that they are ready to become pregnant again:

> "I feel that family planning is good because you get to space your children the way you want and you should be able to save money. If, for example, you want to have a child next year, you use family planning till then and you save money with anticipation for that child so that you can be able to raise the child without financial problems." [R2, FGD 1 Korogocho]

> "I think before one has a child, you have to think about your financial status; how you are financially because you cannot plan to have children when you don't know how you are going to raise them. Thus, you have to be financially stable and also have a means to raise them. That is what people consider." [R2, FGD 4 Viwandani]

In particular, the costs of education were frequently mentioned as a major household expense, and one which had a major influence over the timing of births. Government primary school education is free in Kenya but secondary schools are fee-paying. A large number of respondents stated that their wish to space births widely was related to the costs associated with secondary-level education. They wanted to leave enough time between pregnancies to ensure that they would not have two children in secondary school concurrently.

> "Leaving a gap of 5 years between children will be good for you because at any one time you will not have two children in secondary school; there will not be pressure." [R2, FGD 1 Korogocho]

However, many people within these communities also aspire to privately educate their children of primary school age. Indeed, it has been found that, despite government primary education being free, many poor Kenyan households still send their children to low-fee private schools (Oketch, et al 2010; Oketch et al 2011). Among the respondents in this study, this desire is driven by concerns

about the quality of state education, in particular large class sizes. The cost of private primary school education then becomes an additional financial burden that women consider before pregnancy and may lead them to desire to delay a birth further in order to accumulate the additional savings.

Concerns about the costs of raising children are compounded by the importance of women's paid work for the economic well-being of households in these communities, which serves to increase the opportunity cost of having children. As described previously, the majority of women in these communities work, as the income brought in by their husbands or partners (if they have one) is insufficient, or too irregular, to provide for all the household needs. Women who have recently given birth want to be able to, or are forced to, take time away from work. This means that their household income drops at a time when the economic needs of the household have increased. In order to cope with this situation, the respondents in this study spoke of the need for women to 'organise themselves' before deciding to have another child. In part, this phrase referred to their need to make financial savings to provide for the new child's needs. Women are required to balance their family life with their working life:

> "Thus you have to look at the kind of job that you do so that you do not harm
> the child on one hand or affect the business on the other" [R1, FGD 5
> Korogocho]

The facts that women are so heavily responsible for the costs of raising children, that they need to have savings to cover the costs of another child, and that they desire to take time off work while the child is young mean that the timing of a birth is important:

> "she [a friend] would like to have another child but at the moment she cannot
> because the baby will interrupt her plans and the rest will suffer. You will find
> that if she gives birth to another child the other two will suffer. So, she is forced
> to wait for a while before giving birth to another child because the child will cause
> the other two to suffer a shortage of food. Thus, you are forced to space them"
> [R1, FGD 5 Korogocho]

During the FGDs, we explored the possibility that women's paid work might impact directly upon the timing of their births. Specifically, we were keen to know whether a woman's concern about losing her job would have an influence over when she wants to conceive. However, there seemed to be very little evidence of this occurring. This is likely due to the fact that the majority of respondents in the study did not have formal employment; indeed, over 30% of the adult female population in these two settlements is engaged in casual employment or informal business (verses 14% in formal employment) (Emina et al., 2011). Such small businesses allow women to work in or close to the home and are unlikely to impact on the timing of a birth in the same way as formal, waged employment. Nevertheless, as discussed above, it was abundantly clear that there does exist an indirect relationship between employment and the timing of a birth, which is mediated through the opportunity cost of childbearing.

Relationships and mistrust

The impact of relationship instability and the need to build trust between partners are seen to be a major influence over women's decisions about the timing of a pregnancy. Relationships in these communities are placed under considerable stress; in addition to the high levels of poverty and household insecurity, changing gender roles often increase tensions between partners. These conditions create a social environment in which extra marital relationships are common and levels of mistrust are high. Thus, it was not surprising to learn that the amount of trust between a woman and her partner has an important influence on when women decide that they want to become pregnant. Despite there being a large amount of pressure on a woman from her husband's side of the family to give birth within a short time of getting married or starting a relationship, women wanted to spend time waiting to see whether they felt their partner was the right person to father their child:

> "...you are supposed to stay together for a while as you observe your partner's behaviour so that you may understand each other. You have to observe his behaviours first before giving him a child." [R3, FGD 1 Korogocho].

The respondents in this study frequently used the words 'observe' and 'investigate' to describe what essentially is an exercise in trust-building in their partner: women informed us that they looked at a man's commitment, their relationship to his extended family and his temperament before deciding that they were ready have a child with him. In particular, delaying the birth of a child for reasons related to confidence in a partner is important for women who have remarried because they tend to be fearful of another relationship breakdown.

The influence of trust on the timing of a birth also extends beyond the birth of the first child. Women continue to watch their partner's behaviour further into the family building-process and women who believe that their partners are being unfaithful become very reluctant to have sexual relationships with them:

> "R1:   So I don't think there is any way you will sit and talk about anything constructively; there is completely no relationship.
>
> Mod: There is no relationship. What kind of relationship are you talking about?
>
> R1:   Physical relationship, and even other home related matters, because you no longer see him as a human being" [FGD 2 Viwandani]

Those women who do continue to have sexual relations with partners who they suspect are unfaithful report using contraception. The reluctance to conceive in these circumstances stems from two concerns. Firstly, they fear that unprotected sex with an unfaithful partner might result in them contracting sexually transmitted diseases. Secondly, they are aware that there is a higher risk of becoming a lone mother if their partner is unfaithful, and they are thus unwilling to increase their domestic burden by having another child at a time when they are uncertain about the stability of their relationship.

However, while women may desire to delay the birth of their first child for these reasons, in reality this is difficult for them to do.

> "R7:   [...] it is good to get married first and, if possible, you live near his family members so that you may get to know them well.
>
> Mod: Okay. So you still place importance in marriage before having children?
>
> R7:   Yes it is very important for one to marry first and if possible observe that marriage but in most cases there is no time to observe that marriage. You just find yourself pregnant and have to take up the responsibilities of a mother." [FGD 6 Viwandani]

The following quote illustrates the reasons why delaying a birth to establish trust in a new relationship is difficult:

> "After you have stayed with a man for about a year or so without having a child, he will start to think that you are barren. In fact it's not only the man, even his parents [...] They will say that, since you are not bearing the man a child, then you are infertile and he should marry another woman [...] Thus, even if you were using family planning, you will just have to have a child" [R3, FGD 3 Korogocho]

Thus, there is a large amount of pressure on a newly married woman from her extended family, particularly from her husband's side, to conceive a child within a short period of time (normally within one year). Women who do not become pregnant shortly after marriage are reportedly threatened with being forcibly separated from their husband. Given these difficulties, it is most likely that delaying a pregnancy in order to build trust will have the greatest effect on the timing of second or high order births.

Extended family and the wider community

It was clear from the FGDs that there are cultural expectations about how long women should wait between births; intervals over five years in length are seen as a cause for concern. In particular, the husband's side of a woman's extended family are likely to comment (normally indirectly), since having children is regarded as a demonstration of her commitment to the relationship and the ancestral lineage. However, it was made clear that often the opinions of extended family members are disregarded:

> "But nobody can tell me that when this one grows up I should give birth to another one. Will she feed them for me?" [R7, FGD1 Korogocho]

Women's willingness to discount the opinions of people external to their relationship is justified by their sense of the isolation of their households. As discussed already, a perception exists that they carry the practical burden of raising children alone, and that the financial costs are the sole responsibility of them and their partner. However, women's ability to make decisions independently is likely to depend upon the security of their marriage or relationship, and the extent to which their partner agrees with the wishes of his family.

7.2   Discussion

7.2.1   Desired numbers of children

This study has shown that great importance is attached to family size within Korogocho and Viwandani. In particular, smaller numbers of children are regarded as being increasingly desirable. The perceived changing balance of costs and benefits of children are at the heart of this shift in family size preferences within these communities. Compared with rural Kenya, the dominance of the market economy and the importance of education mean that childrearing costs are higher while the benefits of large family sizes are diminished.

The impact of urban life upon the costs and benefits associated with childbearing has been noted in much of the literature on the "child quality-child quantity" trade-off. This theory posits that, under certain conditions, parents will find it better to have fewer children and invest heavily in developing the human capital of each one rather than bearing larger numbers of children (Parish and Willis, 1993). Compared with rural areas, the costs and benefits of childbearing in urban areas encourages lower fertility and higher child investment strategies (Caldwell, 1976; Stecklov, 1997). In particular, the role of education has been shown to be important. School enrolment rates are higher in urban areas as parents are more likely to value the importance of education for upward social mobility (Agadjanian, 2006; Montgomery et al, 2004). As Caldwell (1980) writes, education increases the cost of childrearing: households endure new, direct costs through a child's reduced ability to contribute to work inside and outside of the home, and also through the expenditures required for schooling such as fees, uniforms and stationery.

In addition to the cost factors listed above, the particular environment of the informal settlements influences perceptions of the costs of raising children in a particular way. Although costs of rent and food are considerably lower than in other areas of Nairobi, incomes are low and unpredictable, making it difficult to cover even the most basic of household needs. In addition to this, the negative and threatening aspects of these communities and the physical environments make women cautious about raising children. Randall and LeGrand (2001) found similar results in urban Senegal where the poverty, unemployment and crowding of cities was thought to make bringing up children more difficult. Compared with rural areas, parents in cities felt that they had to invest more time in parental supervision to maintain their authority over their children.

The recognition of the changing opportunity costs of bearing children and the desire for smaller family sizes is clearly seen among women. It is also reported (by younger women) to be occurring among some men, and the older generations within Korogocho and Viwandani. This suggests a broad social change is occurring, with smaller family sizes being valued widely within these communities.

The desire for smaller family sizes fits firmly within the specific nature of conjugal relationships and extended family within these communities. Women report that having large numbers of children

increases the chance of relationship breakdown, as men fear the increased financial burden that accompanies each extra birth. The findings from this study, and from Agadjanian's (2006) research in Maputo, suggest that the increasingly fragile conjugal ties resulting from changing gender roles and the weakening of the extended family make it easier for men to leave pressurised relationships. In addition, the fact that women's older relatives also encourage women to have smaller numbers of children is likely to be related to a wider recognition of the increasing costs of childrearing and the stresses that this can place upon relationships. As suggested by AbdouMaliq (1998) this encouragement may also stem from extended family networks' reluctance or inability to give financial support for childrearing costs.

It is important to emphasise the social as well as the economic forces that are responsible for shaping women's perceptions about the costs and benefits of childrearing. The fact that poverty is greater in the informal settlements but fertility rates are higher than elsewhere in Nairobi indicates that it not simply economic forces that shape women's reproductive behaviours. Were desired family size merely about the costs of raising children then the fertility of women in Korogocho and Viwandani would likely be much lower than the fertility of the women in other areas of Nairobi. The growing social acceptance of fertility control in these communities allowed the respondents in this to cite the costs of childrearing as a reason to use contraception. Indeed, within the interactions of the discussions the women rarely sanctioned each other for justifying smaller family sizes through counting the costs of education, food, clothing and the like. I argue that both social and economic changes have a role in explaining women's reproductive decision-making in these communities.

As discussed already, urban areas are places where different social agendas, values and cultural system exist simultaneously and in the informal settlements the high levels of migration from rural areas means that women are exposed to, and may subscribe to, a number of contradictory values. I suggest that this leads to a disjunction between women's ideal and desired family size. This disjunction has also been observed among the urban poor in Ouagadougou, Burkina Faso. In this population, large family sizes are seen as desirable while, at the same time, there is strong support for family planning. Indeed, the same desire to continue childbearing if household economic circumstances improve that was observed among women in Korogocho and Viwandani was also observed among men and women in Ouagadougou (Rossier et al, 2013) .

In Korogocho and Viwandani, this disconnection also has implications for when women begin to plan to limit their fertility. The discussions suggest that most women begin childbearing hoping to have a large family size and that they do not consider using contraception until they become concerned about being able to cover the costs of raising another child. Even when women do attempt to stop child bearing, it is often done with the hope of resuming it if their economic circumstances improve. This flexible approach to family planning makes sense in these

circumstances where there are so many different, often conflicting influences upon women's reproductive intentions.

Agadjanian (2006) notes that women's reproductive intentions in Maputo, Mozambique are also ambiguous, tentative and easily changeable, which he also accounts for as resulting from the multiple, and often incompatible, social pressures that act upon them. Interestingly, he also notes that women's intentions are associated with their age and the number of children that they already have. Just as this study has shown that women are more likely to have a firm desired family size at a later stage in their family building process, Agadjanian shows how the ambiguity inherent in women's plans diminishes with increasing age and parity.

I have argued that women's patterns of contraceptive use for family limitation purposes are a reflection of the mixed reproductive values within these communities. On the one hand, the widespread use of family planning shows commitment to modern values that stem from concerns about child "quality". Levels of contraceptive usage are high. Despite very widespread concerns about the side-effects of hormonal methods, many women are determined to prevent a birth and report switching between methods until they find one with which they are satisfied. The reported frequency of contraceptive switching within these communities is at odds with national survey data on this topic which suggest that at three months after discontinuation the proportion of women switching to another modern method is only 30% (Ali et al 2012). Comparison between these two different types of data is very crude and the behaviour that women report in an informal discussion may well be very inaccurate. However, I also believe that the opportunity costs of bearing children in informal settlements is significantly higher than in other parts of Kenya, and this may drive women within these communities to be more committed users of contraception.

It is also relatively common to find women who report having had more children than they had planned. A significant number of these women will have conceived due to their discontinuation of contraceptive use, which is generally driven by their high levels of concern with the side effects of family planning. These women are, in essence, less committed to family size limitation than those women who continue to use contraceptive methods. That such a group exists is hardly surprising given the continuing presence of pronatalist beliefs within these communities. Indeed, many women describe a child as "coming with its own wealth", a proverb which is commonly found across Asia and Africa and has its roots in the high fertility, communal economies (Caldwell, 1976). Interestingly, but perhaps not unsurprisingly, those subscribing to pronatalist and those subscribing to family limitation values are often not two separate groups, it is common to find women who believe in, and may act upon, both value systems.

There is mixed evidence about the extent to which couples in Korogocho and Viwandani make reproductive decisions together. It is clear, however, that women feel that they are generally expected to take the lead on matters concerning childbearing. The study also shows that women often want to make these decisions independently of their partners. This desire is largely a result of

women perceiving that the financial, as well as the practical, burdens of childrearing are mostly carried by them rather than their partners. Furthermore, the fact that contraception is almost always regarded as being women's business means that often women believe they have the final say in decisions about these matters, and many choose to contracept without their partner's knowledge. Nevertheless, as discussed in the following paragraph, women report that men also believe that they hold authority over childbearing in certain situations.

These findings should be understood in light of the existing literature on couple communication and decision-making on childbearing. Literature from Uganda and Nigeria illustrates that couple fertility is the outcome of both partner's desires (Bankole and Westoff, 1998; Wolffe et al 2000). There is strong evidence of negotiation (either implicit or explicit) at all stages of the family building process. However, when communication is implicit, or there is disagreement, high levels of uncertainty or misperception of partner's desires are common. Under these conditions, one in three men and women were found to be unaware of their partner's desire to stop childbearing (Wolff et al., 2000). If, as seems likely, the majority of couple communication among this study population is implicit, men may be not be as opposed to the use of contraception as these data imply. Indeed, much of the secret use of contraceptives may be based on women's misunderstandings of their partner's fertility desires.

That is not to say that disagreements between men and women do not occur. Indeed, as Agadjanian (2006) notes, conflict between women and their partners may arise because of the need to meet the expectations of extended family. The patrilineal lineage system, specifically the payment of bridewealth, means that men's families are able to put pressure on a woman to bear more children, and men are generally still viewed as the heads of households. Indeed, Sear et al (2003) discovered that the presence of a husband's mother (and to a lesser extent, father) increases the chance of a woman giving birth. In addition, a number of respondents in this study reported that men within these communities are suspicious of, or out rightly disapprove of, modern contraceptive methods, and often successfully prevent their partners from using them. Thus, if there is a serious conflict over desired family size or over contraceptive use between a woman and her partner, and she is not prepared to, or cannot, use contraception secretly, she is likely to end up conceiving more children than she would have otherwise wanted.

Thus, I have shown how, as a result of concern about the increased costs associated with child raising and, in particular, the costs of education, small family sizes are regarded as increasingly desirable in these communities. Worries about the economic costs of large numbers of children are exacerbated by concerns about the perceived unsuitability of the informal settlement for childrearing, and about the increased pressure that having many children can place upon conjugal relationships. I have argued that these concerns illustrate how women are increasingly concerned with child "quality" rather than child "quantity" (Parish and Willis, 1993). However, the data also show that women have differing levels of commitment to their desired family sizes; some use

contraception to halt childbearing, whereas others report having had more children than they had planned for. I argue that this phenomenon can be explained by a disconnect between women's ideal and desired family size. As argued by Agadjanian (2001) I believe this may arise a result of the multitude of reproductive norms and values that exist within these communities, or because of perceived disagreements about reproductive intentions within conjugal relationships.

7.2.2 Timing of births

Demographic theory, in particular historical demography, has traditionally defined birth spacing as fertility control by women who want more children but do not want them yet. These woman are regarded as being mutually exclusive to women who have decided that they do not want any more children (Bongaarts, 1992). It has been assumed that women space births because of concerns that relate to the age of their youngest child; either to protect the health of themselves and their children, to evade social condemnation which might arise from the early resumption of sexual relations or to avoid the increased domestic workload resulting from raising two small children simultaneously (Timæus and Moultrie, 2008).

During the FGDs, the respondents in this study used many of the reasons listed above to justify the timing of their births. Firstly, women are concerned with the practical difficulties of raising children in the informal settlement and of the poor quality of the housing and physical environment, and want to avoid raising two young children simultaneously. This concern is compounded by women's perceived lack of support from partners and extended family members that results from the weak conjugal ties and the increasing nuclearisation of households in these settlements, as has also been noted in other parts of urban Africa (Agadjanian, 2001).

In addition, women seek to delay a birth for reasons that are related to the health of themselves and of their youngest child. The influence of health concerns on the spacing of births is a major feature of the fertility dynamics of many Sub-Saharan African communities (Desgrées-du-Loû and Brou, 2005; Lesthaeghe et al, 1981). Short birth intervals are seen as highly undesirable and there is a long tradition of reproductive practices and beliefs, such as post-partum abstinence, partner separation and prolonged breastfeeding, that serve to delay births (Caldwell and Caldwell, 1981). The data from this study show that short birth intervals continue to be frowned upon in these communities; as women fear that they will not allow their bodies time to recover from their previous pregnancy. Women also continue to subscribe to the traditional belief[2] that simultaneous breastfeeding and pregnancy have negative impacts upon the growth and well-being of their youngest child, and thus seek to delay their next conception until this child has been weaned.

While these reasons are significant drivers of the decisions women make about the timing of their pregnancies, factors that are wholly unrelated to the age of their youngest child are equally, if not

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[2] This belief has been observed in a number of cultural contexts. There is some evidence to suggest that simultaneous pregnancy and breastfeeding does have a negative impact upon early infant growth (Marquis et al., 2002).

more, important. In Korogocho and Viwandani, the amount of time women leave between births is undoubtedly controlled by their socio-economic circumstances. In these communities, where levels of poverty are high, the costs of raising children are a major concern for women who are considering another pregnancy. A change in the balance of costs and benefits of raising children has been recognised to influence women's desired family size, as discussed in the previous section. However, there has been little written about the impact that this might have upon birth spacing decisions.

It is very common to find women using family planning to delay a birth in order to save the extra money needed for another child. The cost of education is a large expense for households within these communities and women wish to take time between births in order to raise funds for school fees. Indeed, one of the most commonly cited reasons for delaying a birth was to avoid having two children in secondary school simultaneously. The influence of household finances on the timing of a birth arises because of the increased opportunity cost of childbearing for women in these communities. Although concerns about employment were not found to have a direct impact on the desired timing of births, there is undoubtedly an indirect relationship mediated through concerns about the costs of raising a child. Income from women's paid work is vitally important for their households and without it many childrearing costs cannot be covered. As a result of this, women expressed the need to plan the timing of a pregnancy carefully in order for their existing children not suffer as a result of the income lost through their time off work.

The influence of financial concerns over the timing of births indicates that women are keen to make reproductive decisions based on what they believe is best for the children. This is a demonstration of women's widespread concern with child "quality" (as opposed to quantity) in this population. Parental investment in their children, particularly in secondary level education, is also indicative of parents' implicit assumption that their children will survive. Indeed, it is this fall in mortality that is thought to be the underlying cause of fertility decline (Cleland, 2001). The main route through which this decline in mortality is thought to affect fertility levels is economic: families find themselves under increasing pressure to raise "abnormally" large numbers of surviving children. Indeed, this economic pressure is further accentuated by the increasing importance of education (Cleland, 2001).

In addition to the economic costs of childrearing, relationships also have a major impact on the timing of pregnancies. Women, understandably, desire to trust a partner before the birth of a child and often seek to delay a pregnancy if this trust is missing and the relationship is unstable. The influence of relationships on the timing of births is likely to be particularly important in the insecure and changing social environment of the informal settlements, where conjugal ties are fragile. As Agadjanian (2006) noted in Maputo, Mozambique and Ware (1976) observed in Ibadan, Nigeria, marital infidelity discourages women from desiring a birth as relationship breakdown shifts the burden of raising the children entirely onto their shoulders. Similarly, in Korogocho and

Viwandani women report being unhappy about engaging in sexual relations with their partner if they suspect he is having other relationships, partly because this situation heightens her chances of becoming a lone parent and she is likely to want to minimise her potential burden resulting from this. Women are also aware that a partner's infidelity increases their own risk of contracting sexually transmitted diseases, in particular HIV, which is estimated to have a prevalence of 12% in these settlements (APHRC, 2008 cited in Kabiru et al, 2011). However, as has been found elsewhere in Sub-Saharan Africa, perceptions of risk of infection and AIDS-related mortality do not appear to be having any direct influence over women's fertility intentions (Bauni and Jarabi 2000; Rutenberg et al. 2000). Indeed, the data from this study suggest that marital infidelity and perceived risk of HIV contraction serve as reasons to delay a birth until relations improve, rather than halt childbearing altogether.

Women's relationships with their extended family networks (particularly on their husband's side) are also important. Through giving birth regularly, a woman is thought to demonstrate her commitment to her relationship and also to the ancestral lineage. Long birth intervals often become a cause for concern, particularly for her in-laws, as a married woman in Kenya is usually seen as belonging to her husband's family. The literature shows that women often view their own fertility as an important resource in their relationships, it is one of the few tools available to them that can be used to prevent marital breakdown and divorce (Agadjanian, 2006). Thus, if a woman fears that a long birth interval may destabilise her relationship with her partner or her extended family, she may want to become pregnant sooner than she might otherwise have planned. However, the extent to which her husband's extended family are able to influence when a woman decides to become pregnant is likely to be mediated through her relationship with him, and also through the extent to which she believes she is independent from these networks.

In summary, this study has shown that women in Korogocho and Viwandani seek to time their births based on a large number of considerations, only some of which are related to the age of their youngest child. As Timæus and Moultrie (2008) argue, it is misleading to term this birth spacing, as the desired timing of a birth is not associated with the length of the birth interval. Furthermore, as this study has shown, in order to take time to establish trust with their partner, women often desire to control the timing of their first birth. However, the traditional conceptualisation of birth spacing only allows for the consideration of the time which passes between the first and second (and subsequent) births. Instead, Timæus and Moultrie (2008) propose that there is a third category of motivation for birth control: postponement. The evidence from this study suggests that the timing of women's births in these two communities is much more effectively explained by the postponement hypothesis than by the conceptually more restrictive birth spacing theory.

7.2.3 Study strengths

My access to the demographic surveillance data collected from the Nairobi Urban Health Demographic Surveillance Site (NUHDSS) strengthened the design of this study. It allowed me to

select women into the study randomly as well as purposively. The randomly sampled women improved the representativeness of the study, while the purposive sample ensured that I was able to guarantee a number of respondents whose birth histories (i.e. a long birth interval) were of direct relevance to the study. The focus group discussions allowed to me to examine childbearing within a wider social context. Through the interactions between the respondents I was able to gain an understanding of whether a woman's experiences and opinions were shared by her peers. Finally, although my presence in the discussions had limitations (as will be discussed in the following section), it did allow me to instruct the discussion moderator to probe more deeply whenever a woman gave an interesting response.

7.2.4 Study limitations

Women only

It is important to consider that this study only collected data from women, and that childbearing decisions normally occur within the context of a couple and that negotiations, either explicit or implicit, take place between the man and the woman (Wolff et al., 2000; Agadjanian, 2001). Indeed, analysis of survey data on fertility intentions has shown that the fertility desires of *both* partners are important predictors of fertility (Bankole, 1995). Thus, this study has not been able to tell the full story of reproductive decision-making in these two communities. The inclusion of men would almost certainly have produced different statements about the factors that are considered important for reproductive decision-making. Indeed, it has been argued that men show more concern than women for economic hardships, the costs of raising children and lack of jobs when considering having another child (Agadjanian, 2001, 2006; Randall and Legrand, 2003).

Generalisibility

Furthermore, although residents of informal settlements form the majority of Nairobi's population, the results of this study are not generalisable to the whole of the city. As described in the introduction to this section, Nairobi is characterised by extreme social and economic inequalities and women's lives and experiences within the informal settlements are wholly different from those of women from the wealthier suburbs of the city. Similarly, the sample size of this study is small, and while enough women were interviewed to identify strong themes within the data, it was not possible to explore in depth any differences in responses between the two settlements. Given the different population characteristics of Korogocho and Viwandani, it is very possible that subtle differences do exist.

The group context

Despite this being a group discussion, the presence of other women did not stop the respondents talking about personal topics. Notably, we were able to talk about abortion and sex work in a number of the FGDs. This suggests that women were comfortable talking about sensitive issues in a group context and this increases my confidence in the credibility of the data. However, there were certain things that were not discussed. For example, none of the respondents spoke about

personal experiences of extra-marital relationships, despite the majority of them saying that these relationships are very wide-spread in their communities. As a result, this study has not shed any light on how women's own extra-marital relationships might impact upon their childbearing decision-making. It is more likely that I would have been able to gather this kind of data if I had conducted in-depth interviews with individual women.

The FGDs were an appropriate tool for gathering data about childbearing within a wider social context. And although I was able to gain insights into individual respondents' lives, it did not allow me to focus on respondents' individual reproductive decisions and experiences in a chronological manner, which in-depth individual interviews would have enabled me to do. This has meant that I am unable to reconstruct individual women's experiences or comment in detail on whether different factors are considered at different stages of women's reproductive decision-making.

Differing sample ratios

As shown already, the ratio of the number of respondents recruited from the random sample list to the respondents recruited from the purposive sample list varies considerably between focus groups (as shown in Table 6 in chapter 3). In FGD 1, two respondents were selected on the basis that they had experienced a birth interval of more than three years, compared to five selected randomly. In FGD 5 three of the five total respondents were selected into the study because they had experienced a long birth interval. Some of the women who have experienced long birth intervals are likely to have deliberately chosen to delay a birth and thus may have different attitudes to other women on issues surrounding the control of childbearing and contraceptive use. The dynamics of the discussions may have been affected by these differences in respondent characteristics; if participants sense that there is a majority opinion on a certain topic, for example the social acceptability of family planning, they may be less likely to give a contradictory belief. Certainly, there were noticeable differences between FGD 1 and FGD 5 in the group attitude towards the positives and negatives of childbearing which could be explained by the compositional differences in the sampling origin of the women.

Age range of respondents

The FGDs were held with women who were sometimes quite different in age. In many research projects, respondents are grouped into a discussion based on their ages. However, due to the small-scale nature of this study I chose not to do this. As a result, it is possible that younger respondents may have felt that they could not express their opinions for fear of contradicting the older respondents in a group. However, from my observations of the discussions this seems unlikely; I am convinced that a respondent's character and confidence is a greater determinant of their willingness to contribute their views than the age difference between them and other group members. In a number of discussions, the most confident respondents were the younger women.

Ethnic backgrounds

By the final discussion we had included respondents from many of Kenya's major ethnic groups, including Kikuyu, Luo, Kalenjin, Luhya, Meru and Kamba. One significant tribal group that was missing from our research are women from a Cushitic background, the Cushitic people originate from Somalia and Ethiopia and mostly follow Islam. Very few women from these communities were selected onto our sampling list, and we were not able to recruit those who did into the study. Because Muslim populations in Nairobi's informal settlements have distinctive demographic characteristics (notably, lower levels of contraceptive use and higher fertility levels (APHRC, 2002b)) the absence of any Cushitic women from the FGDs may have biased the results. In light of this, I spent some time speaking to my primary research assistant (who grew up in the Cushitic community in Korogocho) about childbearing within her community. She informed me that, although family planning is less common within this community, there exists a group of women within it who know about contraceptives and have planned families. These women are becoming increasingly influential and now advise some newly-married women. Many within the community want to emulate them because their households are seen as better-off. This information suggests that the differences between the Cushitic and the rest of the informal settlement community (at least among younger women) might not be as large as the quantitative data suggest.

Lack of background data

Unfortunately, during data collection I did not collect any background data from any of my participants. I am therefore unable to provide any details on the age or the ethnic group of the respondents quoted in the results. More problematically, I am also unable to relate their responses to their existing family size or to their relationship status.

The relationships between the researchers and the participants

It is also important to reflect upon my impact on the FGDs. My decision to be present during all stages of the data collection was deliberate: I wanted to gain as much insight of life in both settlements as possible. The time I spent walking the neighbourhoods and visiting women in their homes helped me to understand something of the broader context of this study and of my respondents' lives. However, my presence has undoubtedly had an influence on the data that was collected. The power dynamics between the researcher and the researched are unequal and this research project was no exception. The respondents belong to a much marginalised community: informal settlement dwellers are often regarded as second-class citizens in Nairobi. As a white foreigner entering an unfamiliar community, I was likely to have been perceived as a powerful authority on the topic I was researching. As a result, it is possible that the participants may have felt that their responses would be judged. In particular, because I may have been viewed as an expert, the respondents may have felt the need to emphasise or exaggerate positive experiences of family planning and their desire for small families because they thought that was what I wanted to hear.

My research team and I worked hard to minimise the chances of this happening by creating a welcoming, non-threatening environment for data collection. We attempted to minimise the sense of authority and formality of the FGDs for the participants. We did this by continually emphasising that there were no right or wrong responses to any of the questions and we held the discussions in rooms within each community to create a sense of familiarity. Furthermore, we did not set any rules for the discussion. Instead we asked the respondents themselves to come up with a list to guide the whole group. I was keen to create a sense of sharing knowledge between the research team and the respondents, so we began the discussion with personal introductions and each member of the team (including myself) told the other participants about themselves and their family.

Reflecting upon the impact of the number of respondents in each discussion, the research team had a bigger presence in the room in FGDs 2 and 5 when there were five participants. However, it was easier for the moderator to encourage interaction between respondents when the numbers were smaller. In FGD 1, which had nine participants, it was noticeable that many respondents waited to be asked a question directly by the moderator instead of responding to the views of the other women in the group. This leads to me to believe that the potential power inequality between the researchers and participants may have had the greatest impact on the dynamics of the larger discussion groups, where the between-participant interaction was more limited and the influence of the research team greater.

7.2.5 Conclusions

The aim of this chapter was to analyse how childbearing is controlled within Korogocho and Viwandani. The chapter began with an examination of the extent to which women feel that childbearing is something that can be controlled. The results showed that women in these communities consciously considered childbearing and felt it to be manageable in some way.

Following this, women's perspectives on desired family size were explored. It was found that smaller family sizes are regarded as increasingly desirable. The urban environment, in particular the importance of secondary education, was seen as raising the costs of childrearing (Caldwell, 1980). While smaller numbers of children are socially sanctioned, a disjunction between women's ideal and desired family size was found. Despite a clear shift towards a smaller desired family size in these communities, women still view larger families as ideal. Women appear to begin reproduction desiring large families, but as the costs associated with childrearing become apparent they adjust their desired number downwards. However, the persistence of the ideal of large family size means that women aspire to have more children should their circumstances allow. Contraceptive use among the women was found to reflect these complex reproductive desires: while the use of family planning is widespread its use is also often tentative and easily reversed. The role of male partners and their perceived disapproval of contraception and higher desired family size was shown to be an important factor in a woman's commitment to its use.

Women's decisions about the timing of a birth were found to be subject to as many influences as the decisions that they make about their desired family size. Women consider a number of factors that are related to the amount of time that has passed since their last birth; for example, their domestic workload, their post-pregnancy recovery and whether they are still breastfeeding. However, this study has shown that the desired timing of a birth is also affected by mothers' concerns about matters other than their personal demographic characteristics. Economic considerations, especially the costs of schooling, often lead women to seek to delay a birth in order to accumulate savings. The insecurity of conjugal ties and familial networks also influence birth spacing: a woman can desire to conceive a child more quickly in order to either cement an unstable relationship with her partner or to please his extended family members. Alternatively, she may desire to postpone for fear of contracting a sexually transmitted infection (STI) or becoming a lone parent. Women in these urban communities make decisions about birth timing, and reproduction more generally, by balancing a host factors which often contradict one another. I have argued that this leads women to wait for the right moment to conceive, often resulting in long birth intervals.

8 Conclusion

8.1 Introduction

This thesis aimed to examine the fertility transition and the dynamics of reproduction in Eastern Africa with a particular focus on urban areas. The fertility decline in Sub-Saharan has been slower than those observed in other regions of the world and there is scepticism in the literature about the prospects of further decline. However, this study focussed on urban areas where there has been a greater fall in fertility and where innovative fertility behaviours are more likely to be found. Through this approach it was hoped that conclusions could be drawn about the nature of the dynamics of fertility in this region. I sought to examine the phenomenon of lengthening birth intervals, which have been found to be emerging in Southern Africa. In order to build on the existing literature, comparisons were made between different sub-groups of women with an analytical focus on rural-urban differentials. The phenomena of lengthening birth intervals has been seen as highlighting the need for a revision of the classification of women's motivations for fertility control. Family limitation and spacing, as they have traditionally been defined, are not thought to be able to account for this development. Therefore, in this analysis the associations between lengthening birth intervals and changes to women's family building strategies – including postponement, defined as " the desire to avoid a birth in the present moment" (Timæus and Moultrie, 2008), were explored. In the second section of the thesis I sought to examine a group of urban women's perspectives on childbearing intentions and decision-making. The purpose of this component of the research was to explore the associations between lengthening birth intervals which were found at the macro level and women's reproductive histories and desires at the individual level. In particular, I sought to examine whether birth postponement, was observable among this group of women.

8.2 Birth Intervals

Section I analysed birth intervals and family building strategies in Ethiopia, Kenya, Tanzania and Zimbabwe using Demographic and Health Survey (DHS) birth history data. Chapter 4 explored birth interval lengthening at the national level and by parity, residence, contraceptive use and education. It then examined duration-specific fertility distributions and parity progression ratios in order to understand the changes in family building strategies that are driving changes in birth interval length. Chapter 5 used the same approach to examine whether levels and trends in birth intervals and family building strategies vary between contraceptive users and educational sub-groups in urban and rural areas.

8.2.1 Long and lengthening median birth intervals

The section found that birth intervals are long and have lengthened among women in all four countries. At a national level, the amount of lengthening and pace of change is significantly greater in Zimbabwe, lending support to the body of research that shows this phenomenon to be most pronounced in Southern Africa (Moultrie et al., 2012; Casterline et al., 2011; Bongaarts and Casterline, 2012). However, the analysis of the phenomenon at the sub-national level has revealed that intervals as long as those observed at a national level in Zimbabwe exist among groups of women in the other countries of analysis. Furthermore, as more refined populations were analysed, it was found that some women in Ethiopia, Kenya and Tanzania had median intervals that were as long as, if not longer, than those of the equivalent sub-group in Zimbabwe. These findings suggest that long and lengthening birth intervals are a major feature of the fertility transition in Eastern Africa. It appears likely that equally long birth intervals exist among certain populations of women in other parts of Sub-Saharan Africa. Intervals of similar lengths to those found at the national level in Ethiopia, Kenya and Tanzania have been observed in a large number of other populations on the continent (Moultrie et al., 2012).

8.2.2 Large rural-urban differentials

The large rural-urban differentials documented in this thesis further suggest the importance of lengthening birth intervals in the fertility transition in Sub-Saharan Africa. This study found that the differential in the median interval length ranges from 13 and 22 months in the four countries. This finding is consistent with the existing literature on this topic, which shows the differences in birth rates between rural and urban areas of Sub-Saharan Africa to be large (Shapiro and Tambashe, 2000). This is not unexpected: the original demographic transition theory states that urbanisation brings about fertility change (Notestein, 1945). However, it also seems reasonable to suppose that this apparently innovative reproductive behaviour (very long birth intervals)that was found here in urban areas of the region might eventually diffuse into rural areas.

On the other hand, the results from Chapter 5 suggest that a strong "urban effect" on fertility exists that extends beyond compositional differences. The findings showed that large rural-urban differences remained after controlling for contraceptive use and education level. Again, this is consistent with the findings of other who have found that the average fertility differential in Sub-Saharan Africa persists after controlling for compositional differences in rural and urban populations (Shapiro and Tambashe, 2000; Kirk and Pillet, 1998). Thus, it seems unlikely that the fertility dynamics of rural populations would completely mirror those of urban populations even if contraceptive use and educational attendance were to rise to the levels found in towns and cities.

8.2.3 Mechanisms driving interval lengthening

An important question arises about what the mechanisms are that might be driving the lengthening of birth intervals. Previous research has argued that the trend has been accomplished by contraceptive use (Moultrie et al., 2012; Timæus and Moultrie, 2008). However, this thesis has presented a more mixed picture. While birth intervals are longer and have lengthened more rapidly

among women who have ever-used contraception, the differential analysis in chapter 5 also showed significant lengthening of the intervals of urban women who have never used contraception. This finding may be a reflection of the weaknesses associated with the contraceptive-use variable used. As argued in the discussion of chapter 5, the use of DHS contraceptive history calendars would allow more certain analysis of the relationship between the use of contraception and lengthening birth intervals. In addition, the lengthening of birth intervals among never-users of contraception is likely to be associated with changes to other proximate determinants of fertility, which have disproportionately focussed in urban areas. Abortion is probably a factor, and is likely to be playing a greater role among urban populations. However, quantifying its contribution is very problematic since underreporting of this phenomenon is so high. Changing relationship patterns, specifically changes in exposure to conception may also be playing a role in this trend, particularly in Zimbabwe where survey data has shown rapid increases in widowhood (ZIMSTAT and ICF International, 2012). Indeed, the results from the qualitative section of this thesis further point to the important role of conjugal relationships in women's reproductive decision-making. It seems plausible that the relationship instability and breakdown that were found to influence reproductive decision-making among women in Korogocho and Viwandani might also influence women's reproductive intentions in other urban populations. There is a need for further quantitative research to explore whether there is an association between relationship status and birth intervals at the population level.

8.2.4 Family building strategies – a complex picture

This study has shown that birth spacing and birth postponement, rather than stopping, are the family building strategies that were dominant in Kenya, Tanzania and Zimbabwe, and therefore driving the lengthening of median birth intervals in these populations. Among the sub-populations that developed the longest birth intervals, postponement was the most common family building strategy. In this sense, the results of this study largely support Timæus and Moultrie's (2008) assertion that the emergence of very long birth intervals cannot readily be accounted for by birth spacing (according to its more traditional conceptualisation). However, I also argue that the results show a more complex picture of family building strategies than the existing literature suggests. It was common to find the emergence of two or more family building strategies in one population. In particular, birth postponement and birth spacing often co-emerged over time. This suggests that the dynamism in fertility intentions that was found at the individual level in the qualitative component also exists at the population level. It also suggests that to-date the literature on family building strategies at the population level has oversimplified what is, in fact, a complex reality.

It has been shown that birth spacing patterns have undergone significant changes in a number of the populations. Increasing birth spacing produces a distribution of duration-specific fertility that is distinct from that of increasing postponement. While increasing postponement results in a flattening out of the peak of duration specific fertility, lengthening periods of birth spacing does not alter the overall shape of the distribution, but rather produces a shift of the peak of fertility to

longer durations of the interval. This is suggestive of a change in norms towards birth spacing, whereby large numbers of women appear to be delaying their next birth for longer periods of time. Just as the shifts in the patterns of duration-specific fertility produced by this are distinct from those produced by increasing postponement, these changes to birth spacing are conceptually distinct from postponement. The phenomenon of birth postponement occurs as a result of factors that are unrelated to the amount of time that has passed since a woman's last birth, while birth spacing is theorised as being driven by a woman's consideration of factors that are contingent on the time that has passed since her previous birth (Timæus and Moultrie, 2008). Shifts towards longer birth spacing durations imply a shift in group norms about the appropriate amount of time to leave between children. The lengthening of birth intervals as result of changes in birth spacing, rather than increasing birth postponement, is a novel finding and is not something that has been discussed in the existing literature. This will be discussed further in section 8.4.This research has also shown that lengthening birth intervals can emerge in populations where family limitation is emerging. In Kenya and Zimbabwe, family limitation (as indicated by a fall in parity progression ratios of women who already have more than one child) was found to have developed alongside increasing birth postponement and birth spacing at both the national level and among certain sub-groups. This further indicates that multiple family building strategies can emerge together in a population. However, in the cases of both Kenya and Zimbabwe, the duration-specific fertility distributions also showed the dramatic falls in fertility at shorter durations of the interval and rises in fertility at longer durations that is characteristic of increasing postponement. This suggests that, while family limitation is occurring, the lengthening of birth intervals is largely being driven by increasing birth postponement.

In Ethiopia, in contrast, family limitation alone is driving the lengthening of birth intervals. This finding was somewhat unexpected given Moultrie and colleagues' emphasis on the association between very long birth intervals and the postponement of births (Moultrie et al., 2012; Timæus and Moultrie, 2008). However, it can be explained by the inclusion of both open and closed birth intervals in the analysis: reductions in parity progression reduce the ratio of closed to open intervals, leading to a large increase in the average length of all intervals. I still believe that the inclusion of both open and closed intervals in the analysis of birth intervals by Moultrie and Timæus is appropriate: it is consistent with a theoretical perspective that seeks to challenge the dichotomous classification of the motivations for fertility control into either birth spacing or stopping. However, the dominance of family limitation as the driving force of the lengthening of birth intervals in Ethiopia highlights the need to also examine the distributions of duration-specific fertility and, where there are strong indications of family limitation, parity progression ratios.

8.2.5 The role of parity

As well as finding a more multifaceted relationship between birth interval lengthening and family building strategies than previous research, this thesis has also uncovered a greater complexity in the role of parity than the literature suggests. Parity was predicted to have a minimal role in the African

fertility declines as compared to the transitions in other regions (Caldwell et al., 1992). In this thesis, the lengthening of birth intervals among women of different parities was explored more thoroughly than hitherto. Moultrie et al. (2012) argued that this phenomenon does not vary by parity, but their analysis only examined interval length among women at parities 1, 2, and 3. Using regression methods, this study broadened its scope to look at women of parities 1 to 10 or more and as a result found somewhat different results to Moultrie et al (2012). Specifically, it was found that there in increasing differentiation of interval length by parity in the majority of countries, with longer birth intervals found among lower-parity women. However, unlike with the parity progression ratios this differentiation was not specific to particular parities. Rather, there was a proportional decrease in interval length with each increase in parity.

As discussed in previous paragraphs, there is evidence of increasing family limitation in Ethiopia, Kenya and Zimbabwe. However, it is interesting to note that in Zimbabwe during the period of most rapid decline in parity progression ratios there was minimal differentiation by parity. Only since the 1990s (after ten years of decline) has there been any parity-specific change. Likewise, in urban Ethiopia, the fall in progression ratios has occurred relatively evenly across women of different parities. Only in Kenya has there been significant differentiation by parity since the onset of the decline in progression ratios.

The increasing differentiation by parity of both the trend toward lengthening birth intervals and the drop in the parity progression ratios provides mixed support for Caldwell et al.'s (1992) prediction of the exceptionality of the fertility transition in Sub-Saharan Africa. However, a comparison of the patterns of decline in parity progression ratios shown in this study with those in fertility transitions in Asia reveals significant differences. In Asia, the decline in progression ratios was highly concentrated among mid-parity women i.e. women who have 3 – 6 existing children (Brass and Juárez, 1983). In comparison, as already discussed, this research has found more muted differentiation by parity. In this sense, the role of parity in the fertility decline in Eastern Africa does appear to be different from the role it played in the declines in Asia.

8.2.6 A regional story?

This leads onto the question of the extent of regional homogeneity or heterogeneity revealed by the results of this study. While lengthening birth intervals were found to be a feature of fertility dynamics in Ethiopia, Kenya, Tanzania and Zimbabwe, considerable variation exists between the populations. Zimbabwe was generally found to have the longest intervals of the four countries. Furthermore the lengthening of intervals was more widespread among this population; significantly more lengthening was observed among rural women, less educated women and among never-users of contraception. Kenya and Tanzania have much in common with each other: in terms of both birth interval lengths and family building strategies. Birth intervals in these two countries are shorter than those in Zimbabwe, and lengthening has been concentrated among urban women, more educated women and those who have ever-used contraception. However, the patterns of

family building that are emerging in Kenya and Tanzania also resemble those which have emerged in Zimbabwe in certain respects. Thus, there is some suggestion of a regional pattern of fertility dynamics.

Ethiopia represents an outlier in this analysis. Rather than increasing birth spacing or birth postponement leading to increased birth intervals, increasing family limitation dominates the dynamics of fertility in this population. Ethiopia's exceptionality in this study fits with the findings of other work on the fertility of this population: birth rates in Addis Ababa are exceptionally low for Sub-Saharan Africa. Moreover, the dynamics of reproduction differ from those of other African populations in other ways: women tend to marry late and few births occur outside of marriage (Kinfu, 2001; Gurmu and Mace, 2008). It is interesting to note, however, that the pattern of parity-specific change in Ethiopia has much in common with the patterns of parity-specific change observed in Kenya and Zimbabwe. As argued previously, the decline in parity progression ratios in these countries occurred among women of all parities, largely excepting women with only one child. In this sense, Ethiopia has much in common with the other countries analysed in this research.

The long birth intervals found in Zimbabwe are consistent with other research that has found that the lengthiest birth intervals tend to be concentrated among populations in Southern Africa (Moultrie et al., 2012; Casterline et al., 2011; Bongaarts and Casterline, 2012). It remains unclear why this phenomenon is concentrated in Southern Africa. However, it seems probable that lower exposure to intercourse may be an important contributing factor. The most recent DHS report for the country shows that there has been a steep rise in widowhood in Zimbabwe. This is probably associated with the high AIDS-related mortality in the country, although the trend of lengthening birth intervals in Zimbabwe pre-dates the emergence of the AIDS epidemic, suggesting that this is not the only explanatory factor. Large-scale labour migration among men is also likely to reduce the frequency of intercourse between conjugal partners. Both of these factors are more widespread in Southern Africa than in other regions of the continent. This line of argument implies that Ethiopia, Kenya and Tanzania are unlikely to follow the same path of development as Zimbabwe.

8.3   Reproductive intentions

8.3.1   Revised conceptual model

Section II explored a group of urban women's childbearing intentions and decisions using data collected in Korogocho and Viwandani informal settlements of Nairobi. It analysed the nature of the women's conjugal and familial relationships, their perspectives on the control of childbearing and their views on birth spacing and family size. Figure 28 below shows a revised conceptual model, which draws together the findings from the section (chapters six and seven).

Figure 28   Revised conceptual model: the relationship between the urban environment and women's childbearing intentions and reproductive behaviour
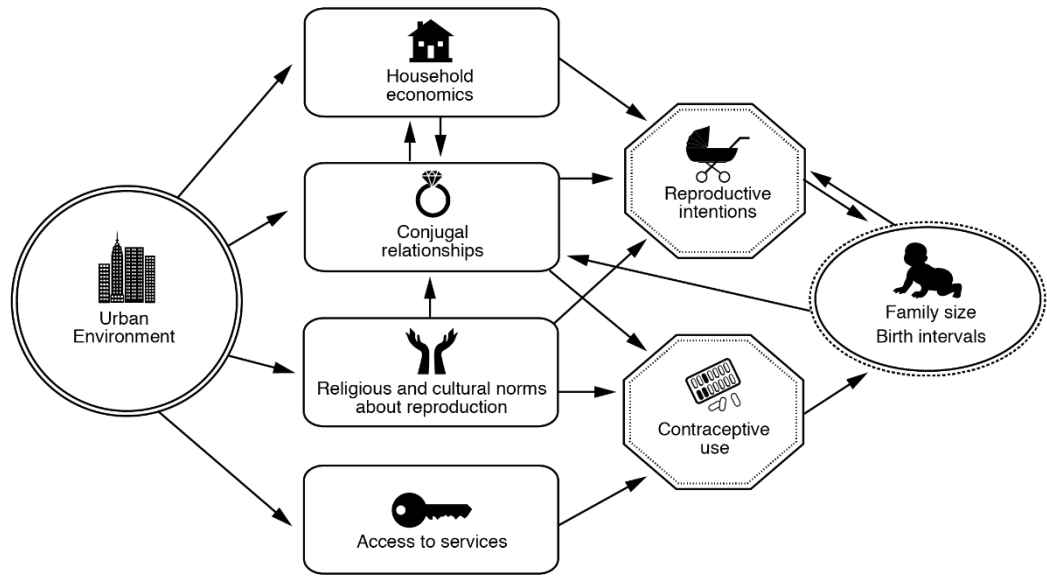
This study has argued that the high degree of monetisation of the urban economy brings about changes to household's economies. This has been shown to have important effects on women's reproductive behaviour. In particular, women's participation in the labour market as a result of the monetisation of consumption is altering gender roles within conjugal relationships. Women are increasingly taking on paid work outside the home and are required to balance this with their child-raising responsibilities. While conservative social values continue to shape the attitudes and behaviours of both women and men, women are keenly aware that they have acquired new roles and responsibilities within their households. Combined with the upheavals and stresses that accompany the social marginalisation of the informal settlement, these developments have brought changes to conjugal relationships, which are often burdened with mistrust and increasingly unstable. The heightened likelihood of ending up lone-parents was found to make women more cautious about childbearing. This was found to have important impacts on their reproductive intentions and their contraceptive use patterns.

The conceptual model presented above (Figure 28) does not differ greatly from the model presented in chapter three (Figure 5). Indeed, the main findings from this study are largely consistent with the existing literature on women's fertility intentions in urban Sub-Saharan Africa. However, one significant change has been made, reflecting the most important finding of the study: the initial factors that were outlined in the literature as being influential over birth intervals were also found to influence women's family size. Thus, these two dimensions of fertility are both included in the revised model. The connections and fluidity between family size and birth intervals are discussed further in the following section

8.3.2 The fluidity of reproductive intentions

Although the results of the study were presented in two sections, intentions regarding family size and intentions regarding the timing of births, I argue that, in women's minds, the distinction between these two aspects of fertility intentions is minimal. There is a great fluidity of reproductive intentions among women in Korogocho and Viwandani. While the changing household economy pushes them to desire smaller families, large families continue to be seen as ideal. As a result, many women's intentions regarding their family size are clear-cut but also flexible: they desire small numbers of children but many of them also remain open to the possibility of further conceptions in the future if their circumstances improve. (Women who have been sterilised are a clear exception here). The fluidity of women's childbearing intentions is also visible in their attitudes towards birth spacing: although economic pressures lead many women to desire long durations between their births, the multiplicity and contradictory nature of the factors that influence these decisions mean that women's intended waiting times are often changeable. I have shown how these intentions are often modified by women's existing family size and birth spacing patterns. Thus, as predicted by the conceptual model, there is a feedback relationship between women's fertility intentions and their family size and birth intervals.

This argument has been made by a number of commentators, Cleland and Rutstein (1986) state that birth postponement and family limitation constitute a motivational continuum, rather than two exclusive categories. Similarly, both Ryder (1985) and Lightbourne (1985) state that there are large numbers of women who, following the birth of a child, use contraception but may not have made a decision about whether they want to bear any more children in the future, yet have a strong motivation to avoid a conception at this point in their lives. More recently, a number of commentators have written about the fluidity of reproductive intentions in Sub-Saharan Africa. From qualitative data collected in Maputo, Mozambique, Agadjanian (2006) finds that women's birth spacing and family limitation intentions are indistinguishable from each other. Women are described as 'waiting' as they assess their economic, social, relationship and familial circumstances. It is argued that within this 'waiting' strategy both aspects of the control of childbearing, spacing and stopping, co-exist. Most recently, Timaeus and Moultrie (2008) have used quantitative data to critique the binary classification of motives for practicing birth control. They propose a third category: postponement, which they describe as being conceptually similar to Agadjanian's 'waiting' strategy. Women who postpone a birth are women whose 'intentions are to simply avoid any further pregnancy in the present' (2008:503).

There are many similarities between the arguments I have made in this study and the arguments outlined by Timæus and Moultrie (2008) in their theoretical outline of postponement. However, this study finds a somewhat different relationship between women's existing family size and fertility intentions to that hypothesised by Timæus and Moultrie. According to their account, women's desires to postpone a birth are not contingent on the number of existing children a woman has borne. In this study, the influences over women's childbearing intentions and decision-making are

not wholly dependent on her current parity, however, they are also not entirely unrelated to her family size. A number of factors influencing women's childbearing desires and behaviours often interact with her current family size. For example, the costs of bearing an additional child appear to become a greater concern and a motivation for contraceptive use among women with more children as compared to those who have fewer. Related to this, women's concern about conjugal relationship breakdown as a result of their childbearing desires or intentions is also related to their parity. It was found that women with larger numbers of children are more likely to fear relationship breakdown as a result of the financial strain that results from an additional, unplanned birth. In contrast, women with few children were less comfortable with delaying their next birth for a prolonged period for fear that their partner might abandon a relationship because he believes her to have problems concieving.

Throughout this section I have argued that the nature of women's reproductive choices can be explained by their social environment. The inhabitants of Korogocho and Viwdandani are keenly aware of life's unpredictability and sense of social disadvantage and marginalisation. Furthermore, my results illustrated how the multiple social value systems that co-exist within these communities, which consist mostly of recent rural migrants, add an additional layer of social uncertainty. I have argued that, as a result of this, there is conflict between women's reproductive values and their preferences. The persistence of pronatalist values lead women to value large numbers of children. In contrast, the importance of investing in each child leads them to want smaller family sizes. As a result there is a disconnect between women's ideal and desired fertility, or phrased in another way, a conflict between their values and circumstances. Despite this, the majority of women in these communities are able to express their fertility intentions in concrete and often numerical terms. Rather than women's ambivalence about their preferences resulting in uncertainty about their intentions, the conflict is usually resolved in favour of pragmatism rather than idealism.

In this sense I deliberately reject the use of the word uncertainty to describe women's reproductive intentions. I argue that, although the women in Korogocho and Viwandani live in a socially uncertain environment, they are not uncertain about their reproductive intentions. Many are able to state the number of children they desire and the time they wish to wait between births. This is important to stress: over the years demography has frequently portrayed African women as lacking rationality or control over their reproductive decision-making. Accounts of African women's fertility have emphasised (and often problematized) women's "up-to-God" responses to questions about reproductive intentions. I do not deny that such responses are given, but rather I wish to highlight the rational and pragmatic approach to childbearing that was held by many of the respondents in this study.

Despite women's ability to express their reproductive intentions in numeric terms, the study has shown that these plans are not fixed. There is tacit acknowledgement of the need to balance the many fertility-influencing factors in their family lives and the potential, or hope, that a change in

their circumstances may enable women to revise their reproductive intentions. Across all social settings, fertility decision-making is contingent on a wide range of aspects of life (Bachrach and Morgan, 2013). However, this contingency is increased in unpredictable settings. As Johnson-Hanks (2005) explains, in socially uncertain environments women need to act in a way that allows them to keep different options open for as long as possible, enabling them to respond to quickly changing circumstances rapidly and effectively. It is this need for flexibility that leads to women expressing their fertility intentions in fluid and sometimes conflicting terms. Furthermore, it is in these conditions that the distinctions between birth spacing, postponement and family limitation become most indistinct.

It is difficult to determine the extent to which these results are unique to informal settlements. All four of the medial impacts on fertility outlined in the conceptual model of this study (household economics, conjugal relationships, cultural norms about reproduction and access to family planning services) have been identified as being influential across many urban settings. Moreover, as shown in the previous section, fluidity in women's reproductive intentions is a phenomenon that has been observed in other urban settings in Sub-Saharan Africa. As Johnson-Hanks (2005) notes of *La Crise* in contemporary Cameroon, uncertainty infiltrates deeply into social and personal relationships. Indeed, life throughout Sub-Saharan Africa is widely thought of as having high levels social uncertainty brought about by civil strife and political instability, spiritual insecurity, environmental disasters and high levels of mortality (Trinitapoli and Yeatman, 2011).

However, it is probable that the influence of household economics and conjugal relationships on contraceptive use and reproductive intentions is distinctive in informal settlement populations. First, households in informal settlements are generally more impoverished than others in urban areas. Thus it is likely that their economic circumstances may influence fertility in unique ways. However, since this study has not included respondents from wealthier areas of Nairobi, I am unable to determine what these differences may be. Second, it does seem probable that the impact of relationship instability on reproductive decision-making is greater in informal settlements than in other urban areas as marital breakdown and partner separation have been shown to be higher in these settlements than elsewhere in Nairobi (APHRC, 2002b). Further discussion of social and economic uncertainty and their association with fertility is given in the next section.

8.4 Broader implications

8.4.1 A re-examination of the classification of fertility intentions

The two sections of this thesis have both focused on fertility intentions: section one examined the family building strategies driving the lengthening of birth intervals at the population level while section two gave a direct observation of women's childbearing intentions at the individual level. At this stage it is important to examine the congruency of the results from the two sections.

The fluidity of reproductive intentions found in the qualitative study raises questions about the meaning of the classification of family building strategies at the population level. At the most basic level, any rigid classification of intentions may appear to be problematic when the qualitative study found such fluidity in women's childbearing intentions. The categorisation of birth spacing, postponement and family limitation implies three different phenomena that are conceptually distinct from one another, while at the individual level women's intentions are characterised by dynamism and women often give similar reasons for wanting to delay a birth as they do for wanting to limit their family size. However, I argue that in order to examine family building strategies at the population level it is necessary, and not invalid, to group the complex individual-level realities into analytic categories. Furthermore, the very concept of postponement is grounded in the recognition that women's fertility intentions are often fluid. Postponement, defined as the desire to avoid a birth in the present moment, acknowledges that at any point in time, a woman may not have decided whether she wants to have another child. In this sense, they are distinct from both spacers and limiters, who have made a decision about whether or not they desire a further pregnancy. A further discussion of postponement, and its association with fluid fertility intentions is given in section 0.

That said, the results from the qualitative study suggest that there needs to be some refinement of the classification of family building strategies in order to improve its validity. In particular, the conceptualisation of birth spacing needs to be adjusted. As was outlined in section 8.2.4, the analysis of family building strategies at the population level showed changes to the patterns of birth spacing among a number of sub-groups of women. The traditional conceptualisation of birth spacing envisages that women seek to delay a child birth for reasons related to their post-pregnancy recovery, whether or not they are still breastfeeding, the level of physical dependence of their youngest child and the social acceptability of sex post-partum (Timæus and Moultrie, 2008). This conceptualisation does not really help to explain the increase in birth spacing durations observed in this analysis, since none of these factors are likely to have changed significantly over time (perhaps with the exception of social censorship for engaging in sex postpartum, although if this was the case the change would be in the reverse direction). Rather, the results from the qualitative component of this thesis suggest that other factors associated with concerns about child "quality", in particular the desire to avoid having two children in secondary school simultaneously, are likely to be driving these increases in birth spacing patterns. The emerging significance of economic considerations for birth spacing is a new finding. Such motives for spacing are unlikely to have been significant prior to the onset of fertility transition when the key literature on birth spacing in Sub-Saharan Africa was written (for example Lesthaeghe et al., 1981). Concerns about the economic consequences of childbearing are likely to push women into desiring longer birth spacing than those more traditional considerations outlined above. Thus, economic considerations, particularly concerns about the costs of schooling, may explain the increases in birth spacing observed in the quantitative component of this PhD.

The recognition of these new motivations for birth spacing brings the conceptualisation of this family building strategy conceptually closer to that of birth postponement. However, I argue that it is still theoretically distinguishable as birth spacing, since it is driven by considerations that are heavily contingent on the amount of time that has passed since a women's previous birth. In contrast, the theoretical definition of birth postponement stipulates that this family building strategy is driven by factors that may be entirely unrelated to the duration of the current birth interval (Timæus and Moultrie, 2008). The identification of economic drivers of birth spacing also brings the concept closer to family limitation, since considerations about child "quality" are generally thought to be associated with the desire to stop childbearing. However, if we take the motivation for family limitation to be the achievement of a particular number of children and the motivations for birth spacing as being independent of a women's existing number of children, then there remains a clear distinction between these two family building strategies.

8.4.2 Connection between lengthening birth intervals and fluid reproductive intentions

One question that arises from the results sections of this thesis is the extent to which the fluid nature of reproductive intentions that were observed among women in Korogocho and Viwandani is associated with the trend of lengthening of birth intervals examined in the first section of the thesis. Despite subtle differences between the results of this study and Moultrie and colleagues' (Timæus and Moultrie, 2008; Moultrie et al., 2012, 2010) theorisation of the concept, I argue that the postponement of births connects these two phenomena. Postponement is defined as the desire to simply avoid a birth in the present moment (Timæus and Moultrie, 2008). As I have shown above, fluid fertility intentions lead to postponement through women's desire to balance a huge variety of priorities in their lives. Some of these factors are those that lead to birth spacing according to its traditional conceptualisation: their post-pregnancy recovery, whether or not they are breastfeeding and the dependence of their youngest child are just a few of these factors. Equally important, if not more important, are a whole series of factors that do not depend on the amount of time that has passed since a woman's last birth. For the women interviewed for this study, these included their relationships with their conjugal partner, expectations from extended family members, their working lives, and the need to accumulate savings, and their own receptiveness, and their partner's, to the use of contraception.

This study's findings fit with Bachrach and Morgan's (2013) argument that schemas, intentions and actions relating wider aspects of life, such as work, relationships and leisure can affect fertility outcomes. By the same token, schemas, intentions and actions relating to fertility can affect outcomes in other areas of women's lives. As they write: 'the multiplicity of structures relevant to fertility implies that individuals encounter a great many situations in which action relevant to fertility must be undertaken' (Bachrach and Morgan, 2013, pp. 472). I argue that the concept of postponement allows us to better theoretically acknowledge the complexities associated with women's reproductive decision-making. It allows demographers to recognise that there are many

reasons for fertility control, many of which are not related to a woman's demographic history. The emphasis placed on the spacing-stopping classification has caused demographers to oversimplify women's reproductive decision-making. However, both the qualitative and quantitative findings of this study have also shown that spacing and stopping must not be written out of the story of fertility dynamics in Sub-Saharan Africa. At the population level, combinations of spacing, stopping and postponement can co-emerge to bring about changes to fertility rates. At the level of the individual, fertility intentions are dynamic: women may evolve from spacing, to postponing and then stopping within a single birth interval.

8.4.3 Social uncertainty and the African fertility transition

Thus far I have argued that women's childbearing decision-making is contingent upon a complex network of schemas, only some of which are directly related to her own demographic behaviour. I have further argued that this leads to well defined but flexible fertility intentions, which in turn often leads to the postponement of births. At the macro level, the widespread postponement of births then leads to the long birth intervals that were observed in this study. I have discussed this in relation to the African context, in particular the Eastern African context (although I draw on literature from throughout the continent). Recently a debate has emerged from the literature on the reproductive dynamics in Sub-Saharan Africa about the region's exceptionalism in terms of its fertility decline. It is to this question that I now turn.

Women's fertility decision-making is undoubtedly multifaceted across all social and cultural contexts. Indeed, fluid fertility intentions and the postponement of births have been found among women (and men) in high-income countries (Berrington, 2004). Furthermore, it has been shown that birth interval lengthening has been a feature of a number of contemporary fertility transitions. Inter-birth intervals in a number of populations have been found to lengthen between 6 and 24 months (Casterline et al., 2011). However, this lengthening has occurred among populations where pre-decline birth intervals were generally shorter than those observed in most African populations, where there has been a longstanding emphasis on birth spacing. Thus, the scope for lengthening was greater. On the other hand, the extremely long birth intervals of the kind found by this study among the various sub-groups, especially in Zimbabwe (and Southern Africa more generally (Moultrie et al., 2012)) appear to be unique. Furthermore, there is little sign of any slowing of this trend. Thus, if complex relationships between fertility-related schema, fluid fertility intentions and birth postponement have been found in other settings, what might be responsible for the extremely long birth intervals unique to Sub-Saharan Africa?

In recent years, the nature of the fertility transition in Sub-Saharan Africa has been related to the uncertain nature of many aspects of life on the continent (Johnson-Hanks, 2005; Agadjanian, 2006; Timæus and Moultrie, 2008; Johnson-Hanks, 2007). Johnson-Hanks (2007) describes eloquently the uncertain nature of life in in Cameroon:

"Prices, for schooling, healthcare, or housing, are extremely unstable, as are wages; even government employees are not paid reliably in some countries. Most employment opportunities are filled through social networks or kin relations, rather than according to formal skills or job experience; few people have access to formal credit. Busses do not run on schedule. Electricity and running water go out regularly, even in capital cities. In the rainy season, roads get washed out. Insect-borne diseases like malaria seem to strike more or less at random; the water-borne and sexually transmitted ones, from cholera to HIV/AIDS, only marginally less so. Mortality rates at all ages are high, and death often unpredictable. Witchcraft and corruption thwart schooling aspirations, marriage plans, health and welfare." Johnson-Hanks (2007, pp. 1036).

She argues that social uncertainty explains why her Cameroonian respondents assert that they unable to plan their lives, including their reproduction. Indeed, this description would equally fit to my own observations of life for many in Eastern Africa.

Figure 29   Conceptual relationship showing the association between institutional development, social uncertainty, fertility intentions and long birth intervals
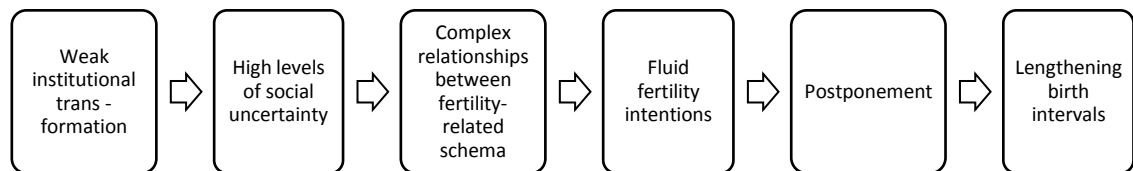
Much of this social uncertainty is thought to be a result of the nature of institutions in Sub-Saharan Africa. Here, the concept of institution is applied in its wider sense, as an "enduring set of ideas about how to accomplish goals generally recognised as important in society" (Johnson, 2000). Institutional dynamics are hugely influential over fertility, indeed, Potter (1983) argues that the nature of these dynamics has a greater role in shaping the process of fertility decline than individual agency. The institutions that are important for fertility transition include the family and local community, the legal system related to property and the family, the local public administration system, the nature of the labour market and the social stratification system (McNicoll, 1994). These institutions impact fertility through altering the perceived costs and benefits of rearing children, shaping the social norms and values that surround family, marriage and reproduction and by creating social and administrative pressures upon reproduction (Potter, 1983). The state itself also plays an important role: its relationship to individuals has an important influence over fertility intentions (McNicoll, 1994).

Throughout much of Sub-Saharan Africa the power of the state is comparatively weak. This is theorised to largely be the result of the nature of colonialism as it occurred in the region. A contestation of power exists between the lineage-based institutions that have long been dominant Sub-Saharan Africa, and the newer administrative and bureaucratic institutions that were installed by the imperial powers (Bayart, 1992). This conflict has resulted in incomplete institutional transformation, which in turn acts as a hindrance to the rapid decline of fertility. The weakness of this transformation of institutions affects fertility transition through the creation of conditions of social uncertainty. Under these conditions the requirements for success are constantly in flux and

outcomes, and the means to achieve them, unclear. As a result, women are hypothesised to act in a way that maximises their options. Johnson-Hanks (2005) uses the term 'judicious opportunism' to describe this way of forming intentions, she describes this in the following way:

> "The challenge is not to formulate a plan and implement it regardless of what comes but to adapt to the moment, to be calm and supple, recognizing the difference between a promising and an unpromising offer." (p.370)

This description of judicious opportunism fits very closely to the kinds of social action that the women in Korogocho and Viwandani described engaging in. Their fluid fertility intentions reflect their desire to pragmatically plan their families while also allowing them to change their course of action should their circumstances change. Indeed, the results of this study suggest that judicious opportunism is highly associated with the phenomena of birth postponement. Furthermore, evidence of the weakness of institutional development is abundant in Nairobi. It is found in the land grabs, in high level corruption, in the state's failure to provide law and order, which in turn has resulted in mob politics (particularly in informal settlements). It is also seen in the structure of households, which can no longer be said to consist of extended family members but, equally, do not resemble the nuclear families that now dominate many other societies. The same could be said for conjugal relationships, which have been shown to be fragile and prone to breakdown. Thus, in Korogocho and Viwandani (and, more widely in Sub-Saharan Africa, according to Johnson-Hanks (2005, 2007) Moultrie et al (Moultrie et al., 2012; Timæus and Moultrie, 2008; Moultrie and Timæus, 2013) and Agadjanian, (2006)) social uncertainty further increases the complexity of the numerous fertility-related schemas that influence women's reproductive decision-making.

It is necessary to emphasise that the results of this thesis, in combination with the literature outlined above, suggest that it is social rather than economic uncertainty that is the main driver of fluid fertility intentions, postponement and lengthening birth intervals. The results of the quantitative analysis show that populations that might be expected to have high levels of economic uncertainty, for example rural women, do not have long birth intervals. Similarly, women likely to be experiencing less economic uncertainty, for example urban educated women, have been found to have extremely long birth intervals. In particular, I argue that there is a need to differentiate from social uncertainty arising from poverty and social uncertainty arising from changing and conflicting values. While rural women might be more impoverished, they are less likely to be aware of their relative economic position and less likely to experience to the kinds of social change that result in conflicting values and norms. On the other hand, although the urban elite do not experience economic uncertainty, they are exposed to the plethora of social and cultural messages that are hypothesised to result in social uncertainty. It is important to note that this thesis does not seek to argue that social uncertainty is driving fertility decline in Sub-Saharan Africa. The socioeconomic and sociocultural theories of transition outlined in the literature review continue to serve as the best tools for understanding the onset or extent of declining birth rates among different groups of women. Rather, I argue that social uncertainty explains why the pattern of

decline (i.e. the importance of long birth intervals and widespread postponement) differs in Sub-Saharan Africa from declines elsewhere in the world.Thus, the conclusions of this thesis can be diagrammatically represented as shown in Figure 29. Weak institutional transformation leads to high levels of social uncertainty, which enhances the complexity and contingency of fertility influencing factors. This results in fluid fertility intentions and widespread birth postponement, which, in turn, leads to the lengthening of median birth intervals at the population level.

Given these findings, what does the future of the fertility transition in Sub-Saharan Africa look like? Given that institutional change is generally slow and social uncertainty in the region is unlikely to reduce in the near future, scope exists for birth intervals to lengthen further in Eastern Africa. In Kenya, Tanzania and Zimbabwe it is likely that increasing levels of postponement will drive this change. In Ethiopia increasing family limitation may well be responsible. Rapidly increasing urbanisation and diffusion will likely mean that the fertility dynamics of urban areas will also come to characterise rural areas to a certain extent. However, this study has shown that there is an additional, unmeasurable effect of urban life (which could be the higher levels of social uncertainty) upon fertility that extends beyond population compositional effects. This suggests that, even with increasing levels of education and contraceptive use, rural fertility dynamics are unlikely to come to mirror those of urban areas.

An improvement in the quality of life in urban areas in Eastern Africa is unlikely to bring about substantial rises in fertility. Although women frequently give economic justifications for their use of contraception, fertility transition is also driven by sociological changes (Cleland and Wilson, 1987). Once fertility control becomes socially acceptable within a population, this is rarely reversed. However, it seems likely that reduced social uncertainty would bring about a decline in birth postponement. Instead, if their circumstances enabled them to formulate more concrete reproductive plans, it seems probably that women would become more likely to limit their overall family size.

8.5   Policy recommendations

This findings of this PhD have implications for the way in which reproductive health services and designed. The association between long birth intervals and contraceptive use highlights women's potential receptiveness to long-acting, reversible contraceptive (LARC) methods. In addition, the qualitative study shows that, contrary to common belief, there is also interest in tubal ligation. Together, these findings highlight the need for family planning clinics providing a wide variety of contraceptive methods to women. This study has also emphasized the need for provision of adequate counselling in family planning services. Women are open to the use of family planning and modern methods of contraception, but have real concerns about side effects. This often results in the tentative use of methods, and without proper support women frequently discontinue use.

8.6 Strengths and weaknesses – a case for mixed methods in demography

To a large extent the ability of this thesis to draw these conclusions results from its adoption of a mixed methods approach. The use of this approach comes from a recognition of the weaknesses associated with both qualitative and quantitative data for the analysis of fertility. Demography has traditionally been a quantitative discipline. With its comparative analysis of large survey datasets from four Eastern African countries, the first section of this PhD conforms very much to the standard demographic approach. The use of multiple surveys that are standardised across countries allowed me to examine similarities and differences in fertility dynamics between populations and to draw conclusions about regional-level patterns. In addition, the availability of multiple surveys in the countries permitted the calculation of fertility trends over a forty-year observation period.

However, studies of population-level phenomena that solely focus on the macro-level have often led demographers to make incorrect assumptions about the social meanings that lie behind statistical relationships. The study of fertility is no exception in this regard. A classification of family building strategies (either spacing or stopping) derived from historical European data has been over-readily applied to DHS data from a wide variety of countries that have very different structures of social organisation and cultural repertoires. This has often led to incorrect inferences about women's fertility intentions, in particular the intention to limit family size, from population-level fertility patterns (Johnson-Hanks, 2007). The quantitative analysis of this PhD was rooted in the perspectives (such as those of Johnson-Hanks referenced above) that argue for a re-evaluation of the dichotomous classification of fertility intentions that originated in the retrospective interpretation of historical European data. However, the analytical approach used to identify family building motivations in chapters 4 and 5 still uses population-level data to make inferences about women's reproductive intentions.

The qualitative component of the PhD permitted an examination of the consistencies and disparities between the classification of family building strategies that were used in the first section of the thesis and women's reproductive decision-making at the individual level. The rich, descriptive data gathered from the focus group discussions (FGDs) resulted in a more nuanced and realistic account of women's childbearing intentions and reproductive decision-making. The narratives of childbearing that were gathered from women in Korogocho and Viwandani gave meaning to the findings of the quantitative analysis of birth intervals, allowing me to contextualise women's fertility and reproductive decision-making within the realities of their everyday lives. I was able to analyse uncertainty, contingency and apparent contradictions in these accounts in a way which is not possible with quantitative data. Although the types of data used in the two sections of thesis are very different, and seek to answer different research questions, the results of the qualitative analysis effectively form a check upon the interpretation of the results of the quantitative analysis.

On the other hand, it is well known that women's reported intentions (either in surveys or in more qualitative forms of data collection) do not always match their later demographic outcomes. Research from a number of contexts has shown that there are often considerable inconsistencies between intentions and action. Significant proportions of women who say that they want another child end up not having one, and, equally, large numbers of women who report not wanting another child do give birth again (Westoff and Ryder, 1977; De Silva, 1991). Johnson-Hanks (2007) gives five reasons for the discrepancy between reported fertility intentions and women's reproductive outcomes. First, unmet need for family planning, contraceptive failure and sterility cause random variation in fertility outcomes. Second, women do not always decide upon their reproductive intentions alone and in much research on fertility the influence of partners' intentions is generally not taken into account. Third, intentions may change over time as a result of changing circumstances. In particular, the formation and dissolution of conjugal relationships and the raising of children often lead to alterations in individuals' reproductive intentions (Iacovou and Tavares, 2011; Bachrach and Morgan, 2013). Fourth, intentions may only be formulated weakly, and thus never be enacted. This is particularly likely to occur when younger women are asked about their intentions (Bachrach and Morgan, 2013). Finally, fertility intentions may be poorly measured, either due to poor response or due to poor validation of the questions or measure.

The qualitative data collected on women's fertility intentions in this study are not immune to these flaws. Although much of the discussion was based upon reproductive decisions that had been made in the past, a large amount of the data gathered focused on women's fertility intentions. As already discussed in chapter seven, the fact that partners' intentions and desires are not directly included in this study is a particular weakness. As stated above, partners' influence over women's reproductive outcomes is often very substantial. Furthermore, as the women highlighted themselves, their childbearing desires and intentions are highly contingent on a huge variety of factors, none of which are static over time. The cross-sectional nature of this section of the PhD does not allow me to explore the development or alteration of women's intentions over time. However, I argue that the weaknesses associated with the use of reproductive intention data are balanced by the strengths of the maternity history data from the DHS, which allowed me to analyse the actual reproductive behaviours of women at the national and sub-national level.

It is important to recognise that the findings from the qualitative study are not generalizable to the experiences of all women in Nairobi, let alone across the urban areas of the four Eastern African countries included in the quantitative analysis. The four countries are socially, economically and culturally diverse. However, the social and economic marginalisation experienced by the participants in this study it not unique to Nairobi. Over two-thirds of the urban population in Sub-Saharan Africa live in informal settlements. Indeed, the similarity between the findings of this study and those of Agadjanian's (2006, 1998, 2001) work in Maputo suggest that parallel experiences exist across different cities in the region.

To conclude, I join the call made by other demographers (Coast et al., 2007; Randall and Koppenhaver, 2004; Greenhalgh, 1997) for the increased acceptance of a mixed methods approach. Including the voices of those whose actions form our statistical estimates is of vital importance if we are really to appreciate the multifaceted nature of demographic behaviour. It is also of paramount importance if we are to avoid incorrectly transplanting knowledge onto contexts that are very different from those in which the insight was generated.

8.7   Suggestions for further research

The literature would greatly benefit from a detailed analysis of time trends in birth interval length and duration-specific fertility, such as that conducted in chapters 4 and 5 that extends to other Sub-Saharan African countries, including those in Western Africa. West African societies have a very long tradition of birth spacing but have witnessed less of a decline in total fertility compared with southern and eastern Africa. Thus, it would be interesting to explore how trends in this region compare with elsewhere on the continent. More broadly, recent debate has centred on whether lengthening birth intervals and postponement are a unique feature of fertility transition in Sub-Saharan Africa (Moultrie et al., 2012; Casterline et al., 2011; Bongaarts and Casterline, 2012). In order to increase the evidence on this topic, a comparative analysis using data from non-African populations needs to be conducted.

In light of the limitations associated with the measure of contraceptive use in this study, further research on the relationship between birth interval lengthen and contraceptive use should make use of the DHS contraceptive use calendars, which record women's births, pregnancies, foetal losses and use of contraceptive methods for the five-year period prior to interview. These details are recorded on a month-by-month basis, which would allow researchers to determine the exact dates a woman started and stopped a contraceptive episode, and to be able to relate them more precisely to birth interval length. The qualitative component of this PhD has shown that the status of women's conjugal relationships is an important influence on their reproductive decision-making. It is also a possible that this is associated with long birth intervals at the macro level. Therefore, a need exists for quantitative analysis of the association between relationship status and birth intervals.

Further qualitative research on reproductive decision-making in Sub-Saharan Africa should include the perspectives of men. Although there is a significant literature based on the quantitative analysis of survey data on couple communication about fertility, little exists based on qualitative data. The inclusion of male perspectives would allow an investigation of the extent to which couples discuss matters concerning childbearing explicitly. It would also shed light on the extent to which the between-partner conflict reported in this study is real or perceived. In addition, much of the literature on partner negotiation focuses solely on desired family size. The results from this study suggest that men may also exert an important influence on their partners' births.

Further research should also include respondents of higher socio-economic status, in order to investigate the extent to which the findings of this study are unique to informal settlements. Although urban living raises the cost of childrearing for women of all income levels, the mechanisms through which this happens are likely to vary. Finally, as well as focus group generated data, which have allowed me to analyse the broad social context of reproductive decisions, in-depth interviews would better contextualise such decisions and intentions within the realities of individuals' lives.

References

AbdouMaliq, Simone (1998) "Urban Social Fields in Africa," *Social Text*, 56, pp. 71–89.

African Population and Health Research Centre (APHRC) (2002a) *Nairobi Informal Settlements Needs Assessment Survey*, Nairobi, Kenya.

African Population and Health Research Centre (APHRC) (2002b) *Population and Health Dynamics in Nairobi's Informal Settlements*, Nairobi, Kenya.

African Population and Health Research Centre (APHRC) (2008) *The Social, Health, and Economic Context of HIV/AIDS in Informal Urban Settlements of Africa*, Nairobi, Kenya.

Agadjanian, Victor (1998) "Economic security, informational resources, and women's reproductive choices in urban Mozambique," *Biodemography and Social Biology*, 45(1), pp. 60–79.

Agadjanian, Victor (2006) "Fraught with ambivalence: Reproductive intentions and contraceptive choices in a sub-Saharan fertility transition," *Population Research and Policy Review*, 24(6), pp. 617–645.

Agadjanian, Victor (2001) "Negotiating through reproductive change: Gendered social interaction and fertility regulation in Mozambique," *Journal of Southern African Studies*, 27(2), pp. 291–309.

Agyei-Mensah, Samuel (2002) "Fertility transition in West Africa," *Journal of African Policy Studies*, 12(2).

Agyei-Mensah, Samuel (2007) "New times, new families: the stall in Ghanaian fertility," In *African Population Conference*, Arusha, Tanzania.

Alder, Graham (1995) "Tackling poverty in Nairobi's informal settlements: developing an institutional strategy," *Environment and Urbanization*, 7(2), pp. 85–108.

Ali, Mohamed M., Cleland, John G. and Shah, Iqbal H. (2012) *Causes and Consequences of Contraceptive Discontinuation: Evidence from 60 Demographic and Health Surveys*, Geneva, Switzerland.

Allison, Paul D. (1984) *Event History Analysis: Regressions for Longitudinal Event Data*, London, SAGE Publications.

Alter, George (2007) "The shape of a fertility transition: An analysis of birth intervals in Eastern Belgium," In *Population Association of America Annual Meeting*, New York.

Amoateng, Acheampong Yaw, Heaton, Tim B. and Kalule-sabiti, Ishmael (2007) "Living arrangements in South Africa," In Amoateng, A. Y. and Heaton, T. B. (eds.), *Families and Households in Post-apartheid South Africa: Socio-demographic Perspectives*, Cape Town, South Africa, HSRC Press, pp. 43–60.

Arnold, Fred (1990) *Assessment of the quality of birth history data in the Demographic and Health Surveys*, Institute for Resource Development (ed.), *An Assessment of DHS-I Data Quality*, DHS Methodological Reports, Columbia, Maryland, USA, Institute for Resource Development/Macro Systems.

Bachrach, Christine A. and Morgan, Philip S. (2013) "A cognitive – social model of fertility intentions," *Population and Development Review*, 39(3), pp. 459–485.

Balkaran, S. (1982) *Evaluation of the Guyana Fertility Survey*, WFS Scientific Reports, Voorburg, Netherlands.

Bankole, Akinrinola (1995) "Desired fertility and fertility behaviour among the Yoruba of Nigeria: A study of couple preferences and subsequent fertility," *Population Studies*, 49(2), pp. 317–328.

Bankole, Akinrinola and Westoff, Charles F. (1998) "The consistency and validity of reproductive attitudes: evidence from Morocco.," *Journal of Biosocial Science*, 30(4), pp. 439–55.

Bayart, Jean-Francois (1992) *The State in Africa: The Politics of the Belly*, London, Longman.

Becker, Gary S. (1981) *A Treatise on the Family*, Cambridge, Massachusetts, Harvard University Press.

Berrington, Ann (2004) "Perpetual postponers? Women's, men's and couple's fertility intentions and subsequent fertility behaviour," *Population Trends*, (117), pp. 9–19.

Bertrand, Jane T., Mathu, Nellie, Dwyer, Joseph C., Thuo, Margaret and Wambwa, Grace (1989) "Attitudes toward voluntary surgical contraception in four districts of Kenya," *Studies in Family Planning*, JSTOR, 20(5), pp. 281–288.

Biggart Woolsey, Nicole (2001) "Banking on each other: The situational logic of rotating savings and credit associations," *Advances in Qualitative Organization Research*, 3, pp. 129–153.

Bledsoe, Caroline H., Banja, Fatoumatta and Hill, Allan G. (1998) "Reproductive Mishaps and Western Contraception: An African Challenge to Fertility Theory," *Population and Development Review*, 24(1), pp. 15–57.

Bledsoe, Caroline H., Hill, Allan G., D'Alessandro, Umberto and Langerock, Patricia (1994) "Constructing natural fertility: The use of western contraceptive technologies in rural Gambia," *Population and Development Review*, JSTOR, 20(1), pp. 81–113.

Bongaarts, John (1992) "Do reproductive intentions matter?," *International Family Planning Perspectives*, 18(3), pp. 102–108.

Bongaarts, John (2008) *Fertility transitions in developing countries: progress or stagnation?,*.

Bongaarts, John (2009) "Human population growth and the demographic transition," *Philosophical Transactions of the Royal Society of London. Series B: Biological Sciences*, 364(1532), pp. 2985–2990.

Bongaarts, John (2006) "The causes of stalling fertility transitions," *Studies in Family Planning*, 37(1), pp. 1–16.

Bongaarts, John and Casterline, John B. (2012) "Fertility Transition: Is sub-Saharan Africa Different?," *Population and Development Review*, 38(Supplement), pp. 153–168.

Brass, William and Juárez, Fatima (1983) "Censored cohort parity progression ratios from birth histories," *Asian and Pacific Census Forum*, 10(1), pp. 5–12.

Brass, William, Juárez, Fatima and Scott, Anne (1997) "An analysis of parity-dependent fertility falls in tropical Africa," In Jones, G. W., Douglas, R. M., Caldwell, J. C., and D'Souza, R. M. (eds.), *The Continuing Demographic Transition*, Oxford, Clarendon Press, pp. 80–93.

Burch, T. K. (1967) "The size and structure of families: A comparative analysis of census data," *American Journal of Sociology*, 32(3), pp. 347–363.

Caldwell, John C. (1980) "Mass education as a determinant of the timing of fertility decline," *Population and Development Review*, 6(2), pp. 225–255.

Caldwell, John C. (1976) "Toward a restatement of demographic transition theory," *Population and Development Review*, 2(3/4), pp. 321–366.

Caldwell, John C. and Caldwell, Pat (2002) "Africa: the new family planning frontier," *Studies in Family Planning*, 33(1), pp. 76–86.

Caldwell, John C. and Caldwell, Pat (1981) "Function of child-spacing in traditional societies and the direction of change," In Page, H. J. and Lestaeghe, R. J. (eds.), *Child-Spacing in Tropical Africa: Traditions and Change*, London-New York, Academic Press, pp. 73–92.

Caldwell, John C. and Caldwell, Pat (1987) "The cultural context of high fertility in sub-Saharan Africa," *Population and Development Review*, 13(3), pp. 409–437.

Caldwell, John C., Orubuloye, I. O. and Caldwell, Pat (1992) "Fertility decline in Africa: A new type of transition?," *Population and Development Review*, 18(2), pp. 211–242.

Caldwell, John C. and Ruzicka, Lado T. (1978) "The Australian fertility transition: an analysis," *Population and Development Review*, 4(1), pp. 81–103.

Carter, Stacy M. and Little, Miles (2007) "Justifying knowledge, justifying method, taking action: Epistemologies, methodologies, and methods in qualitative research," *Qualitative Health Research*, 17(10), pp. 1316–1328.

Casterline, John B., El-Zeini, Laila O. and Odden, Colin (2011) "Fertility decline and birth intervals: Is Africa distinct?," In *Sixth African Population Conference: African Populations, Past, Present and Future*, Ougadougou, Burkina Faso, [online] Available from: http://uaps2011.princeton.edu/sessionViewer.aspx?SessionId=102.

Chibalonza, Kashwantale, Chirhamolekwa, Chirwisa and Bertrand, Jane T. (1989) "Attitudes toward tubal ligation among acceptors, potential candidates, and husbands in Zaire," *Studies in Family Planning*, 20(5), pp. 273–280.

Chidambaram, V. C., Cleland, John G., Goldman, Noreen and Rutstein, Shea O. (1980) "An assessment of the quality of WFS demographic data," In *Seminar on the Analysis of Maternity Histories*, London.

Clayton, David and Hills, Michael (1993) *Statistical Methods in Epidemiology*, Oxford, Oxford University Press.

Cleland, John G. (2001) "The effects of improved survival on fertility: A reassessment," *Population and Development Review*, JSTOR, 27(Supplement: Global Fertility Transition), pp. 60–92.

Cleland, John G., Bongaarts, John, Townsend, John W., Bertrand, Jane T. and Das Gupta, Monica (2012) *Family Planning Programmes for the 21st Century*, New York.

Cleland, John G., Ndugwa, Robert P. and Zulu, Eliya M. (2011) "Family planning in sub-Saharan Africa: progress or stagnation?," *Bulletin of the World Health Organization*, 89(2), pp. 137–43.

Cleland, John G., Onuoha, Nelson and Timæus, Ian M. (1994) "Fertility change in sub-Saharan Africa: a review of the evidence Fertility," In Locoh, T. and Hertich, V. (eds.), *The Onset of Fertility Transition in Sub-Saharan Africa*, Ordina Editions.

Cleland, John G. and Rutstein, Shea O. (1986) "Contraception and Birthspacing," *International Family Planning Perspectives*, 12(3), pp. 83–90.

Cleland, John G. and Wilson, Christopher (1987) "Demand theories of the fertility transition: An iconoclastic view," *Population Studies*, Taylor & Francis, 41(1), pp. 5–30.

Coale, A (1973) "The Demographic Transition," In *International Population Conference, Leige*, Leige, Belgium.

Coale, J and Watkins, Susan C. (1986) *The Decline of Fertility in Europe*, Princeton, Princeton University Press.

Coast, Ernestina, Hampshire, Katherine and Randall, Sara (2007) "Disciplining anthropological demography," *Demographic Research*, 16, pp. 493–518.

Cohen, Barney (1993) "Fertility levels, differentials, and trends," In Foote, K. A., Hill, K. H., and Martin, L. G. (eds.), *Demographic change in Sub-Saharan Africa*, Washington D.C., National Academy Press, pp. 8–67.

Collumbien, Martine, Timæus, Ian M. and Acharya, Laxmi (2001) "Fertility decline in Nepal," In Sathar, Z. A. and Phillips, J. F. (eds.), *Fertility Transition in South Asia*, Oxford, Oxford University Press, pp. 99–120.

Dafe, Florence (2009) *No Business Like Slum Business? The Political Economy of the Continued Existence of Slums. A case study of Nairobi*, DESTIN Working Paper Series, London, [online] Available from: http://www2.lse.ac.uk/internationalDevelopment/pdf/WP/WP98.pdf.

Van Dalen, H. P. and Reuser, M (2008) "Aid and AIDS: a delicate cocktail," [online] Available from: http://www.voxeu.orgindex.php/?q=node/ (Accessed 7 July 2008).

Davis, Kingsley (1963) "The theory of change and response in modern demographic history," *Population Index*, 29, pp. 345–366.

Davis, Kingsley (1943) "World population in transition," *Annals of the American Academy of Social and Political Science*, 237.

Denzin, Norman K. and Lincoln, Yvonna S. (2000) "Introduction: The discipline and practice of qualitative research," Second. In Denzin, N. K. and Lincoln, Y. S. (eds.), *Handbook of Qualitative Research*, Thousand Oaks, California, SAGE Publications, pp. 1–30.

Desgrées-du-Loû, Annabel and Brou, Hermann (2005) "Resumption of sexual relations following childbirth: norms, practices and reproductive health issues in Abidjan, Côte d'Ivoire," *Reproductive Health Matters*, 13(25), pp. 155–163.

Diamond, Ian, Newby, Margaret and Varle, Sarah (1998) "Female education and fertility: Examining the links," In Bledsoe, C. H., Casterline, J. B., Johnson-Kuhn, J. A., and Haaga, J. G. (eds.), *Critical Perspectives on Schooling in the Developing World*, Washington D.C., National Academies Press.

Dow, Thomas E., Archer, L., Khasiani, S. and Kekovole, J. (1994) "Wealth flows and fertility decline in rural Kenya, 1991-92," *Population and Development Review*, 20, pp. 343–364.

Dwyer, Joseph C. and Haws, Jeanne M. (1990) "Is permanent contraception acceptable in sub-Saharan Africa?," *Studies in Family Planning*, JSTOR, 21(6), pp. 322–326.

Dyson, Tim (2011) "The role of the demographic transition in the process of urbanization," *Population and Development Review*, 37(Supplement), pp. 34–54.

Easterlin, Richard A. (1978) "The economics and sociology of fertility: a synthesis," In Tilley, C. (ed.), *Historical Studies of Changing Fertility*, Princeton, Princeton University Press.

Egbuonu, I., Ezechukwu, C. C., Chukwuka, J. O. and Ikechebelu, J. I. (2005) "Breast-feeding, return of menses, sexual activity and contraceptive practices among mothers in the first six months of lactation in Onitsha, South Eastern Nigeria.," *Journal of Obstetrics and Gynaecology*, 25(5), pp. 500–503.

Elandt-Johnson, Regina C. and Johnson, Norman L. (1980) *Survival Models and Data Analysis*, Chichester, John Wiley.

Emina, Jacques, Beguy, Donatien, Zulu, Eliya M., Ezeh, Alex C., et al. (2011) "Monitoring of health and demographic outcomes in poor urban settlements: evidence from the Nairobi Urban Health and Demographic Surveillance System.," *Journal of Urban Health: Bulletin of the New York Academy of Medicine*, 88(Supplement 2), pp. S200–18.

Ezeh, Alex C., Kodzi, Ivy and Emina, Jacques O. (2010) "Reaching the urban poor with family planning services," *Studies in Family Planning*, 41(2), pp. 109–116.

Ezeh, Alex C., Mberu, Blessing U. and Emina, Jacques O. (2009) "Stall in fertility decline in Eastern African countries: regional analysis of patterns, determinants and implications.," *Philosophical Transactions of the Royal Society of London. Series B: Biological Sciencesransactions of the Royal Society of London. Series B: Biological Sciences*, 364(1532), pp. 2991–3007.

Fotso, Jean-Christophe, Kizito, P., Lumumba, V., Moran, G., et al. (2011) "Contraceptive use in urban Kenya: Recent trends and differentials set in the policy and program context," In *Population Association of America Annual Meeting*, Washington D.C.

Garenne, Michel M. (2008) "Fertility Changes in Sub-Saharan Africa," DHS Comparative Reports, Calverton, Maryland, USA.

Garenne, Michel M. and Joseph, Veronique (2002) "The timing of the fertility transition in sub-Saharan Africa," *World Development*, Elsevier, 30(10), pp. 1835–1843.

Gathuthi, Charity, Muindi, Michael, Chiuri, Mercy and Kariuki, James (2010) *Korogocho Socio-economic Survey Report*, Nairobi, Kenya, [online] Available from: http://www.kiddp.org/docs/Korogocho Socio-Economic Survey Report.pdf.

Gillespie, Duff, Ahmed, Saifuddin, Tsui, Amy O. and Radloff, Scott (2007) "Unwanted fertility among the poor: an inequity?," *Bulletin of the World Health Organization*, 85(2), pp. 100–107.

Glaser, Barney G. (1998) *Doing Grounded Theory: Issues and Discussions*, Mill Valley, California, Sociology Press.

Goody, Jack (1962) *Death, Property and the Ancestors: A Study of the Mortuary Customs of the LoDagaa of West Africa*, Stanford, Stanford University Press.

Goody, Jack (1976) *Production and Reproduction: A Comparative Study of the Domestic Domain*, Cambridge, UK, Cambridge University Press.

Green, Judith and Thorogood, Nicki (2004) *Qualitative Methods for Health Researchers*, London, SAGE Publications.

201

Greenhalgh, Susan (1997) "Methods and Meanings: Reflections on Disciplinary Difference," *Population and Development Review*, 23(4), p. 819.

Guest, Greg, MacQueen, Kathleen M. and Namey, Emily (2012) *Introduction to applied thematic analysis*, *Applied Thematic Analysis*, London, SAGE Publications.

Gulis, Gabriel, Mulumba, Joshua A., Juma, Olivia and Kakosova, Beatrica (2004) "Health status of people of slums in Nairobi, Kenya.," *Environmental Research*, 96(2), pp. 219–227.

Gurmu, Eshetu and Mace, Ruth (2008) "Fertility decline driven by poverty: the case of Addis Ababa, Ethiopia.," *Journal of Biosocial Science*, 40(3), pp. 339–358.

Hallberg, Lillemor R-M. (2010) "Some thoughts about the literature review in grounded theory studies.," *International Journal of Qualitative Studies on Health and Well-Being*, 5, p. 5387.

Hobcraft, John N. and McDonald, John (1984) *Birth Intervals*, WFS Comparative Studies, Voorburg, Netherlands.

Hobcraft, John N. and Rodríguez, German (1992) "Methodological issues in the life table analysis of birth histories," In Hill, A. G. and Brass, W. (eds.), *The Analysis of Maternity Histories*, Liege, Belgium, IUSSP, pp. 53–95.

Holstein, J A and Gubrium, J F (2005) "Interpretive Practice and Social Action," 5th Editio. In Denzin, N. K. and Lincoln, Y. S. (eds.), *The Sage Handbook of Qualitative Research*, USA, SAGE Publications, pp. 483–506.

Howard, Mary and Millard, Ann Y. (1997) *Hunger and Shame: Child Malnutrition and Poverty on Mount Kilimanjaro*, New York, Routledge.

Iacovou, Maria and Tavares, Lara Patrício (2011) "Yearning, learning, and conceding: Reasons men and women change their childbearing intentions," *Population and Development Review*, 37(1), pp. 89–123.

Jejeeboy, S. H. (1995) *Women's education, autonomy and reproductive behavior: experience from developing countries*, Oxford, Clarendon Press.

Johnson, Allan G. (2000) *The Blackwell Dictionary of Sociology*, Second. Oxford, Blackwell Publishers.

Johnson, Kiersten, Grant, Monica, Khan, Shane, Moore, Zhuzhi, et al. (2009) *Fieldwork-Related Factors and Data Quality in the Demographic and Health Surveys Program*, DHS Analytical Studies, Calverton, Maryland, USA.

Johnson-Hanks, Jennifer (2007) "Natural intentions: Fertility decline in the African demographic and health surveys," *American Journal of Sociology*, 112(4), pp. 1008–1043.

Johnson-Hanks, Jennifer (2005) "When the future decides: Uncertainty and intentional action in contemporary Cameroon," *Current Anthropology*, 47(1), pp. 363–385.

K'Akumu, O. and Olima, W. (2007) "The dynamics and implications of residential segregation in Nairobi," *Habitat International*, 31(1), pp. 87–99.

Kabiru, Caroline, Beguy, Donatien, Chrichton, Joanna and Zulu, Eliya M. (2011) "HIV/AIDS among youth in urban informal (slum) settlements in Kenya: What are the correlates of and motivations for HIV testing?," *BMC Public Health*, 11(685), pp. 1–12.

Karobia, Caroline (2011) "Nairobi anger high after deadly pipeline fire," *BBC World News*, [online] Available from: http://www.bbc.co.uk/news/world-africa-14890897 (Accessed 19 November 2012).

Kinfu, Yohannes A. (2001) "The Quite [sic] Revolution: An analysis of the change toward below-replacement-level fertility in Addis Ababa," *Demography*, The Australian National University, [online] Available from: https://digitalcollections.anu.edu.au/handle/1885/47496.

Kingoriah, G.K. (1980) "Policy Impacts on Urban Land Use Patterns in Nairobi, Kenya 1899-1979," Indian State University, USA.

Kirk, Dudley (1996) "Demographic transition theory," *Population Studies*, 50(3), pp. 361–387.

Kirk, Dudley and Pillet, Bernard (1998) "Fertility levels, trends, and differentials in sub-Saharan Africa in the 1980s and 1990s," *Studies in Family Planning*, JSTOR, 29(1), pp. 1–22.

Knodel, John and van de Walle, Etienne (1978) "Lessons from the past: policy implications of historical fertility transition studies," *Population and Development Review*, 5(2), pp. 217–245.

Kobia, S (1991) "Forward," In *NCCK (The National Council of Churches of Kenya) Nairobi Demolitions: What Next?*

Kravdal, Øystein (2002) "Education and fertility in Sub-Saharan Africa: Individual and community effects," *Demography*, 39(2), pp. 233–250.

Kyobutungi, Catherine, Ziraba, Abdhalah K., Ezeh, Alex C. and Yé, Yazoumé (2008) "The burden of disease profile of residents of Nairobi's slums: results from a demographic surveillance system," *Population Health Metrics*, 6(1), p. 1.

Landry, A (1934) *La Révolution Démographique*, Paris.

Lesthaeghe, Ron J. (1983) "A century of demographic and cultural change in Western Europe: an exploration of underlying dimensions," *Population and Development Review*, 9(3), pp. 411–435.

Lesthaeghe, Ron J. (1978) *The Decline of Belgian Fertility, 1800-1960*, Princeton, Princeton University Press.

Lesthaeghe, Ron J., Ohadike, P. O., Kocher, J. and Page, Hilary J. (1981) "Child-spacing and fertility in sub-Saharan Africa: an overview of issues," In Page, H. J. and Lesthaeghe, R. J. (eds.), *Child-Spacing in Tropical Africa: Traditions and Change*, London-New York, Academic Press, pp. 2–23.

Lightbourne, Robert E. (1985) "Individual preferences and fertility behaviour," In Cleland, J. G. and Hobcraft, J. N. (eds.), *Reproductive Change in Developing Countries: Insights from the World Fertility Survey*, Oxford, Oxford University Press, pp. 165–198.

Machiyama, Kazuyo (2010) *A Re-Examination of Recent Fertility Declines in Sub-Saharan Africa*, *Population Studies*, DHS Working Papers, Calverton, Maryland, USA.

Madriz, Esther (2000) "Focus groups in feminist research," Second. In Denzin, N. K. and Lincoln, Y. S. (eds.), *Handbook of Qualitative Research*, Thousand Oaks, California, SAGE Publications, pp. 835–850.

Marquis, Grace S., Penny, Mary E., Diaz, Judith M. and Marin, Margot R. (2002) "Postpartum Consequences of an Overlap of Breastfeeding and Pregnancy: Reduced Breast Milk Intake and Growth During Early Infancy," *Pediatrics*, 109(4), pp. e56–e64.

Mayhew, Susannah and Adjei, S (2004) "Sexual and reproductive health: challenges for priority-setting in Ghana's health reforms," *Health Policy and Planning*, 19(Supplement), pp. i50–i60.

McNicoll, G (1994) "Institutional analysis of fertility," In Kiessling, K. and Landberg, H. (eds.), *Population, Development and the Environment*, Oxford, Oxford University Press, pp. 199–230.

McNicoll, Goeff (1994) "Institutional analysis of fertility," In Kiessling, K. and Landberg, H. (eds.), *Population, Development and the Environment*, Oxford, Oxford University Press, pp. 199–230.

Mitullah, Winnie (2003) *Understanding Slums: Case Studies for the Global Report on Human Settlements 2003: The Case of Nairobi, Kenya*, Nairobi, Kenya, [online] Available from: http://www.begakwabega.com/documenti/Nairobi-HabitatReport2003.pdf.

Montgomery, Mark R., Stren, Richard, Cohen, Barney and Reed, Holly E. (2004) *Cities Transformed: Demographic Change and its Implications in the Developing World*, London, Earthscan.

Moultrie, Tom A., Hosegood, Victoria, McGrath, C, Hill, Kenneth H., et al. (2008) "Refining the criteria for stalled fertility declines: an application to rural KwaZulu-Natal, South Africa, 1990-2005," *Studies in Family Planning2*, 39(1), pp. 39–48.

Moultrie, Tom A., Sayi, Takudzwa S. and Timæus, Ian M. (2010) "Age and parity effects on birth intervals in the African fertility decline," In *Population Association of America Annual Meeting*, Dallas, Texas.

Moultrie, Tom A., Sayi, Takudzwa S. and Timæus, Ian M. (2012) "Birth intervals, postponement, and fertility decline in Africa: A new type of transition?," *Population Studies*, 66(3), pp. 241–258.

Moultrie, Tom A. and Timæus, Ian M. (2013) "Rethinking African Fertility: The state in, and of, the future Sub-Saharan African fertility decline," In *IUSSP International Population Conference*, Busan.

Murdock, Peter G. (1954) *Our Primitive Contemporaries*, orton.catie.ac.cr, New York, The Macmillan Company.

Ndugwa, Robert P., Cleland, John G., Madise, Nyovani J., Fotso, Jean-Christophe and Zulu, Eliya M. (2011) "Menstrual pattern, sexual behaviors, and contraceptive use among postpartum women in Nairobi urban slums.," *Journal of Urban Health: Bulletin of the New York Academy of Medicine*, 88(Supplement 2), pp. S341–355.

Notestein, Frank W. (1945) "Population: The Long View," In Schultz, T. W. (ed.), *Food for the World*, Chicago, University of Chicago Press.

Obudho, Robert A. (1997) "Nairobi: National capital and regional hub," In Rakodi, C. (ed.), *The Urban Challenge in Africa: Growth and Management of its Large Cities*, Tokyo, United Nations University Press, pp. 292–334.

Oketch, Moses, Mutisya, Maurice, Ngware, M and Ezeh, Alex C. (2010) "Why are there proportionately more poor pupils enrolled in non-state schools in urban Kenya in spite of FPE policy?," *International Journal of Educational Development*, 30(1), pp. 23–32.

Oketch, Moses, Mutisya, Maurice and Sagwe, Jackline (2011) *Do poverty dynamics explain the shift to informal private schooling systems in the wake of free primary education in Nairobi slums?*, APHRC Working Paper, Nairobi, Kenya.

Olima, Washington H. (2001) "The dynamics and implications of sustaining urban spatial segregation in Kenya: Experiences from Nairobi metropolis," In *International Seminar on*

Segregation in the City, Cambridge, Massachusetts, [online] Available from: https://www.lincolninst.edu/pubs/dl/608_olima.pdf.

Oparanya, Wycliffe A. (2010) *2009 Population and Housing Census Results*, Nairobi, Kenya, [online] Available from: http://www.knbs.or.ke/Census Results/Presentation by Minister for Planning revised.pdf.

Pamoja Trust (2009) *An Inventory of the Slums in Nairobi*, Nairobi, Kenya, [online] Available from: http://www.irinnews.org/pdf/nairobi_inventory.pdf.

Parish, William L. and Willis, Robert J. (1993) "Daughters , education , and family budgets: Taiwan Experiences," *The Journal of Human Resources*, 28(4), pp. 863–898.

Pollack, Robert A. and Watkins, Susan C. (1993) "Cultural and economic approaches to fertility: proper marriage or mésalliance?," *Population and Development Review*, 19(3), pp. 467–496.

Pope, Catherine, Mays, Nicholas and Popay, Jennie (2007) *Synthesising Qualitative and Quantitative Health Research: A Guide to Methods*, Maidenhead, UK, Open University Press.

Potter, J. E. (1983) "Effects of societal and community institutions on fertility," In Bulatao, R. and Lee, R. D. (eds.), *Determinants of Fertility in Developing Countries (Volume 2)*, New York, Academic Press, pp. 627–665.

Potter, J. E. (1977) "Problems in using birth-history analysis to estimate trends in fertility," *Population Studies*, 31(2), pp. 335–64.

Pullum, Thomas W. (2006) *An assessment of age and date reporting in the DHS surveys, 1985-2003*, *Development*, Methodological Reports, Calverton, Maryland, USA.

Randall, Sara and Koppenhaver, Todd (2004) "Qualitative data in demography," *Demographic Research*, 11, pp. 57–94.

Randall, Sara and Legrand, Thomas (2003) "Reproductive strategies in Senegal: the of role of child mortality," *Population (English Edition)*, 58(6), pp. 687–715.

Randall, Sara and Legrand, Thomas K. (2001) "Is child mortality important? Reproductive strategies, decisions and outcomes in Senegal," In *IUSSP Workshop on Mortality and Reproductive Decision-Making in Sub-Saharan Africa*, Salvador de Bahia, Brazil.

Rodríguez, German and Hobcraft, John N. (1980) *Illustrative Analysis: Life Table Analysis of Birth Intervals in Columbia*, World Fertility Survey Scientific Reports, London.

Rodríguez, German, Hobcraft, John N., McDonald, John and Menken, Jane (1984) *A Comparative Analysis of Determinants of Birth Intervals*, WFS Comparative Studies, Voorburg, Netherlands.

Romaniuk, A. (2011) "Persistence of high fertility in tropical Africa: the case of the Democratic Republic of the Congo," *Population and Development Review*, 37(1), pp. 1–28.

Rossier, Clementine, Senderowicz, Leigh and Soura, Abdramane (2013a) "The one God sends to save me: Conflicted fertility preferences and unmet need among Burkina Faso's urban poor," In *Is access enough? Understanding and addressing unmet need in Family Planning*, Nanyuki, Kenya.

Rossier, Clementine, Senderowicz, Leigh and Soura, Abdramane (2013b) "The one God sends to save me: Conflicted fertility preferences and unmet need among Burkina Faso's urban poor," In *Is access enough? Understanding and addressing unmet need in Family Planning*, Nanyuki, Kenya.

Rutstein, Shea O. and Bicego, George T. (1990) *Assessment of the Quality of Data Used to Ascertain Eligibility and Age in the Demographic and Health Surveys*, DHS Methodological Reports, Calverton, Maryland.

Ryder, Norman B. (1985) "The structure of pregnancy intervals by planning status," *Population Studies*, 39(2), pp. 193–211.

Santow, Gigi (1987) "Reassessing the contraceptive effect of breastfeeding," *Population Studies*, 41(1), pp. 147–160.

Schoenmakers, R, Shah, Iqbal H., Lesthaeghe, Ron J. and Tambashe, Oleko B. (1981) "The child-spacing tadition and the postpartum taboo in tropical Africa: Anthropological evidence," In *Child-Spacing in Tropical Africa: Traditions and Change*, London-New York, Academic Press, pp. 25–71.

Schoumaker, Bruno (2008) "Stalls in Fertility in Sub-Saharan Africa: Real or Spurious?," In *IUSSP Seminar on Human Fertility in Africa*, Cape Coast, Ghana.

Sear, Rebecca, Mace, Ruth and McGregor, Ian A. (2003) "The effects of kin on female fertility in rural Gambia," *Evolution and Human Behavior*, 24, pp. 25–42.

Shapiro, David and Gebreselassie, Tesfayi (2008) "Fertility transition in sub-Saharan Africa: Falling and stalling," *African Population Studies*, Union for African Population Studies, 22/23(2/1), pp. 3–23.

Shapiro, David and Tambashe, B. (2000) "Fertility transition in urban and rural areas of sub-Saharan Africa," In *Chaire Quetelet Symposium in Demography*, Louvain-la-Neuve, Belgium.

De Silva, Indralal W. (1991) "Consistency between reproductive preferences and behavior: the Sri Lankan experience," *Studies in Family Planning*, JSTOR, 22(3), pp. 188–197.

Silverman, David (2011) *Interpreting Qualitative Data*, Fourth Edi. Padstow, UK, SAGE Publications.

Sinding, Steven W. (1991) "The demographic transition in Kenya: A portent for Africa?," *Asia-Pacific Journal of Public Health*, 5(2), pp. 145–153.

Smith, David P. (1985) "Breastfeeding, contraception, and birth intervals in developing countries," *Studies in Family Planning*, 16(3), pp. 154–163.

StataCorp (2013) *Stata Base Reference Manual: Release 13*, College Station, Texas, Stata Press Publication.

Stecklov, G. (1997) "Intergenerational resource flows in Cote d'Ivoire: Empirical analysis of aggregate flows," *Population and Development Review*, 23(3), pp. 525–553.

Syagga, P, Mitullah, Winnie and Karirah-Gitau, S. (2001) *Nairobi Situation Analysis Consultative Report*, Nairobi, Kenya.

Tabutin, Dominique and Schoumaker, Bruno (2004) "The demography of sub-Saharan Africa from the 1950s to the 2000s - A survey of changes and a statistical assessment," *Population (English Edition)*, 59, pp. 455–555.

The Open University (2012) "Interpretivism," [online] Available from: http://openlearn.open.ac.uk/mod/oucontent/view.php?id=406964&section=5.3 (Accessed 27 November 2012).

Thompson, Warren S. (1929) "Population," *American Journal of Sociology*, 34, pp. 959–975.

Timæus, Ian M. and Balasubramanian, K. (1984) *Evaluation of the Lesotho Fertility Survey 1977*, WFS Scientific Reports, Voorburg, Netherlands.

Timæus, Ian M. and Moultrie, Tom A. (2013) "Distinguishing the impact of postponement, spacing and stopping on birth intervals: evidence from a model with heterogeneous fecundity," *Journal of Biosocial Science*, 45(3), pp. 311–330.

Timæus, Ian M. and Moultrie, Tom A. (2008) "On postponement and birth intervals," *Population and Development Review*, 34(3), pp. 483–510.

Trinitapoli, Jenny and Yeatman, Sara (2011) "Uncertainty and fertility in a generalized AIDS epidemic," *American Sociological Review*, 76(6), pp. 935–954.

UN-HABITAT (2001) *Cities in a Globalising World: Global Report on Human Settlements 2001*, London, [online] Available from: http://www.unhabitat.org/downloads/docs/GRHS.2001.0.pdf.

UN-HABITAT (2003) *The Challenge of Slums: Global Report on Human Settlements 2003*, London, [online] Available from: http://www.unhabitat.org/pmss/listItemDetails.aspx?publicationID=1156.

United Nations (UN) (2012) *World Population Prospects: The 2012 Revision*, New York.

Van de Walle, Etienne (1992) "Fertility transition, conscious choice, and numeracy," *Demography*, 29(4), pp. 487–502.

Walters, Sarah L. (2008) "Fertility, Mortality and Marriage in Northwest Tanzania, 1920-1970: A Demographic Study Using Parish Registers," University of Cambridge, [online] Available from: http://www.geog.cam.ac.uk/people/walters/phd.pdf.

Ware, Helen (1976) "Motivations for the use of birth control: evidence from West Africa.," *Demography*, 13(4), pp. 479–493.

Westoff, Charles F. (2006) *New Estimates of Unmet Need and the Demand for Family Planning*, DHS Comparative Reports, Calverton, Maryland, USA.

Westoff, Charles F. and Cross, Anne R. (2006) *The Stall in the Fertility Transition in Kenya*, DHS Analytical Studies, Calverton, Maryland, USA.

Westoff, Charles F. and Ryder, Norman B. (1977) "The predictive validity of reproductive intentions," *Demography*, 14, pp. 431–453.

Wolf, Merrill, Abubakar, Aisha, Tsui, Sharon and Williamson, Nancy E. (2008) *Child Spacing Attitudes in Northern Nigeria*, [online] Available from: http://pdf.usaid.gov/pdf_docs/PNADL911.pdf.

Wolff, Brent, Blanc, Ann K. and Ssekamatte-Ssebuliba, John (2000) "The role of couple negotiation in unmet need for contraception and the decision to stop childbearing in Uganda," *Studies in Family Planning*, 31(2), pp. 124–137.

World Bank (2000) *Entering the 21st Century: World Development Report 1999/2000*, New York.

Yamaguchi, Kazuyo (1991) *Event History Analysis*, London, SAGE Publications.

Yeakey, Marissa P., Muntifering, Carie J., Ramachandran, Daesha V., Myint, Yemon, et al. (2009) "How contraceptive use affects birth intervals: results of a literature review," *Studies in Family Planning*, 40(3), pp. 205–214.

Yitna, A (2002) "Levels, trends and determinants of fertility in Addis Ababa, Ethiopia," *Journal of African Policy Studies*, 12(2).

Zimbabwe National Statistics Agency (ZIMSTAT) and ICF International (2012) *Zimbabwe Demographic and Health Survey 2010-11*, Calverton, Maryland.

Ziraba, Abdhalah K., Kebaso, John, Khamadi, Samoel, Okoth, Vincent and Mwau, Matilu (2008) "HIV and AIDS in the city: Prevalence among residents of informal urban settlements in Nairobi, Kenya," In *Population Association of America Annual Meeting*, New Orleans, [online] Available from: http://www.dfid.gov.uk/r4d/PDF/Outputs/SexReproRights_RPC/ziraba2.pdf.

Zulu, Eliya M., Dodoo, Francis N. and Ezeh, Alex C. (2002) "Sexual risk-taking in the slums of Nairobi, Kenya, 1993-8," *Population Studies*, 56(3), pp. 311–323.

Appendices

Appendix 1: Table of descriptive statistics showing the number of births* and number of woman years in the national and sub-national populations by country and time period

| | Residence | | | | | | Contraceptive use | | | | Education | | | | | |
| | National | | Urban | | Rural | | Never use | | Ever use | | None | | Primary | | Secondary + | |
	Births	Woman-years	Births	Woman-years	Births	Woman-years	Births	Woman-years	Births	Woman-years	Births	Woman-years	Births	Woman-years	Births	Woman-years
ETHIOPIA																
1965-69	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1970-74	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1975-79	2,263	197,928	481	46356	1,782	151,572	2,201	189,979	61	6760	2,083	177,978	126	12,671	54	7,279
1980-84	5,137	400,581	1047	95108	4,090	305,473	4,882	369,809	194	22337	4,671	349,570	275	30,153	191	20,858
1985-89	9,314	696,282	1676	164543.7	7,638	531,738	8,617	614,200	409	53966.33	8,344	586,002	669	68,761	301	41,518
1990-94	14,584	1,064,709	2108	248210.7	12,476	816,498	13,126	894,932	660	105552.7	12,894	859,734	1,323	132,675	367	72,299
1995-99	18,046	1,479,984	2163	343763.6	15,883	1,136,220	15,477	1,168,110	1043	202127.6	15,326	1,153,444	2,179	210,634	541	115,906
2000-04	13,699	1,167,515	1511	270771.9	12,188	896,743	10,641	861,171	627	153967.2	11,249	879,624	2,105	198,630	345	89,261
2005-10	7,572	746,527	891	180,775	6,681	565,752	5,174	504,245	64	120,076	6,082	533,153	1,378	162,225	112	51,149
TOTAL	70,615	5,753,526	9,877	1,349,529	60,738	4,403,996	60,118	4,602,446	3,058	664,787	60,649	4,539,506	8,055	815,749	1,911	398,270
KENYA																
1965-69	1,508	118,135	145	12,853	1,363	105,282	1,371	107,030	122	10,172	849	63,540	625	51,481	30	2,941
1970-74	3,702	256,363	344	32,527	3,358	223,836	3,294	221,594	379	33,096	1,848	122,537	1,741	119,716	106	13,822
1975-79	7,250	470,073	781	69,725	6,469	400,349	6,080	379,364	1,123	88,358	3,306	197,029	3,519	227,659	419	45,013
1980-84	11,397	769,670	1,315	130,264	10,082	639,407	9,070	565,466	2,272	201,020	4,486	270,562	5,748	382,978	1,156	115,684
1985-89	13,951	1,039,116	1,731	193,537	12,220	845,579	10,316	665,692	3,567	370,892	4,418	299,537	7,427	540,849	2,102	198,301
1990-94	10,083	883,036	1,248	169,654	8,835	713,382	7,072	492,303	2,992	389,897	2,843	208,864	5,635	479,350	1,605	194,822
1995-99	7,345	733,109	1,117	171,641	6,228	561,468	4,703	370,222	2,634	362,558	1,995	157,220	4,151	398,662	1,199	177,226
2000-04	5,364	505,019	902	136,299	4,462	368,720	3,217	247,746	2,143	256,943	1,502	111,573	3,069	272,556	793	120,891
2005-10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TOTAL	60,600	4,774,521	7,583	916,499	53,017	3,858,023	45,123	3,049,417	15,232	1,712,936	21,247	1,430,862	31,915	2,473,250	7,410	868,700

* Only 2nd or higher order births are included in this table since these are the births which contribute to the closing, rather than opening of an interval.

Appendix 1 (continued) Table of descriptive statistics showing the number of births* and number of woman years in the national and sub-national populations by country and time period

	Residence						Contraceptive use				Education					
	National		Urban		Rural		Never use		Ever use		None		Primary		Secondary +	
	Births	Woman-years	Births	Woman-years	Births	Woman-years	Births	Woman-years	Births	Woman-years	Births	Woman-years	Births	Woman-years	Births	Woman-years
							TANZANIA									
1965-69	983	51,434	157	8,515	826	42,919	933	48,385	38	2,295	725	37,574	256	13,796	2	64
1970-74	2,638	136,102	462	23,933	2,176	112,169	2,409	122,679	156	9,430	1,746	89,076	870	45,956	22	1,070
1975-79	5,546	279,753	1,020	54,067	4,526	225,686	4,819	237,336	463	29,638	3,424	170,095	2,042	104,788	80	4,870
1980-84	8,778	483,481	1,545	96,658	7,233	386,823	7,183	378,946	904	66,579	5,128	273,865	3,393	193,843	257	15,773
1985-89	12,423	764,894	2,104	152,600	10,319	612,294	9,107	542,709	1,646	133,582	6,197	374,231	5,636	356,077	590	34,586
1990-94	13,096	864,624	2,180	181,718	10,916	682,906	8,195	520,255	1,895	184,649	5,187	345,107	7,134	467,162	775	52,355
1995-99	10,792	734,638	1,632	158,920	9,160	575,718	5,153	332,611	1,509	181,813	3,577	242,968	6,397	431,451	818	60,219
2000-04	8,985	620,832	1,295	118,062	7,690	502,770	3,149	193,738	1,686	141,719	2,686	186,048	5,583	378,515	716	56,269
2005-10	4,848	340,788	725	66,656	4,123	274,132	1	1,186	0	627	1,363	93,484	3,072	210,837	413	36,467
TOTAL	68,089	4,276,546	11,120	861,129	56,969	3,415,417	40,949	2,377,845	8,297	750,332	30,033	1,812,448	34,383	2,202,425	3,673	261,673
							ZIMBABWE									
1965-69	729	62,153	151	14,853	578	47,299.33	407	37,041	320	24,971	216	17,602	486	41,014	27	3,537
1970-74	1,662	142,063	326	35,121	1,336	106,942	864	79,824	794	61,826	450	37,429	1,115	92,789	97	11,845
1975-79	3,304	282,617	587	73,165	2,717	209,453	1,585	141,319	1,709	139,438	907	69,094	2,177	183,945	220	29,579
1980-84	6,055	498,588	1,194	134,662	4,861	363,927	2,513	203,717	3,455	278,258	1,569	111,579	3,977	319,642	509	67,367
1985-89	7,558	680,402	1,407	190,296	6,151	490,106	2,380	203,325	4,783	433,857	1,840	130,402	4,899	411,334	819	138,666
1990-94	6,259	743,536	1,151	206,200	5,108	537,336	1,569	181,123	3,990	483,383	1,260	108,560	3,811	397,331	1,188	237,645
1995-99	4,850	689,861	909	202,547	3,941	487,314	972	134,263	2,831	429,886	655	67,099	2,638	321,746	1,557	301,016
2000-04	4,028	590,131	714	179,647	3,314	410,484	591	103,492	1,879	319,727	309	40,344	1,967	246,560	1,752	303,227
2005-10	2,362	401,201	449	127,553	1,913	273,647	252	82,911	347	174,093	105	20,650	1,061	154,149	1,196	226,402
TOTAL	36,807	4,090,551	6,888	1,164,043	29,919	2,926,508	11,133	1,167,016	20,108	2,345,439	7,311	602,758	22,131	2,168,510	7,365	1,319,283

* Only 2nd or higher order births are included in this table since these are the births which contribute to the closing, rather than opening of an interval.

Appendix 1 (continued) Table of descriptive statistics showing the number of births* and number of woman years in the national and sub-national populations by country and time period

	Contraceptive use by residence								Education by residence							
	Urban				Rural				Urban				Rural			
	Never use		Ever use		Never use		Ever use		No education		Some education		No education		Some education	
	Births	Woman-years	Births	Woman-years	Births	Woman-years	Births	Woman-years	Births	Woman-years	Births	Woman-years	Births	Woman-years	Births	Woman-years
ETHIOPIA																
1965-69	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1970-74	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1975-79	440	40627	40	5,223	1,761	149,352	21	1537	317	28375	164	17,981	1,766	149,603	16	1969
1980-84	861	73,297	162	19,029	4,021	296,512	32	3308	645	51694	402	43,414	4,026	297,876	64	7597
1985-89	1,273	111,459	321	44,451	7,344	502,741	88	9515	978	81,733	698	82,810	7,366	504,269	272	27469
1990-94	1,483	147,678	429	81,213	11,643	747,254	231	24340	1,212	112,180	896	136,030	11,682	747,554	794	68,944
1995-99	1,310	173747	537	137,018	14,167	994,363	506	65109.99	1,142	143111.7	1,021	200,652	14,184	1,010,332	1,699	125,888
2000-04	805	134770	240	89,443	9,836	726,401	387	64524.29	805	106605.6	706	164,166	10,444	773,018	1,744	123,725
2005-10	400	86,404	21	58,773	4,774	417,841	43	61,303	528	69,007	363	111,769	5,554	464,147	1,127	101,605
TOTAL	6,572	767,983	1,750	435,149	53,546	3,834,463	1,308	229,637	5,627	592,707	4,250	756,823	55,022	3,946,799	5,716	457,197
KENYA																
1965-69	129	10,744	16	2,109	1,242	96,286	106	8,063	65	4,527	78	8,246	784	59,013	577	46,176
1970-74	289	24,451	55	8,040	3,005	197,143	324	25,056	121	10,321	222	22,139	1,727	112,216	1,625	111,399
1975-79	608	47,075	172	22,503	5,472	332,289	951	65,856	263	19,209	518	50,438	3,043	177,820	3,420	222,235
1980-84	919	76,483	395	53,468	8,151	488,983	1,877	147,553	372	29,835	943	100,333	4,114	240,727	5,961	398,329
1985-89	1,066	96,640	660	96,726	9,250	569,052	2,907	274,166	411	36,237	1,320	157,196	4,007	263,300	8,209	581,954
1990-94	719	73,287	528	96,315	6,353	419,016	2,464	293,582	302	28,380	946	141,274	2,541	180,484	6,294	532,898
1995-99	635	67,648	481	103,832	4,068	302,574	2,153	258,726	280	27,069	837	144,571	1,715	130,151	4,513	431,317
2000-04	455	52,260	446	83,946	2,762	195,486	1,697	172,998	194	20,013	708	116,286	1,308	91,560	3,154	277,160
2005-10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TOTAL	4,820	448,588	2,753	466,937	40,303	2,600,829	12,479	1,245,999	2,008	175,591	5,572	740,482	19,239	1,255,271	33,753	2,601,468

* Only 2nd or higher order births are included in this table since these are the births which contribute to the closing, rather than opening of an interval.

Appendix 1 (continued) Table of descriptive statistics showing the number of births* and number of woman years in the national and sub-national populations by country and time period

	Contraceptive use by residence								Education by residence							
	Urban				Rural				Urban				Rural			
	Never use		Ever use		Never use		Ever use		No education		Some education		No education		Some education	
	Births	Woman-years	Births	Woman-years	Births	Woman-years	Births	Woman-years	Births	Woman-years	Births	Woman-years	Births	Woman-years	Births	Woman-years
TANZANIA																
1965-69	148	7710	7	562	785	40675	31	1733	91	4807	66	3708	634	32767	192	10152
1970-74	393	19,513	39	2,933	2,016	103,166	117	6,497	216	11,712	246	12,221	1,530	77,364	646	34,805
1975-79	778	38,489	144	10,730	4,041	198,847	319	18,908	448	22,875	572	31,192	2,976	147,220	1,550	78,466
1980-84	1,065	60,523	273	24,855	6,118	318,423	631	41,724	586	35,823	959	60,835	4,542	238,042	2,691	148,781
1985-89	1,222	81,576	484	48,463	7,885	461,133	1,162	85,119	653	46,809	1,451	105,791	5,544	327,422	4,775	284,872
1990-94	1,065	79,232	502	66,504	7,130	441,023	1,393	118,145	530	44,029	1,650	137,689	4,657	301,078	6,259	381,828
1995-99	523	48,742	353	63,670	4,630	283,869	1,156	118,143	287	29,451	1,345	129,469	3,290	213,517	5,870	362,201
2000-04	281	22,140	389	38,805	2,868	171,598	1,297	102,914	189	17,173	1,106	100,889	2,497	168,875	5,193	333,895
2005-10	0	203	0	141	1	983	0	486	99	8,717	626	57,939	1,264	84,767	2,859	189,365
TOTAL	5,475	358,128	2,191	256,663	35,474	2,019,717	6,106	493,669	3,099	221,396	8,021	639,733	26,934	1,591,052	30,035	1,824,365
ZIMBABWE																
1965-69	89	8553	62	6300.33	318	28488	258	18670.33	30	2714	121	12139.33	186	14888	392	32411.33
1970-74	153	16,685	173	18,436	711	63,139	621	43,390	53	4,382	273	30,739	397	33,047	939	73,895
1975-79	225	28,141	362	44,720	1,360	113,178	1,347	94,719	79	7,545	508	65,619	828	61,548	1,889	147,904
1980-84	344	40,240	834	89,719	2,169	163,477	2,621	188,539	127	11,719	1,067	122,942	1,442	99,860	3,419	264,067
1985-89	297	40,424	1,012	136,588	2,083	162,901	3,771	297,269	131	13,200	1,276	177,096	1,709	117,201	4,442	372,905
1990-94	161	34,752	828	147,488	1,408	146,371	3,162	335,895	67	9,167	1,084	197,033	1,193	99,393	3,915	437,943
1995-99	107	27,611	585	136,869	865	106,652	2,246	293,018	31	5,240	878	197,307	624	61,859	3,317	425,455
2000-04	59	26,132	325	104,955	532	77,360	1,554	214,772	10	3,528	704	176,119	299	36,816	3,015	373,667
2005-10	29	23,580	58	63,216	223	59,331	289	110,877	3	2,029	446	125,524	102	18,621	1,811	255,027
TOTAL	1,464	246,118	4,239	748,291	9,669	920,897	15,869	1,597,149	531	59,525	6,357	1,104,519	6,780	543,234	23,139	2,383,274

* Only 2nd or higher order births are included in this table since these are the births which contribute to the closing, rather than opening of an interval.

Appendix 2: Ethical Approval Document LSHTM OIREC

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OBSERVATIONAL/INTERVENTIONS RESEARCH ETHICS COMMITTEE

30 January 2012

Catriona Towriss

Dear Catriona

Study Title:	Reproductive Decision-Making Amongst the Urban Poor in Nairobi's Informal Settlements
LSHTM ethics ref:	6110
Department:	Epidemiology and Population Health

Thank you for your email of 26 January responding to the Committee's request for further information on the above research and submitting revised documentation.

The further information has been considered on behalf of the Committee by the Chair.

Confirmation of ethical opinion

On behalf of the Committee, I am pleased to confirm a favourable ethical opinion for the above research on the basis described in the application form, protocol and supporting documentation as revised, subject to the conditions specified below.

Conditions of the favourable opinion

Approval is dependent on local ethical approval having been received, where relevant.

Approved documents

The final list of documents reviewed and approved by the Committee is as follows:

Document	Version	Date	
LSHTM ethics application	n/a		
Protocol	V2.0	30/01/12	
Information Sheet	V2.0	30/01/12	
Consent form	V2.0	30/01/12	

After ethical review

Any subsequent changes to the application must be submitted to the Committee via an E2 amendment form.

Yours sincerely,

Professor Andrew J Hall
Chair

KENYA MEDICAL RESEARCH INSTITUTE

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KEMRI/RES/7/3/1   April 18, 2012

TO: Ms. CATRIONA TOWRISS (PRINCIPAL INVESTIGATOR)
              DEPARTMENT OF POPULATION STUDIES,
              LONDON SCHOOL OF HYGIENE AND TROPICAL MEDICINE,
              KEPPEL STREET, LONDON, WC1E 7HT,
              UNITED KINGDOM

THROUGH: DR. DONATIEN BEGUY,
              APHRC,
              NAIROBI

Dear Madam,

RE: NON-SSC PROTOCOL No. 334 – (*EXPEDITED REVIEW OF INITIAL
        APPLICATION*): REPRODUCTIVE DECISION-MAKING AMONGST THE
        URBAN POOR IN NAIROBI'S INFORMAL SETTLEMENTS.

Reference is made to your letter dated 4th April 2012. The ERC Secretariat acknowledges receipt of the following documents:

 (a) A copy of the NIH Certificate of Completion of Protecting Human Research Participants course dated 3rd April 2012.
 (b) The Revised Study Protocol – Version 2 dated 11 April 2012.
 (c) The CVs for investigators – Version 1 dated 23 March 2012.
 (d) The role of investigators on the study - Version 1 dated 23 March 2012.
 (e) The Focus Group Discussion Topic Guide - Version 1 dated 11 April 2012.
 (f) The Introduction to Focus Group Discussions - Version 1 dated 23 March 2012.
 (g) The Participant Information Sheet – Version 2 dated 11 April 2012.
 (h) The Informed Consent Document – Version 1 dated 23 March 2012.
 (i) A copy of the approval letter from the LSHTM's Observational/Interventions Research Ethics Committee dated 30 January 2012.

This is to inform you that at the 200th ERC meeting held on Tuesday, 17th April 2012, the Committee determined that the issues raised at the initial review of the application are adequately addressed. Consequently, the study is granted approval for implementation effective this **17th day of April 2012** for a period of one year.

Please note that authorization to conduct this study will automatically expire on **April 16, 2013.** If you plan to continue data collection or analysis beyond this date, please submit an

In Search of Better Health

215

application for continuation approval to the ERC Secretariat by **March 5, 2013**. The regulations require continuing review even though the research activity may not have begun until sometime after the ERC approval.

Note that any unanticipated problems resulting from the implementation of this study should be brought to the attention of the ERC. You are also required to submit any proposed changes to this study to the SSC and ERC for review and approval prior to initiation and advise the ERC when the study is completed or discontinued.

Work on this project may begin.

Sincerely,

CHRISTINE WASUNNA,
Ag. SECRETARY,
KEMRI ETHICS REVIEW COMMITTEE

Focus Group Protocol

1) Open-ended starting questions:

a) Is it important for people to have children these days? Why?
   Je?Ni muhimu kwa watu kupata watoto siku hizi?Kwa nini?

b) How do you feel about being a mother?
   Je?Unajihisi vipi kuwa mama?

c) Does having a baby just happen or does a couple consider their situation and make a decision?
   Je?Kupata watoto ni ajali ama watu wanaochumbiana hudadisi hali yao kabla ya kufanya huo uamuzi?

d) What things do women/people in your community think about when they are considering having a baby?
   Ni mambo gani wanawake/watu wa jamii yenu huyatilia maanani wanapopanga kupata watoto?

Focused topic guide:

2) Relationships

Now I want us to talk about how relationships between men and women in Korogocho/Viwandani affect couples decisions about having a baby

Kwa sasa ningependa tuzungumzie jinsi uhusiano kati ya wanaume na wanawake Korogocho/Viwandani huathiri uamuzi wa wachumba kuhusu kupata mtoto

a) What kinds of relationships between men and women are good for having children?
   Je?Ni uhusiano wa aina gani unaofaa kati ya wanaume na wanawake wanapotaka kupata watoto?

b) How important is it for people to be **married** when they have a child?
   Je?Kuna umuhimu gani kwa watu **kuoana** wanapotaka kupata mtoto?

c) What happens if children are born **outside** of a marriage?
   Je?ni mambo gani hufanyika watoto wanapozaliwa **nje** ya ndoa
   I.   Probe: Before a woman or man is married?
        Dadisi: Kabla mwanamke au mwanamke kuolewa/kuoa?
   II. Probe: After a relationship has finished?
        Dadisi: Baada ya uhusiano kuisha?
   III. Probe: During a relationship (after divorce)
        Dadisi: Wakati wa uhusiano (baada ya kutalikiana)

d) Has the **importance of marriage** for having a child **changed** over time?
   Je? **Umuhimu wa ndoa** katika kupata mtoto **umebadilika** jinsi siku zilivyozidi kusonga?

e) Do you think that having another child makes a **relationship stronger**? Or does it **add more pressure** to it?

Je?Unafikiri kwamba kupata mtoto **huuimarisha uhusiano**?Au **huuongezea shinikizo**?

f) Would it make a difference if the couple are **living apart** for long periods of time
e.g. if one is working away or visiting ushago
Je?Kuna tofauti iwapo wachumba **hawaishi pamoja** kwa muda, kwa mfano mmoja wao anafanya kazi mbali au amewetembelea watu mashambani?

g) If a woman doesn't **trust** her husband or partner and suspects that he is having a relationship with another women, how would this affect having a new baby?
Je?Iwapo mwanamke **hamuamini** mumewe ama mchumbake na anamshuku kuwa na uhusiano wa kimapenzi na mwanamke mwingine,hili litaathiri vipi nia ya kumpata mtoto mwingine?

h) If a woman is **remarried** and is with a new husband, how would this make a difference to decisions about having a new baby?
Iwapo mwanamke **ataolewa tena** na mume mwingine, je? hili litaathiri vipi uamuzi wa kumpata mtoto mwingine?

i) Among couples that you know, do the man and woman talk about having children?
Kati ya wachumba unaowajua wewe,je?wanaume na wanawake hulijadili swala la kupata watoto?

j) Is it the man or the woman **who decides** about having a baby?
Je?Ni mwanaume au mwanamke **anayefanya uamuzi** wa kumpata mtoto?
  I. Probe: Why?
     Dadisi: Kwa nini
  II. Probe: Are there disagreements sometimes?
      Dadisi: Kuna kutoelewana wakati mwingine
  III. Probe: What happens if there is disagreement?
       Dadisi: Ni nini hufanyika wakati

k) Do **bridewealth** payments have an impact on having children? How?
Je?Ulipaji wa **mahar**i una umuhimu katika kupata watoto?
  I. Probe: Has this changed over time?
     Dadisi: Je?Haya yamebadilika siku zilivyosonga?
  II. Probe: Do most people in this community pay bridewealth?

3) Extended family

Let's discuss about what other family members (for example, parents, grandparents, mothers-in law, sisters, cousins) have to say about couples having children

Sasa hebu tujadili mawazo waliyonayo watu wa jamii yako ama watu wa ukoo kuhusu wachumba kupata watoto(kama vile,wazazi,kina babu na nyanya na binamuzo)

a) Are your closest relatives **living near to you** or are they far away?
Je?Watu mlio na ukoo wa karibu **wanaishi karibu na wewe** au wako mbali?

b) What do other family members have to say about the **importance of having children**
Je?Watu wengine wa jamii yako wana nini cha kusema kuhusu **umuhimu wa kupata watoto**
  I. Probe: Husband's vs. women's own family

c) Are **decisions** about having children talked about with **other family members**?
   Je?**Uamuzi** wa kupata watoto hujadiliwa na **watu wengine katika jamii yako?**
   I. Probe: **Who** in particular are these things discussed with?
       Dadisi: **Nani** haswa huhusika katika kuyajadili mambo haya?
d) What do other family members have to say about **when is a good time** to have another baby?
   Je? Watu wengine wa jamii yako wanasemaje kuhusu **wakati muafaka** wa kumpata mtoto mwingine?
e) Do other members of your family **help you with raising** your children?
   Je?Watu wengine wa jamii yako **hukusaidia kuwalea** watoto wako?
   I. Who? (Husband's vs. women's own family)
       Nani?
   II. Can you tell me exactly what kinds of help you get from these other family members?
       Unaweza kunieleza ni msaada gani haswa unaopata kutoka kwa watu hawa wengine wa jamii yako?
f) Do you think that the influence of extended family members over having children has **changed over time**? How?
   Je?Unafikiri ushawishi wa watu wengine wa jamii yako kuhusu kupata watoto umebadilika **kadri mda ulivyosonga?**Vipi?

4) Costs of raising children

Earlier we talked about the importance of having children and you told me....

Awali tumezungumzia umuhimu wa kupata watoto na ulinieleza.....

a) give brief summary of earlier discussion from the first opening question
   Toa maelezo mafupi kuhusu majadiliano kuanzia swali la ufunguzi
b) ask participants whether they have anything else they would like to say about the good things about having children
   Waulize washiriki iwapo wana jambo jingine la kusema kuhusu uzuri na ubaya wa kupata watoto

...... now I want us to talk about the difficulties of raising children

......sasa nataka tuzungumzie ugumu wa kuwalea watoto

c) What things are **the difficulties** of having a child in Korogocho/Viwandani?
   Je? **Ni ugumu gani uliopo** wa kuwapata watoto katika mtaa huu wa Korogocho/Viwandani?
d) What are **the costs** of having a child?
   Ni **gharama** zipi zilizopo kwa kupata mtoto?
e) How do people pay for these costs?
   Watu huzilipiaje gharama hizi?
   I. Probe: Where does the money come from?
       Dadisi: Pesa hizi hutoka wapi?
   II. Probe: What if there is not enough money, what happens then?

III. <u>Probe:</u> What happens if there are no other sources of money at all?

Dadisi:Je?itakuwaje iwapo hamna kabisa njia nyinginezo za kupata pesa?

IV. <u>Probe:</u> What does the man pay for?

Dadisi:Je?Mwanaume hugharamia nini?

V. <u>Probe:</u> What does the woman pay for?

Dadisi:Mwanamke hugharamia nini?

f) Are the costs of having a girl different to having a boy? How?

Je?Gharama ya kumpata mtoto msichana ni ya juu zaidi kuliko ile ya mtoto mvulana?Kivipi?

g) Are the costs of children something **people worry** about when deciding whether to have another baby?

Je? **Watu huhofia** mambo ya gharama ya kuwapata watoto wanapofanya uamuzi wa kupata mtoto mwingine?

h) Problems of having children now compared to **having children in the past**

Shida zilzopo sasa kwa kupata watoto ikilinganshwa na zile zilizokuwepo **nyakati za zamani**

i) If a woman experiences **health problems** because of having children is that a reason for her to **wait** for a while for another birth? **Stop** having any more children?

e.g. if she has had a difficult birth

Iwapo mwanamke atakumbwa na shida za **kiafya** anapojifungua,je? hiyo ni sababu ya kutosha ya kumshurutisha **kusubiri** kidogo kabla ya kupata mtoto mwingine?**Kuacha** kupata watoto zaidi? Kwa mfano iwapo atakuwa na ugumu wakati wa uzazi

5) Job opportunities

Now let's talk about women doing paid work

Sasa hebu tuzungumzie swala la wanawake kufanya ajira ya kulipwa

a) **Importance of paid work** for women in Korogocho/Viwandani

Umuhimu wa ajira ya kulipwa kwa wanawake wa Korogocho/Viwandani

b) How much paid work takes place **away from the home**

Je?Ni kiwango gani cha ajira ya kulipwa hufanyika kwingineko **mbali na nyumbani**

c) How do husbands/partners/other family members **feel about women working**

Je? Wanaume/wapenzi/na watu wengine wa jamii wana mtazamo upi kuhusu **wanawake walioajiriwa**

d) How might having paid work effect **having and raising** a child? Does having a child have an effect on women having paid work?

Je?Kuwa na ajira ya kulipwa huathiri vipi **kumpata na kumkuza** mtoto?

I. <u>Probe:</u> In particular the impact of paid work *away* from the home

Dadisi:Athari haswa za ajira ya kulipwa *mbali* na nyumbani

6) Attitudes to family planning/contraception

We have talked a lot about having children, now I would like us to talk about the things that women can do to control when or whether they have a child

Tumezungumzia kwa mapana na marefu kuhusu kupata watoto,sasa ningelipenda tuzungumzie mambo wanayoweza kufanya wanawake ili kudhibiti ni lini watapata mtoto na iwapo watapata mtoto

a) What do you **think about family planning**?
   Je?Una maoni gani kuhusu **upangaji wa uzazi?**
   I.   Probe: modern vs. traditional methods Traditional methods – periodic abstinence, withdrawal, abstinence
        Dadisi:Njia za kisasa dhidi ya zile za kitamaduni-kutoshiriki ngono kwa mida fulani fulani kutomimina mbegu,na kutoshiriki ngono kabisa
        Modern methods – pill, IUD, injections, diaphragm, condom, sterilization, implants
        Njia za kisasa-tembe,IUD,sindano,diaphragm,mipira ya kondomu,kufungwa uzazi,implants

   II. Probe: Long lasting vs short lasting methods
        Long-lasting – IUD, implants, injections
        Short-lasting – pill, condom
        Dadisi:Njia za kudumu mda mrefu dhidi ya zile zisizodumu mda mrefu
        NJia za kudumu mda mrefu-IUD,Implants(zinazowekwa mwilini) na sindano
        Njia za mda mfupi – tembe,mipira ya kondomu

b) Do people in this community **use contraception**?
   Je?Watu wa jamii hii hutumia njia za kupanga uzazi za kisasa(contraception)?

c) **Why** do they use contraception?
   Kwa nini wao huzitumia?

   I.   Probe: in order to leave some time between children? To stop having children altogether?
        Dadisi: Iwapo ni kwa sababu ya kuweka nafasi kutoka kwa mtoto hadi mwingine?Au kuacha kupata watoto kabisa?
   II. Probe: **When** do people start using contraception? How long after a birth?
        Dadisi: **Ni lini** watu huanza kutumia njia za upangaji uzazi? Mda gani baada ya kujifungua?

d) Why might a woman decide to **stop using contraception**?
    Kwa nini mwanamke aamue kuacha kutumia huduma za kupanga uzazi?

e) What do you think about the **amount of time a woman should leave after she has had a baby** and decides she wants another?
    Je?Una maoni gani kuhusu mda ambao mwanamke anastahili kusubiri baada ya kumpata mtoto na kuamua kwamba anataka kumpata mwingine?
    I.   Probe: ask the group what they think the good and bad things are about having one child quickly after another
            Dadisi: Kiulize kikundi maoni yao kuhusu uzuri na ubaya wa kumpata mtoto kwa haraka baada ya kumpata mwingine
    II. Probe: ask the group what they think the good and bad things are about having one child a long time after another

Dadisi: Kiulize kikundi maoni yao kuhusu uzuri na ubaya wa kusubiri mda mrefu kabla ya kumpata mtoto mwingine

f) **Who do women talk to** about family planning?
   Je?Wana wake huongea na nani kuhusu upangaji uzazi?

g) Do **couples** talk about family planning? If yes is it normally the man or the woman **who initiates** the discussion?
   Je?**wachumba** hulijadili swala la upangaji uzazi?Iwapo ndivyo,je? ni mwanaume au mwanamke **anayeyaanzisha** majadiliano?

h) How much do couples normally **agree or disagree** about using contraception?
   Je?Ni kwa kiwango gani ambacho wachumba **hukubaliana ama kutokubaliana** kuhusu matumizi ya njia za kisasa za kupanga uzazi?

   I.   Probe: is there much secret use?
        Dadisi: Je?Kuna utumiaji wa kisiri?

   II. Probe: do the men or the women have the most power in decisions about these things?
        Dadisi: Je?Ni wanaume au wanawake walio na ushawishi katika uamuzi wa mambo haya?

i) Do you think it is **easy or difficult** for people in this community to **get family planning**?
   Je?Unafikiri ni **vigumu au rahisi** kwa watu wa jamii hii **kupata huduma ya upangaji uzazi?**

   I.   Probe: physical/geographic accessibility, cost, community awareness, stigma, fear
        Dadisi:Mambo ya kimwili/au ya Kigiografia na kimawasiliano,gharama,kuelewa kwa jamii,unyanyapaa(stigma) na woga

7)   Ending questions:

a) Is there an ideal number of children for a woman to have in her family?
   Je?Ipo idadi ya watoto anaostahili kuwapata mwanamke katika jamii yake?

   I.   Probe: If yes, how many?
        Dadisi: Iwapo ipo,wangapi?

   II. Probe: Why?
        Dadisi: Kwa nini?

   III. Probe: Do you think that this ideal number is also the right number for you? Why?
        Dadisi: Unafikiria hii idadi inayostahili pia ni namba ambayo inafaa kwako?
        Kwa nini?

b) Do you think it is possible for you to say how many children you want to have in your life? Why?
   Je?Unafikiri inawezekana kwa mwanamke kusema ni watoto wangapi anaotaka kuwapata maishani mwake? Kwa nini?

c) For those of you who have told me that you want to have another child, do you think it is possible for you to say when you will want to have that child?

Appendix 5: Regression model 2 (birth intervals and duration-specific fertility by parity)

	MODEL 2							
	Ethiopia		Kenya		Tanzania		Zimbabwe	
	Coeff.	Stand. Error	Coeff.	Stand. Error	Coeff.	Stand. Error	Coeff.	Stand. Error
Mothers age at interval segment								
<15	0.04	0.08	0.04	0.06	-0.04	0.07	0.04	0.08
15-19	0.11	0.02	0.10	0.02	0.07	0.02	0.08	0.02
20-24	0.11	0.01	0.16	0.01	0.12	0.01	0.13	0.01
25-29	0.00	-	0.00	-	0.00	-	0.00	-
30-34	-0.15	0.01	-0.18	0.01	-0.17	0.01	-0.20	0.02
35-39	-0.43	0.02	-0.44	0.02	-0.49	0.02	-0.55	0.02
40-44	-0.92	0.03	-0.96	0.04	-0.99	0.03	-1.12	0.04
45-49	-1.77	0.10	-1.76	0.11	-1.85	0.09	-1.92	0.12
Parity								
1	0.00	-	0.00	-	0.00	-	0.00	-
2	-0.03	2.22	-1.95	1.62	-2.48	1.45	-1.10	1.22
3	-1.85	2.69	-0.18	1.82	-0.16	1.50	-1.05	1.42
4	4.45	2.87	-2.18	2.13	-0.10	1.68	-3.57	2.38
5	-3.95	4.55	3.01	2.45	2.15	1.75	-4.06	2.59
6	-2.72	5.04	4.92	2.82	-0.07	2.44	-2.13	3.12
7	1.98	6.41	6.02	3.42	4.57	2.28	-4.41	5.16
8	-4.64	8.46	1.47	5.27	1.85	3.22	-2.97	7.67
9	-8.75	9.58	4.47	6.18	3.55	4.60	1.57	9.39
10	-18.63	12.02	7.71	6.93	1.26	2.88	-8.44	10.27
Five year period of interval segment								
1960-64	-4.53	3.20	2.81	1.83	1.85	0.77	-1.52	2.81
1965-69	-3.35	2.38	2.19	1.46	1.58	0.62	-1.18	2.25
1970-74	-2.64	1.79	1.67	1.10	1.22	0.46	-0.85	1.68
1975-79	-1.72	1.19	1.18	0.73	0.86	0.31	-0.54	1.12
1980-84	-0.89	0.60	0.63	0.37	0.43	0.15	-0.12	0.56
1985-89	0.00	-	0.00	-	0.00	-	0.00	-
1990-94	0.92	0.60	-0.71	0.37	-0.38	0.15	0.09	0.56
1995-99	1.75	1.19	-1.29	0.73	-0.79	0.31	0.36	1.12
2000-04	2.54	1.79	-1.73	1.10	-1.13	0.46	0.77	1.68
2005-10	3.29	2.38	-2.23	1.46	-1.46	0.62	1.03	2.25
Interval segment (months)								
0-8	-11.77	5.02	0.63	1.08	0.63	1.08	-3.68	4.23
0-9	-2.45	1.80	1.84	0.74	1.84	0.74	0.61	1.40
18-23	-0.38	1.22	1.75	0.59	1.75	0.59	1.35	0.94
24-29	0.25	0.85	1.39	0.42	1.39	0.42	1.26	0.65
30-35	0.22	0.44	0.70	0.21	0.70	0.21	0.68	0.34
36-41	0.00	-	0.00	-	0.00	-	0.00	-
42-47	-0.55	0.46	-0.74	0.21	-0.74	0.21	-0.73	0.34
48-53	-1.11	0.93	-1.38	0.41	-1.38	0.41	-1.36	0.68
54-59	-1.75	1.41	-1.91	0.60	-1.91	0.60	-1.94	0.99
60-65	-2.37	1.89	-2.30	0.77	-2.30	0.77	-2.46	1.29
66-71	-2.93	2.37	-2.68	0.91	-2.68	0.91	-2.88	1.57
72-83	-3.76	3.13	-3.12	1.09	-3.12	1.09	-3.45	1.95
84-95	-4.50	4.24	-3.23	1.25	-3.23	1.25	-3.86	2.45
96-107	-4.87	5.53	-3.01	1.30	-3.01	1.30	-3.59	3.05
108-119	-5.00	7.10	-2.62	1.26	-2.62	1.26	-2.99	3.84
120-131	-4.41	9.01	-1.37	1.13	-1.37	1.13	-1.79	4.95
132-143	-4.06	11.30	-0.27	0.98	-0.27	0.98	-0.51	6.42
144-179	-1.63	17.13	3.02	1.17	3.02	1.17	3.60	10.53
180-239	8.50	34.21	13.95	4.54	13.95	4.54	17.83	23.45
240+	86.05	135.55	84.76	29.99	84.76	29.99	112.45	103.95

	MODEL 2							
	Ethiopia		Kenya		Tanzania		Zimbabwe	
	Coeff.	Stand. Error	Coeff.	Stand. Error	Coeff.	Stand. Error	Coeff.	Stand. Error
Ever-married at interval segment	-1.0E+00	3.3E-01	-1.5E-01	1.3E-01	-2.1E-01	1.3E-01	7.2E-01	1.2E-01
Interval segment by date of interval segment	9.5E-06	1.1E-05	3.2E-06	1.2E-05	-5.1E-06	9.0E-06	1.5E-05	7.4E-06
Interval segment squared by date of interval segment	-2.8E-08	4.4E-08	-1.5E-10	5.1E-08	6.7E-08	3.9E-08	-6.1E-08	2.2E-08
Log interval segment by date of interval segment	-8.3E-05	2.6E-04	3.5E-04	2.5E-04	7.2E-04	2.0E-04	3.9E-04	1.8E-04
Parity by date of interval segment								
1	-7.3E-03	5.0E-03	3.2E-03	3.1E-03	5.7E-04	1.4E-03	-4.9E-03	4.7E-03
2	-7.4E-03	5.0E-03	3.9E-03	3.1E-03	1.4E-03	1.4E-03	-4.3E-03	4.7E-03
3	-6.7E-03	5.1E-03	3.1E-03	3.1E-03	3.3E-04	1.4E-03	-4.7E-03	4.7E-03
4	-9.6E-03	5.1E-03	4.0E-03	3.2E-03	3.0E-04	1.4E-03	-3.2E-03	4.8E-03
5	-5.8E-03	5.3E-03	1.6E-03	3.2E-03	-5.2E-04	1.5E-03	-2.5E-03	4.8E-03
6	-6.5E-03	5.4E-03	1.1E-03	3.3E-03	6.6E-04	1.7E-03	-3.7E-03	4.9E-03
7	-8.7E-03	5.6E-03	4.0E-04	3.4E-03	-1.2E-03	1.6E-03	-2.9E-03	5.3E-03
8	-5.7E-03	6.1E-03	2.3E-03	3.9E-03	-1.5E-04	2.0E-03	-3.2E-03	6.0E-03
9	-3.6E-03	6.4E-03	9.8E-04	4.1E-03	-9.2E-04	2.5E-03	-4.5E-03	6.4E-03
10+	0.00	-	0.00	-	0.00	-	0.00	-
Never-married by date of interval segment	-5.8E-04	1.5E-04	-3.2E-04	6.2E-05	-2.9E-04	6.0E-05	1.8E-04	5.8E-05
Parity by interval segment								
1	4.0E-01	3.2E-01	-1.8E-01	2.3E-01	1.9E-01	1.1E-01	3.1E-01	2.7E-01
2	3.7E-01	3.2E-01	-2.1E-01	2.3E-01	1.5E-01	1.1E-01	3.0E-01	2.7E-01
3	3.1E-01	3.2E-01	-1.6E-01	2.3E-01	1.8E-01	1.1E-01	3.1E-01	2.7E-01
4	4.3E-01	3.2E-01	-1.8E-01	2.3E-01	1.7E-01	1.1E-01	3.2E-01	2.8E-01
5	2.3E-01	3.4E-01	-9.7E-02	2.3E-01	2.2E-01	1.1E-01	2.7E-01	2.8E-01
6	6.4E-02	3.4E-01	6.7E-03	2.4E-01	1.7E-01	1.2E-01	2.9E-01	2.8E-01
7	2.5E-01	3.6E-01	-3.0E-02	2.4E-01	2.8E-01	1.3E-01	2.8E-01	2.9E-01
8	1.4E-01	3.9E-01	-1.5E-01	2.6E-01	2.2E-01	1.2E-01	2.6E-01	3.1E-01
9	-2.0E-01	4.2E-01	-1.5E-01	2.7E-01	4.3E-01	1.7E-01	3.4E-01	3.5E-01
10	0.00	-	0.00	-	0.00	-	0.00	-
Parity by interval segment squared								
1	-1.5E-03	1.7E-03	1.1E-03	1.6E-03	-1.3E-03	4.9E-04	-1.6E-03	1.4E-03
2	-1.4E-03	1.7E-03	1.2E-03	1.6E-03	-1.1E-03	4.8E-04	-1.6E-03	1.4E-03
3	-1.0E-03	1.7E-03	8.6E-04	1.6E-03	-1.1E-03	4.8E-04	-1.6E-03	1.4E-03
4	-1.4E-03	1.7E-03	9.5E-04	1.6E-03	-1.1E-03	4.8E-04	-1.8E-03	1.4E-03
5	-8.1E-04	1.8E-03	7.0E-04	1.6E-03	-1.2E-03	4.8E-04	-1.5E-03	1.4E-03
6	7.6E-04	1.8E-03	-6.0E-05	1.6E-03	-1.0E-03	4.9E-04	-1.4E-03	1.4E-03
7	-5.5E-04	1.9E-03	2.8E-04	1.6E-03	-1.4E-03	5.9E-04	-1.6E-03	1.5E-03
8	3.2E-04	2.2E-03	9.9E-04	1.7E-03	-1.1E-03	5.0E-04	-1.1E-03	1.5E-03
9	1.7E-03	2.4E-03	1.1E-03	1.7E-03	-2.4E-03	9.4E-04	-1.6E-03	1.7E-03
10	0.00	-	0.00	-	0.00	-	0.00	-

	MODEL 2							
	Ethiopia		Kenya		Tanzania		Zimbabwe	
	Coeff.	Stand. Error	Coeff.	Stand. Error	Coeff.	Stand. Error	Coeff.	Standard Error
Parity by interval segment and date of interval segment								
1	0.00	-	0.00	-	0.00	-	0.00	-
2	1.4E-05	2.1E-05	7.7E-06	1.5E-05	1.7E-05	1.2E-05	7.3E-06	1.0E-05
3	3.5E-05	2.7E-05	-1.3E-05	1.7E-05	1.9E-06	1.2E-05	-6.0E-06	1.2E-05
4	-2.1E-05	2.8E-05	-3.5E-06	2.0E-05	3.3E-06	1.3E-05	-5.1E-07	2.4E-05
5	6.9E-05	5.5E-05	-4.6E-05	2.4E-05	-1.4E-05	1.5E-05	2.7E-05	2.0E-05
6	1.3E-04	6.1E-05	-8.5E-05	3.1E-05	9.9E-06	2.0E-05	7.8E-06	2.6E-05
7	4.6E-05	7.5E-05	-7.3E-05	3.2E-05	-4.3E-05	2.9E-05	2.7E-06	5.2E-05
8	8.9E-05	1.0E-04	-3.0E-05	6.0E-05	-1.3E-05	2.9E-05	1.4E-05	7.1E-05
9	2.4E-04	1.2E-04	-3.6E-05	6.2E-05	-1.1E-04	5.7E-05	4.2E-06	1.0E-04
10	1.3E-04	1.3E-04	-9.3E-05	9.5E-05	6.5E-05	5.1E-05	1.4E-04	1.2E-04
Parity by interval squared and date of interval segment								
1	0.00	-	0.00	-	0.00	-	0.00	-
2	-7.9E-08	9.5E-08	-7.2E-09	5.9E-08	-1.1E-07	4.6E-08	-1.5E-08	2.6E-08
3	-2.2E-07	1.3E-07	1.2E-07	7.5E-08	-8.1E-08	4.6E-08	3.0E-08	3.7E-08
4	-3.4E-08	1.3E-07	8.3E-08	9.6E-08	-8.7E-08	4.5E-08	7.8E-08	1.1E-07
5	-3.3E-07	3.2E-07	2.1E-07	1.3E-07	-5.2E-08	4.8E-08	-1.1E-07	6.0E-08
6	-9.7E-07	3.5E-07	5.1E-07	1.7E-07	-1.4E-07	6.0E-08	-8.3E-08	9.0E-08
7	-3.8E-07	4.4E-07	3.8E-07	1.6E-07	4.7E-08	1.6E-07	2.9E-08	2.5E-07
8	-7.4E-07	6.1E-07	9.3E-08	3.2E-07	-1.0E-07	9.4E-08	-2.1E-07	2.8E-07
9	-1.4E-06	7.4E-07	9.2E-08	3.0E-07	5.1E-07	3.5E-07	-2.3E-07	4.7E-07
10	-4.9E-07	6.9E-07	5.1E-07	6.5E-07	-5.0E-07	2.3E-07	-7.6E-07	6.3E-07
Parity by log of interval and date of interval segment								
1	0.00	-	0.00	-	0.00	-	0.00	-
2	-9.1E-05	4.6E-04	-3.4E-04	3.3E-04	-4.1E-04	2.9E-04	-2.7E-04	2.6E-04
3	-4.6E-04	5.6E-04	1.7E-05	3.7E-04	6.1E-05	3.0E-04	-3.5E-05	3.0E-04
4	9.1E-04	5.9E-04	-2.7E-04	4.4E-04	1.0E-04	3.4E-04	-5.5E-04	5.1E-04
5	-9.9E-04	9.8E-04	8.5E-04	5.0E-04	5.1E-04	3.6E-04	-9.3E-04	5.3E-04
6	-1.2E-03	1.1E-03	1.2E-03	6.0E-04	-8.5E-06	5.0E-04	-3.6E-04	6.4E-04
7	1.3E-04	1.3E-03	1.4E-03	7.0E-04	9.9E-04	5.2E-04	-5.8E-04	1.1E-03
8	-1.1E-03	1.8E-03	5.2E-04	1.2E-03	5.2E-04	6.9E-04	-3.6E-04	1.7E-03
9	-2.8E-03	2.0E-03	1.1E-03	1.3E-03	1.5E-03	1.0E-03	6.4E-05	2.1E-03
10	-3.3E-03	2.4E-03	1.7E-03	1.5E-03	-2.9E-04	7.7E-04	-2.2E-03	2.3E-03
Intercept	32.50	22.57	-20.85	13.28	-11.05	5.44	9.02	20.24

Appendix 6:   Regression model 3 (birth intervals and duration-specific fertility by residence)

	MODEL 3							
	Ethiopia		Kenya		Tanzania		Zimbabwe	
	Coeff.	Stand. Error	Coeff.	Stand. Error	Coeff.	Stand. Error	Coeff.	Stand. Error
Mothers age at interval segment								
<15	0.00	0.08	-0.03	0.06	-0.06	0.07	-0.01	0.08
15-19	0.07	0.02	0.03	0.02	0.05	0.02	0.02	0.02
20-24	0.08	0.01	0.12	0.01	0.10	0.01	0.10	0.01
25-29	0.00	-	0.00	-	0.00	-	0.00	-
30-34	-0.13	0.01	-0.17	0.01	-0.15	0.01	-0.16	0.02
35-39	-0.43	0.02	-0.46	0.02	-0.48	0.02	-0.51	0.02
40-44	-1.00	0.04	-1.07	0.04	-1.02	0.03	-1.18	0.04
45-49	-2.05	0.10	-2.04	0.11	-1.99	0.09	-2.18	0.12
Parity								
1	0.00	-	0.00	-	0.00	-	0.00	-
2	0.55	0.37	0.34	0.33	0.52	0.22	0.02	0.17
3	0.88	0.43	-0.22	0.33	0.25	0.25	0.01	0.20
4	1.02	0.59	-0.44	0.40	-0.07	0.37	-0.02	0.28
5	-0.47	0.69	-1.01	0.54	0.08	0.39	-0.14	0.42
6	1.51	0.85	-1.35	0.66	-0.69	0.56	0.13	0.70
7	-1.09	1.31	1.05	0.93	1.13	0.63	0.72	1.08
8	0.79	1.70	-1.34	1.04	-0.94	1.10	-4.97	1.43
9	-6.18	2.13	-6.85	2.26	-1.62	1.39	1.37	2.03
10	-2.00	2.68	1.21	2.73	0.32	1.60	1.94	2.74
Five year period of interval segment								
1960-64	-0.52	1.36	1.39	0.78	1.64	0.46	1.36	0.80
1965-69	-0.15	0.60	1.04	0.63	1.42	0.37	1.11	0.64
1970-74	-0.23	0.44	0.80	0.47	1.10	0.28	0.87	0.48
1975-79	-0.12	0.29	0.60	0.31	0.77	0.18	0.61	0.32
1980-84	-0.09	0.15	0.34	0.16	0.38	0.09	0.44	0.16
1985-89	0.00	-	0.00	-	0.00	-	0.00	-
1990-94	0.12	0.15	-0.42	0.16	-0.34	0.09	-0.49	0.16
1995-99	0.16	0.29	-0.70	0.31	-0.71	0.18	-0.81	0.32
2000-04	0.16	0.44	-0.84	0.47	-1.00	0.28	-0.99	0.48
2005-10	0.13	0.59	-1.06	0.63	-1.29	0.37	-1.32	0.64
Interval segment (months)								
0-8	-3.82	0.42	-2.57	0.32	-1.55	0.26	-3.46	0.29
0-9	-0.98	0.13	-0.58	0.10	-0.18	0.09	-0.82	0.10
18-23	-0.31	0.08	0.11	0.07	0.31	0.05	0.06	0.05
24-29	-0.01	0.05	0.36	0.05	0.46	0.03	0.35	0.04
30-35	-0.01	0.03	0.15	0.03	0.26	0.02	0.22	0.02
36-41	0.00	-	0.00	-	0.00	-	0.00	-
42-47	-0.20	0.03	-0.25	0.03	-0.35	0.03	-0.30	0.03
48-53	-0.36	0.06	-0.45	0.05	-0.67	0.04	-0.54	0.04
54-59	-0.57	0.09	-0.66	0.07	-0.94	0.06	-0.82	0.06
60-65	-0.77	0.11	-0.88	0.09	-1.14	0.08	-1.09	0.08
66-71	-0.92	0.14	-1.04	0.11	-1.41	0.09	-1.36	0.11
72-83	-1.21	0.18	-1.51	0.13	-1.83	0.12	-1.86	0.14
84-95	-1.40	0.24	-1.88	0.17	-2.17	0.16	-2.51	0.18
96-107	-1.45	0.31	-2.38	0.22	-2.49	0.20	-2.87	0.23
108-119	-1.53	0.40	-2.81	0.29	-2.96	0.24	-3.29	0.27
120-131	-1.20	0.50	-3.27	0.39	-2.88	0.27	-3.53	0.32
132-143	-1.42	0.65	-4.14	0.52	-3.27	0.31	-4.10	0.38
144-179	-1.10	0.99	-5.50	0.87	-3.91	0.38	-4.94	0.47
180-239	0.57	2.03	-9.23	2.01	-4.74	0.57	-5.74	0.75
240+	13.09	8.42	-23.92	9.40	-4.42	2.06	-3.53	1.45

	MODEL 3							
	Ethiopia		Kenya		Tanzania		Zimbabwe	
	Coeff.	Stand. Error	Coeff.	Stand. Error	Coeff.	Stand. Error	Coeff.	Stand. Error
Ever-married at interval segment	-0.68	0.33	-0.14	0.12	-0.11	0.13	0.69	0.12
Rural vs urban residence	-2.23	1.98	-0.17	1.48	3.03	1.48	-2.94	1.00
Parity by date of interval segment								
1	-9.0E-04	1.1E-03	7.1E-04	1.3E-03	-3.7E-05	7.2E-04	8.2E-04	1.3E-03
2	-1.2E-03	1.1E-03	4.5E-04	1.3E-03	-3.1E-04	7.2E-04	7.0E-04	1.3E-03
3	-1.3E-03	1.1E-03	6.9E-04	1.3E-03	-2.1E-04	7.2E-04	7.0E-04	1.3E-03
4	-1.3E-03	1.2E-03	8.0E-04	1.3E-03	-3.9E-05	7.3E-04	7.1E-04	1.3E-03
5	-6.3E-04	1.2E-03	1.1E-03	1.3E-03	-9.1E-05	7.3E-04	7.7E-04	1.3E-03
6	-1.5E-03	1.2E-03	1.3E-03	1.3E-03	3.1E-04	7.6E-04	6.3E-04	1.3E-03
7	-3.8E-04	1.3E-03	2.4E-04	1.3E-03	-4.9E-04	7.7E-04	5.3E-04	1.4E-03
8	-1.2E-03	1.4E-03	1.3E-03	1.3E-03	4.4E-04	8.6E-04	3.1E-03	1.5E-03
9	1.8E-03	1.4E-03	3.7E-03	1.6E-03	8.2E-04	9.5E-04	2.2E-04	1.6E-03
10+	0.00	-	0.00	-	0.00	-	0.00	-
Interval segment by date of interval segment	4.3E-05	1.9E-05	3.6E-05	1.1E-05	3.8E-05	1.4E-05	1.7E-05	6.7E-06
Interval segment squared by date	-1.5E-07	8.2E-08	-1.0E-07	3.7E-08	-7.8E-08	6.7E-08	-7.1E-08	2.0E-08
Log interval segment by date of interval segment	-3.4E-04	3.9E-04	-1.1E-04	2.7E-04	-1.7E-04	2.9E-04	2.8E-04	1.7E-04
Never-married by date of interval segment	-3.9E-04	1.5E-04	-3.0E-04	5.9E-05	-2.3E-04	6.0E-05	1.7E-04	5.8E-05
Urban residence by interval segment	-5.7E-02	4.5E-02	-9.9E-02	3.1E-02	-8.3E-02	3.3E-02	3.3E-02	1.6E-02
Urban residence by interval segment squared	1.1E-04	2.0E-04	4.2E-04	1.4E-04	1.2E-04	1.6E-04	-4.5E-05	3.7E-05
Urban residence by log of interval segment	1.9E-01	9.4E-01	9.6E-01	6.6E-01	2.0E+00	6.8E-01	- 1.1E+00	4.3E-01
Urban residence by date of interval segment	-4.0E-04	9.1E-04	3.1E-04	7.0E-04	1.5E-03	6.8E-04	-7.9E-04	4.9E-04
Rural residence by parity								
1	0.00	-	0.00	-	0.00	-	0.00	-
2	-4.2E-01	3.9E-01	5.0E-02	3.5E-01	-4.0E-01	2.4E-01	2.1E-01	2.0E-01
3	-5.8E-01	4.6E-01	8.4E-01	3.4E-01	-1.2E-01	2.7E-01	1.7E-01	2.3E-01
4	-8.6E-01	6.2E-01	6.5E-01	4.3E-01	7.9E-02	3.9E-01	2.5E-01	3.1E-01
5	9.6E-01	7.2E-01	1.2E+00	5.6E-01	-7.9E-02	4.2E-01	4.3E-01	4.5E-01
6	-7.4E-01	8.9E-01	1.7E+00	6.9E-01	6.7E-01	5.9E-01	-1.3E-01	7.4E-01
7	1.8E+00	1.4E+00	-1.1E+00	9.6E-01	- 1.3E+00	6.7E-01	-4.9E-01	1.1E+00
8	2.2E-01	1.8E+00	1.8E+00	1.1E+00	4.5E-01	1.1E+00	4.8E+00	1.5E+00
9	6.8E+00	2.2E+00	7.1E+00	2.3E+00	1.0E+00	1.5E+00	- 1.5E+00	2.1E+00
10	3.5E+00	2.8E+00	-1.0E+00	2.8E+00	7.0E-01	1.7E+00	2.9E+00	2.9E+00
Rural residence by interval segment and date of interval segment	-3.1E-05	2.1E-05	-4.9E-05	1.4E-05	-4.6E-05	1.5E-05	3.2E-06	7.9E-06
Rural residence by interval segment squared and date of interval segment	5.2E-08	9.1E-08	1.9E-07	5.9E-08	7.9E-08	6.8E-08	6.9E-09	2.1E-08
Rural residence by log of interval segment and date of interval segment	3.8E-04	4.3E-04	6.5E-04	3.1E-04	1.1E-03	3.1E-04	-1.9E-04	2.1E-04
Rural residence by log of interval segment and date of interval segment	3.8E-04	4.3E-04	6.5E-04	3.1E-04	1.1E-03	3.1E-04	-1.9E-04	2.1E-04

	MODEL 3							
	Ethiopia		**Kenya**		**Tanzania**		**Zimbabwe**	
	Coeff.	Stand. Error	Coeff.	Stand. Error	Coeff.	Stand. Error	Coeff.	Stand. Error
Rural residence by log of interval segment and date of interval segment	3.8E-04	4.3E-04	6.5E-04	3.1E-04	1.1E-03	3.1E-04	-1.9E-04	2.1E-04
Rural residence by parity and date of interval segment								
1	0.00	-	0.00	-	0.00	-	0.00	-
2	1.9E-04	1.8E-04	8.8E-06	1.7E-04	1.9E-04	1.1E-04	-3.4E-05	9.0E-05
3	2.4E-04	2.0E-04	-3.4E-04	1.6E-04	7.9E-05	1.3E-04	-1.3E-05	1.1E-04
4	3.4E-04	2.7E-04	-2.7E-04	2.0E-04	-2.1E-05	1.8E-04	-2.8E-05	1.4E-04
5	-4.8E-04	3.2E-04	-5.2E-04	2.6E-04	5.3E-05	1.9E-04	-8.3E-05	2.1E-04
6	2.2E-04	3.9E-04	-8.1E-04	3.2E-04	-3.2E-04	2.7E-04	2.2E-04	3.5E-04
7	-8.0E-04	5.9E-04	4.6E-04	4.5E-04	5.7E-04	3.1E-04	2.4E-04	5.3E-04
8	-1.1E-04	7.7E-04	-8.4E-04	5.2E-04	-2.1E-04	5.1E-04	-2.1E-03	7.0E-04
9	-3.0E-03	9.3E-04	-3.2E-03	1.1E-03	-5.4E-04	6.7E-04	7.7E-04	1.0E-03
10	-1.6E-03	1.2E-03	5.7E-04	1.3E-03	-5.0E-04	7.4E-04	1.3E-03	1.4E-03
Intercept	0.90	3.52	-7.39	3.29	-12.04	2.33	-4.65	3.13

Appendix 7: Regression model 4 (birth intervals and duration-specific fertility by contraceptive use)

	Ethiopia		Kenya		Tanzania		Zimbabwe	
MODEL 4	Coeff.	Stand. Error	Coeff.	Stand. Error	Coeff.	Stand. Error	Coeff.	Stand. Error
Mothers age at interval segment								
<15	0.00	0.08	-0.10	0.06	-0.10	0.07	-0.08	0.08
15-19	0.06	0.02	-0.04	0.02	0.02	0.02	-0.01	0.02
20-24	0.08	0.01	0.08	0.01	0.08	0.01	0.09	0.01
25-29	0.00	-	0.00	-	0.00	-	0.00	-
30-34	-0.13	0.01	-0.15	0.01	-0.15	0.01	-0.17	0.02
35-39	-0.43	0.02	-0.44	0.02	-0.48	0.02	-0.54	0.02
40-44	-1.01	0.04	-1.05	0.04	-1.03	0.03	-1.24	0.04
45-49	-2.06	0.10	-2.02	0.11	-2.02	0.09	-2.27	0.12
Parity								
1	0.00	-	0.00	-	0.00	-	0.00	-
2	0.14	0.15	0.28	0.12	0.15	0.11	0.03	0.16
3	0.37	0.16	0.53	0.13	0.06	0.12	0.13	0.18
4	0.21	0.19	0.27	0.15	-0.12	0.15	0.20	0.23
5	0.50	0.23	0.27	0.18	-0.10	0.17	0.23	0.30
6	1.05	0.28	0.66	0.22	-0.05	0.21	-0.52	0.40
7	0.82	0.38	0.51	0.27	0.08	0.25	0.55	0.50
8	1.13	0.50	0.83	0.36	-0.72	0.34	-2.46	0.92
9	0.65	0.73	1.20	0.57	-0.29	0.52	0.40	0.93
10	2.30	0.89	0.76	0.64	0.76	0.49	-0.33	1.07
Five year period of interval segment								
1960-64	0.88	1.21	1.23	0.26	1.90	0.22	-0.12	0.42
1965-69	1.00	0.28	0.88	0.21	1.60	0.17	-0.11	0.33
1970-74	0.62	0.20	0.66	0.16	1.23	0.13	-0.07	0.25
1975-79	0.44	0.13	0.48	0.11	0.86	0.09	-0.03	0.17
1980-84	0.19	0.07	0.26	0.05	0.42	0.05	0.11	0.08
1985-89	0.00	-	0.00	-	0.00	-	0.00	-
1990-94	-0.15	0.07	-0.34	0.05	-0.37	0.04	-0.18	0.08
1995-99	-0.37	0.13	-0.57	0.11	-0.77	0.09	-0.18	0.17
2000-04	-0.63	0.20	-0.66	0.16	-1.11	0.13	-0.06	0.25
2005-10	-0.90	0.26	-0.81	0.21	-1.46	0.17	-0.08	0.33
Interval segment (months)								
0-8	-3.34	0.39	-2.66	0.30	-1.63	0.26	-4.22	0.45
0-9	-0.87	0.13	-0.80	0.10	-0.34	0.09	-1.03	0.15
18-23	-0.29	0.08	-0.10	0.06	0.18	0.05	0.01	0.08
24-29	-0.01	0.05	0.21	0.04	0.37	0.04	0.36	0.05
30-35	-0.02	0.03	0.07	0.03	0.21	0.02	0.23	0.03
36-41	0.00	-	0.00	-	0.00	-	0.00	-
42-47	-0.19	0.03	-0.17	0.03	-0.30	0.03	-0.32	0.03
48-53	-0.33	0.06	-0.28	0.05	-0.59	0.04	-0.61	0.06
54-59	-0.53	0.08	-0.39	0.07	-0.81	0.06	-0.92	0.09
60-65	-0.71	0.11	-0.52	0.09	-0.97	0.08	-1.23	0.12
66-71	-0.85	0.14	-0.58	0.11	-1.20	0.10	-1.54	0.16
72-83	-1.12	0.17	-0.88	0.14	-1.56	0.12	-2.08	0.21
84-95	-1.28	0.23	-1.01	0.19	-1.82	0.16	-2.78	0.28
96-107	-1.31	0.29	-1.24	0.23	-2.07	0.19	-3.18	0.35
108-119	-1.38	0.36	-1.36	0.29	-2.48	0.23	-3.62	0.42
120-131	-1.05	0.45	-1.49	0.36	-2.33	0.27	-3.85	0.48
132-143	-1.29	0.58	-1.99	0.43	-2.69	0.31	-4.39	0.57
144-179	-1.04	0.88	-2.52	0.62	-3.28	0.40	-5.17	0.67
180-239	0.32	1.82	-4.24	1.25	-4.29	0.69	-5.73	0.88
240+	10.26	7.29	-9.64	5.49	-6.91	3.38	-2.67	0.79

	MODEL 4							
	Ethiopia		Kenya		Tanzania		Zimbabwe	
	Coeff.	Stand. Error	Coeff.	Stand. Error	Coeff.	Stand. Error	Coeff.	Stand. Error
Ever-married at interval segment	-0.713	0.334	-0.249	0.125	-0.122	0.129	0.585	0.122
Rural vs urban residence	-1.108	0.173	-0.555	0.125	-0.969	0.100	-0.036	0.079
Ever-users of contraception by five-year period of interval segment	6.341	3.277	3.971	1.574	-4.731	2.240	3.014	1.158
Parity by date of interval segment								
1	1.0E-03	3.8E-04	4.5E-04	2.9E-04	3.5E-04	2.2E-04	-1.9E-04	4.9E-04
2	9.6E-04	3.8E-04	2.6E-04	2.9E-04	2.5E-04	2.2E-04	-2.4E-04	5.0E-04
3	8.8E-04	3.8E-04	1.3E-04	2.9E-04	2.9E-04	2.2E-04	-3.0E-04	5.0E-04
4	9.4E-04	3.8E-04	2.4E-04	3.0E-04	3.9E-04	2.2E-04	-3.0E-04	5.0E-04
5	8.2E-04	3.8E-04	2.7E-04	3.0E-04	4.0E-04	2.3E-04	-2.9E-04	5.1E-04
6	5.8E-04	3.9E-04	7.5E-05	3.0E-04	3.9E-04	2.3E-04	8.4E-05	5.3E-04
7	7.0E-04	4.0E-04	1.6E-04	3.1E-04	3.4E-04	2.4E-04	-3.6E-04	5.4E-04
8	5.6E-04	4.2E-04	-5.3E-06	3.3E-04	7.0E-04	2.6E-04	1.0E-03	6.5E-04
9	7.2E-04	4.8E-04	-1.7E-04	3.9E-04	5.2E-04	3.1E-04	-2.6E-04	6.5E-04
10+	0.00	-	0.00	-	0.00	-	0.00	-
Interval segment by date of interval segment	3.3E-06	9.1E-06	-2.2E-05	6.8E-06	-1.7E-05	5.2E-06	2.8E-05	7.4E-06
Interval segment squared by date of interval segment	-6.6E-08	4.4E-08	5.8E-08	3.0E-08	3.2E-08	1.9E-08	-7.7E-08	1.7E-08
Log of interval segment by date of interval segment	2.4E-04	1.9E-04	6.6E-04	1.5E-04	9.9E-04	1.2E-04	-3.4E-04	2.0E-04
Never-married by date of interval segment	-4.1E-04	1.5E-04	-3.4E-04	6.0E-05	-2.3E-04	5.9E-05	1.2E-04	5.7E-05
Urban residence by date of interval segment	-6.3E-04	7.7E-05	-3.9E-04	6.0E-05	-5.7E-04	4.6E-05	-1.9E-04	3.7E-05
Ever-users of contraception by interval segment	-2.8E-02	5.7E-02	-3.8E-02	2.9E-02	-5.5E-02	5.4E-02	5.5E-02	1.8E-02
Ever-users of contraception by interval segment squared	1.4E-04	2.1E-04	1.3E-04	1.2E-04	-1.7E-04	2.9E-04	-1.2E-04	5.0E-05
Ever-users of contraception by log of interval segment	-1.676	1.398	-0.777	0.680	1.903	1.047	-1.228	0.486
Ever-users of contraception by five-year period at start of interval segment	-2.4E-03	1.4E-03	-1.8E-03	7.2E-04	2.0E-03	1.0E-03	-2.0E-03	5.9E-04
Ever users of contraception by parity								
1	0.00	-	0.00	-	0.00	-	0.00	-
2	0.80	0.68	-0.02	0.27	0.51	0.35	0.12	0.19
3	-0.17	0.69	0.05	0.28	0.40	0.35	-0.02	0.21
4	1.14	0.83	-0.46	0.32	0.37	0.40	-0.03	0.26
5	-0.72	0.91	-0.52	0.39	0.37	0.45	0.05	0.35
6	-1.49	1.14	-0.54	0.45	-0.14	0.56	0.81	0.47
7	-3.76	1.42	-0.68	0.58	0.03	0.73	-0.22	0.59
8	-2.39	1.98	-0.57	0.78	1.09	0.85	2.75	1.02
9	-5.48	2.98	-2.84	1.12	-1.09	1.19	-0.45	1.23
10	-7.79	3.37	-0.56	1.36	1.67	0.99	-0.48	1.58

	MODEL 4							
	Ethiopia		Kenya		Tanzania		Zimbabwe	
	Coeff.	Stand. Error	Coeff.	Stand. Error	Coeff.	Stand. Error	Coeff.	Stand. Error
Ever-users of contraception by interval segment and date of interval segment	2.0E-05	2.5E-05	2.7E-05	1.3E-05	4.0E-05	2.4E-05	-1.4E-05	9.2E-06
Ever-users of contraception by interval segment squared and date of interval segment	-7.3E-08	9.5E-08	-7.3E-08	5.3E-08	1.6E-08	1.3E-07	1.2E-08	2.6E-08
Ever-users of contraception by log of interval segment and date of interval segment	4.9E-04	6.1E-04	2.0E-04	3.1E-04	-9.8E-04	4.6E-04	6.1E-04	2.4E-04
Ever users of contraception by parity and date of interval segment								
1	0.00	-	0.00	-	0.00	-	0.00	-
2	-3.2E-04	2.9E-04	-1.2E-05	1.3E-04	-2.0E-04	1.5E-04	-9.0E-05	9.3E-05
3	8.1E-05	2.9E-04	-1.8E-05	1.3E-04	-1.7E-04	1.6E-04	-8.0E-06	1.0E-04
4	-4.4E-04	3.5E-04	1.9E-04	1.5E-04	-1.7E-04	1.8E-04	-1.7E-05	1.3E-04
5	3.2E-04	3.8E-04	2.1E-04	1.8E-04	-1.7E-04	2.0E-04	-4.9E-05	1.7E-04
6	6.7E-04	4.7E-04	2.5E-04	2.1E-04	8.4E-05	2.5E-04	-4.0E-04	2.2E-04
7	1.5E-03	5.9E-04	3.4E-04	2.7E-04	2.4E-05	3.2E-04	6.9E-05	2.8E-04
8	1.0E-03	8.1E-04	2.9E-04	3.6E-04	-4.3E-04	3.7E-04	-1.2E-03	4.8E-04
9	2.3E-03	1.2E-03	1.3E-03	5.2E-04	5.7E-04	5.3E-04	1.8E-04	5.7E-04
10	3.3E-03	1.4E-03	3.6E-04	6.2E-04	-6.2E-04	4.4E-04	2.4E-04	7.4E-04
Intercept	-5.20	1.22	-6.39	0.95	-8.85	0.78	-2.49	1.47

Appendix 8: Regression model 5 (birth intervals and duration-specific fertility by education)

	MODEL 5							
	Ethiopia		Kenya		Tanzania		Zimbabwe	
	Coeff.	Stand. Error	Coeff.	Stand. Error	Coeff.	Stand. Error	Coeff.	Stand. Error
Ever-married at interval segment	-0.666	0.329	-0.068	0.126	-0.069	0.131	0.635	0.117
Rural vs urban residence	-1.177	0.180	-0.374	0.128	-0.909	0.100	0.005	0.081
Education								
None	0.00	-	0.00	-	0.00	-	0.00	-
Primary	4.910	2.217	-2.493	1.415	-1.815	1.163	-2.701	1.779
Secondary +	7.754	3.639	-1.891	1.965	-1.755	2.232	1.341	1.709
Parity by date of interval segment								
1	7.2E-04	3.9E-04	5.1E-04	3.7E-04	6.0E-04	2.5E-04	1.5E-04	6.0E-04
2	6.3E-04	3.9E-04	3.8E-04	3.8E-04	4.7E-04	2.5E-04	-1.7E-05	6.0E-04
3	5.7E-04	3.9E-04	1.8E-04	3.8E-04	5.4E-04	2.5E-04	-1.0E-04	6.0E-04
4	5.7E-04	3.9E-04	3.9E-04	3.8E-04	6.2E-04	2.5E-04	-1.7E-04	6.1E-04
5	5.1E-04	3.9E-04	3.1E-04	3.8E-04	7.0E-04	2.6E-04	-8.7E-05	6.1E-04
6	2.7E-04	4.0E-04	6.9E-05	3.9E-04	5.3E-04	2.7E-04	-2.3E-04	6.3E-04
7	3.8E-04	4.1E-04	2.4E-04	4.1E-04	5.4E-04	2.8E-04	-1.0E-04	6.5E-04
8	2.4E-04	4.3E-04	-1.3E-04	4.2E-04	8.7E-04	3.0E-04	5.4E-04	7.1E-04
9	5.3E-04	4.8E-04	-2.5E-04	4.8E-04	9.9E-04	3.4E-04	-5.3E-04	8.3E-04
10	0.00	-	0.00	-	0.00	-	0.00	-
Interval segment by date of interval segment	1.2E-05	1.2E-05	-2.9E-05	1.4E-05	-8.1E-06	6.1E-06	3.0E-05	1.2E-05
Interval segment squared by date of interval segment	-9.8E-08	6.0E-08	1.1E-07	7.3E-08	-3.1E-10	1.8E-08	-1.1E-07	3.2E-08
Log of interval segment by date of interval segment	3.5E-05	2.2E-04	6.6E-04	2.5E-04	8.6E-04	1.6E-04	2.1E-04	3.3E-04
Never-married by date of interval segment	-3.9E-04	1.5E-04	-2.7E-04	6.0E-05	-2.1E-04	6.0E-05	1.5E-04	5.4E-05
Urban residence by date of interval segment	-6.8E-04	8.0E-05	-3.3E-04	6.1E-05	-5.6E-04	4.6E-05	-1.6E-04	3.7E-05
Education by interval segment								
None	0.156	0.085	0.198	0.045	0.053	0.070	-0.116	0.026
Primary	0.125	0.089	0.103	0.041	0.046	0.073	-0.133	0.019
Secondary +	0.00	-	0.00	-	0.00	-	0.00	-
Education by interval segment squared								
None	-8.7E-04	3.7E-04	-8.5E-04	2.2E-04	6.1E-06	3.9E-04	3.6E-04	7.8E-05
Primary	-8.4E-04	3.7E-04	-5.8E-04	1.9E-04	-1.2E-04	4.1E-04	3.7E-04	6.9E-05
Secondary +	0.00	-	0.00	-	0.00	-	0.00	-
Education by log of interval segment								
None	0.81	1.71	-2.56	0.91	-1.30	1.15	1.21	0.71
Primary	-0.30	1.85	-0.78	0.87	-0.56	1.19	2.40	0.46
Secondary +	0.00	-	0.00	-	0.00	-	0.00	-

	MODEL 5							
	Ethiopia		Kenya		Tanzania		Zimbabwe	
	Coeff.	Stand.	Coeff.	Stand.	Coeff.	Stand.	Coeff.	Stand.
Education by parity								
Primary 1								
Primary 2	-0.32	0.47	0.28	0.23	0.05	0.20	-0.18	0.34
Primary 3	0.57	0.53	-0.02	0.24	0.02	0.22	-0.46	0.35
Primary 4	0.86	0.67	0.15	0.28	0.10	0.27	-0.48	0.39
Primary 5	0.89	0.75	-0.45	0.32	0.40	0.30	-0.28	0.46
Primary 6	0.24	1.03	-0.75	0.39	-0.41	0.37	-1.09	0.58
Primary 7	-1.81	1.50	-0.40	0.49	-0.23	0.46	-0.26	0.68
Primary 8	0.94	1.94	-1.30	0.66	0.17	0.61	0.57	1.02
Primary 9	-3.63	3.06	-2.37	0.98	0.33	0.97	-1.55	1.46
Primary 10	-2.07	2.95	-0.74	1.11	-0.34	0.85	-1.54	1.68
Secondary 1	0.00	-	0.00	-	0.00	-	0.00	-
secondary 2	1.43	0.74	0.50	0.37	-0.32	0.52	-0.34	0.34
Secondary 3	0.47	0.91	-0.63	0.41	0.11	0.58	-0.68	0.37
Secondary 4	-3.31	1.50	-0.38	0.55	-0.74	0.76	-0.71	0.41
Secondary 5	-1.86	1.75	-0.60	0.72	0.62	1.00	-0.37	0.56
Secondary 6	0.07	2.66	-1.92	0.94	-1.62	1.45	-1.08	0.70
Secondary 7	-3.72	4.44	-3.13	1.33	0.81	1.14	-1.10	1.16
Secondary 8	-1.96	5.36	0.00	2.27	0.24	1.94	-0.47	1.17
Secondary 9	9.23	13.40	-3.84	3.08	2.91	1.43	-3.15	3.06
Secondary 10	-0.15	8.14	1.33	3.95	-5.52	6.16	0.63	1.70
Education by date of interval segment								
None	2.8E-03	1.6E-03	-6.0E-04	9.3E-04	-1.4E-03	1.0E-03	5.0E-04	8.7E-04
Primary	8.8E-04	1.8E-03	-5.6E-05	8.8E-04	-8.8E-04	1.0E-03	1.4E-03	5.2E-04
Secondary +	0.00	-	0.00	-	0.00	-	0.00	-
Education by interval segment and date of interval segment								
None	0.00	-	0.00	-	0.00	-	0.00	-
Primary	1.5E-05	1.9E-05	3.7E-05	1.6E-05	5.2E-06	1.1E-05	7.1E-06	1.3E-05
Secondary +	7.1E-05	3.7E-05	8.8E-05	2.1E-05	4.4E-05	3.1E-05	-4.1E-05	1.3E-05
Education by interval segment squared and date of interval segment								
None	0.00	-	0.00	-	0.00	-	0.00	-
Primary	-1.1E-08	8.1E-08	-9.8E-08	8.2E-08	4.4E-08	5.0E-08	-3.4E-09	3.1E-08
Secondary +	-3.6E-07	1.6E-07	-3.6E-07	9.8E-08	-7.1E-08	1.7E-07	1.4E-07	3.7E-08
Education by log of interval segment and date of interval segment								
None	0.00	-	0.00	-	0.00	-	0.00	-
Primary	4.0E-04	4.4E-04	-5.9E-04	3.1E-04	-2.8E-04	2.4E-04	-4.5E-04	3.7E-04
Secondary +	1.1E-04	7.5E-04	-1.1E-03	4.3E-04	-9.6E-04	5.2E-04	3.9E-04	3.6E-04

	MODEL 5							
	Ethiopia		Kenya		Tanzania		Zimbabwe	
	Coeff.	Stand.	Coeff.	Stand.	Coeff.	Stand.	Coeff.	Stand.
Education by parity and date of interval segment								
Primary 1	0.00	-	0.00	-	0.00	-	0.00	-
Primary 2	1.3E-04	2.0E-04	-1.4E-04	1.1E-04	-1.7E-05	9.2E-05	5.7E-05	1.7E-04
Primary 3	-2.4E-04	2.3E-04	-2.0E-05	1.2E-04	-3.1E-05	1.0E-04	1.5E-04	1.7E-04
Primary 4	-3.3E-04	2.9E-04	-9.6E-05	1.4E-04	-6.0E-05	1.2E-04	1.8E-04	1.9E-04
Primary 5	-3.5E-04	3.2E-04	1.6E-04	1.5E-04	-1.9E-04	1.4E-04	5.9E-05	2.2E-04
Primary 6	-2.6E-05	4.3E-04	3.0E-04	1.8E-04	2.0E-04	1.7E-04	4.3E-04	2.8E-04
Primary 7	7.8E-04	6.2E-04	1.8E-04	2.3E-04	1.2E-04	2.1E-04	8.5E-06	3.2E-04
Primary 8	-3.1E-04	8.0E-04	6.0E-04	3.0E-04	-5.9E-05	2.7E-04	-3.1E-04	4.9E-04
Primary 9	1.4E-03	1.3E-03	1.1E-03	4.5E-04	-1.6E-04	4.3E-04	8.7E-04	6.9E-04
Primary 10	9.1E-04	1.2E-03	4.0E-04	5.1E-04	2.1E-04	3.7E-04	6.9E-04	7.8E-04
Secondary 1	0.00	-	0.00	-	0.00	-	0.00	-
secondary 2	-7.2E-04	3.3E-04	-2.8E-04	1.8E-04	1.6E-04	2.3E-04	8.5E-05	1.7E-04
Secondary 3	-3.2E-04	4.0E-04	2.3E-04	1.9E-04	-1.2E-04	2.6E-04	2.2E-04	1.8E-04
Secondary 4	1.4E-03	6.5E-04	8.7E-05	2.5E-04	3.2E-04	3.4E-04	2.3E-04	2.0E-04
Secondary 5	7.0E-04	7.6E-04	2.0E-04	3.3E-04	-2.8E-04	4.5E-04	1.4E-04	2.6E-04
Secondary 6	1.1E-05	1.1E-03	8.3E-04	4.2E-04	7.5E-04	6.3E-04	3.7E-04	3.3E-04
Secondary 7	1.5E-03	1.9E-03	1.4E-03	5.9E-04	-2.9E-04	4.8E-04	5.8E-04	5.2E-04
Secondary 8	8.1E-04	2.3E-03	-1.2E-05	1.0E-03	-4.5E-05	7.8E-04	1.6E-04	5.5E-04
Secondary 9	-3.5E-03	5.7E-03	1.9E-03	1.4E-03	-1.3E-03	6.4E-04	1.6E-03	1.3E-03
Secondary 10	-1.3E-04	3.4E-03	-5.4E-04	1.7E-03	2.1E-03	2.6E-03	3.2E-04	7.8E-04
Intercept	-17.16	7.02	-2.46	3.59	-3.52	4.21	-9.25	2.43

Appendix 9: Regression model 6 (birth intervals and duration-specific fertility by parity and residence)

		Ethiopia		Kenya		Tanzania		Zimbabwe	
		Coeff.	Stand. Error	Coeff.	Stand. Error	Coeff.	Stand. Error	Coeff.	Stand. Error
Mothers age at interval segment									
	<15	0.03	0.08	0.02	0.06	-0.06	0.08	0.00	0.08
	15-19	0.09	0.02	0.08	0.02	0.06	0.02	0.03	0.02
	20-24	0.09	0.01	0.15	0.01	0.11	0.01	0.11	0.01
	25-29	0.00	-	0.00	-	0.00	-	0.00	-
	30-34	-0.14	0.01	-0.17	0.01	-0.16	0.01	-0.18	0.02
	35-39	-0.42	0.02	-0.43	0.02	-0.48	0.02	-0.52	0.02
	40-44	-0.91	0.03	-0.95	0.04	-0.98	0.03	-1.10	0.04
	45-49	-1.77	0.10	-1.76	0.11	-1.85	0.09	-1.92	0.12
Parity									
	1	0.00	-	0.00	-	0.00	-	0.00	-
	2	-9.82	4.04	-1.98	1.64	-4.39	3.35	-0.72	1.79
	3	-2.71	5.12	-0.37	1.84	0.68	3.69	-0.94	2.59
	4	7.27	5.71	-3.63	2.18	-1.04	5.24	-3.23	3.20
	5	-2.45	9.33	0.76	2.51	3.50	5.47	-4.03	7.66
	6	-13.38	11.09	2.26	2.86	3.38	7.88	-20.97	11.25
	7	-31.74	21.64	3.45	3.58	9.45	4.15	-27.13	9.17
	8	7.78	12.87	-1.05	5.90	2.68	9.50	-20.16	22.08
	9	3.15	18.86	-2.15	6.63	17.63	7.43	34.22	41.33
	10	14.38	25.82	5.15	7.55	-0.17	14.31	-13.60	16.60
Five year period of interval segment									
	1960-64	3.34	6.62	3.07	1.97	2.61	3.83	-3.87	4.63
	1965-69	2.92	5.22	2.38	1.58	2.19	3.07	-3.06	3.70
	1970-74	2.07	3.91	1.81	1.18	1.68	2.30	-2.26	2.78
	1975-79	1.41	2.61	1.27	0.79	1.16	1.53	-1.48	1.85
	1980-84	0.68	1.30	0.67	0.39	0.58	0.77	-0.60	0.93
	1985-89	0.00	-	0.00	-	0.00	-	0.00	-
	1990-94	-0.65	1.30	-0.76	0.39	-0.53	0.77	0.55	0.93
	1995-99	-1.38	2.61	-1.38	0.79	-1.10	1.53	1.28	1.85
	2000-04	-2.16	3.91	-1.86	1.18	-1.59	2.30	2.14	2.78
	2005-11	-2.96	5.21	-2.42	1.57	-2.08	3.07	2.85	3.70
Interval segment (months)									
	0-8	-5.22	10.44	-0.22	2.90	1.74	6.10	-5.03	5.58
	0-9	-7.34	5.64	0.07	1.18	2.36	2.82	3.80	5.67
	18-23	-5.31	4.48	0.37	0.80	1.87	2.04	5.41	3.93
	24-29	-3.27	3.20	0.49	0.54	1.33	1.39	4.86	2.48
	30-35	-1.53	1.68	0.21	0.26	0.60	0.69	2.90	1.21
	36-41	0.00	-	0.00	-	0.00	-	0.00	-
	42-47	0.95	1.78	-0.31	0.25	-0.49	0.65	-3.77	1.43
	48-53	1.49	3.63	-0.58	0.50	-0.76	1.24	-8.24	3.36
	54-59	1.47	5.53	-0.89	0.74	-0.75	1.74	-13.45	6.00
	60-65	0.91	7.50	-1.25	1.00	-0.46	2.14	-19.37	9.45
	66-71	-0.18	9.54	-1.59	1.30	-0.02	2.43	-25.97	13.79
	72-83	-3.02	12.77	-2.40	1.86	1.05	2.65	-37.23	22.03
	84-95	-8.78	17.51	-3.41	2.89	3.48	2.58	-54.55	36.37
	96-107	-16.98	22.94	-4.75	4.31	6.85	2.26	-74.20	54.62
	108-119	-27.85	29.23	-6.23	6.15	10.99	2.41	-96.51	76.85
	120-131	-40.97	36.52	-7.98	8.42	16.60	3.80	-121.20	103.09
	132-143	-57.35	44.93	-10.35	11.14	22.65	6.29	-148.80	133.38
	144-179	-97.54	65.44	-15.45	17.90	37.70	13.66	-211.34	206.14
	180-239	-209.96	122.35	-29.51	36.85	79.47	36.89	-365.89	400.73
	240+	-841.97	444.87	-101.35	143.44	309.06	181.40	1103.91	1433.63

		MODEL 6							
		Ethiopia		Kenya		Tanzania		Zimbabwe	
		Coeff.	Stand. Error	Coeff.	Stand. Error	Coeff.	Stand. Error	Coeff.	Stand. Error
Ever-married at interval segment		-0.69	0.33	-0.17	0.13	-0.12	0.13	0.68	0.12
Rural vs urban residence		-3.20	2.93	-0.49	1.55	2.75	2.44	-2.88	1.57
Parity by date of interval segment									
	1	5.9E-03	1.1E-02	3.3E-03	3.3E-03	1.1E-03	6.4E-03	-8.6E-03	7.7E-03
	2	1.0E-02	1.1E-02	3.9E-03	3.3E-03	2.6E-03	6.4E-03	-8.4E-03	7.7E-03
	3	6.9E-03	1.1E-02	3.5E-03	3.3E-03	1.8E-04	6.4E-03	-8.5E-03	7.7E-03
	4	2.1E-03	1.1E-02	4.6E-03	3.4E-03	1.2E-03	6.7E-03	-7.1E-03	7.8E-03
	5	7.2E-03	1.1E-02	2.6E-03	3.4E-03	-1.4E-03	6.7E-03	-6.6E-03	8.4E-03
	6	1.2E-02	1.2E-02	2.4E-03	3.5E-03	-1.4E-03	7.2E-03	1.1E-03	9.5E-03
	7	1.9E-02	1.4E-02	5.6E-04	3.6E-03	-3.3E-03	6.5E-03	5.5E-03	8.6E-03
	8	2.9E-03	1.2E-02	3.5E-03	4.1E-03	-1.3E-03	7.5E-03	6.7E-04	1.3E-02
	9	4.2E-03	1.4E-02	4.1E-03	4.3E-03	-6.8E-03	7.2E-03	-2.5E-02	2.2E-02
	10	0.00	-	0.00	-	0.00	-	0.00	-
Interval segment by date of interval segment		3.7E-05	2.3E-05	4.0E-05	1.7E-05	2.6E-05	2.4E-05	9.4E-06	9.8E-06
Interval segment squared by date		-9.7E-08	9.1E-08	-1.5E-07	7.2E-08	2.6E-08	1.2E-07	-5.9E-08	2.6E-08
Log interval segment by date of interval segment		-2.9E-04	5.2E-04	-5.4E-05	3.7E-04	-2.1E-05	4.7E-04	5.0E-04	2.5E-04
Never-married by date of interval segment		-4.0E-04	1.5E-04	-3.3E-04	6.1E-05	-2.4E-04	6.0E-05	1.7E-04	5.8E-05
Urban residence by date of interval segment		-8.8E-04	1.3E-03	2.8E-04	7.6E-04	1.8E-03	1.1E-03	-5.5E-04	7.9E-04
Rural residence by parity and date of interval segment									
	1	0.00	-	0.00	-	0.00	-	0.00	-
	2	-4.9E-03	2.2E-03	3.6E-05	1.7E-04	-7.8E-04	1.7E-03	5.2E-04	1.2E-03
	3	-2.8E-04	2.7E-03	-3.8E-04	1.7E-04	1.3E-03	1.9E-03	-1.0E-04	1.5E-03
	4	2.7E-03	3.1E-03	-3.7E-04	2.1E-04	7.0E-05	2.7E-03	6.2E-05	2.1E-03
	5	3.8E-04	4.7E-03	-6.7E-04	2.6E-04	2.2E-03	2.6E-03	3.6E-04	3.8E-03
	6	-5.4E-03	5.6E-03	-1.0E-03	3.1E-04	3.4E-03	3.8E-03	-9.8E-03	5.8E-03
	7	-1.6E-02	9.7E-03	9.0E-05	4.4E-04	3.6E-03	2.2E-03	-1.4E-02	4.6E-03
	8	6.0E-03	7.0E-03	-9.0E-04	4.9E-04	2.9E-03	4.6E-03	-8.2E-03	1.1E-02
	9	5.6E-03	9.6E-03	-3.3E-03	8.9E-04	7.7E-03	4.4E-03	1.7E-02	2.1E-02
	10	1.8E-02	1.2E-02	3.3E-04	1.2E-03	1.6E-03	6.5E-03	-3.4E-03	9.2E-03
Urban residence by interval segment		-3.6E-02	6.1E-02	-8.2E-02	3.2E-02	-6.2E-02	5.9E-02	5.6E-02	2.8E-02
Urban residence by interval segment squared		5.0E-05	2.5E-04	3.6E-04	1.4E-04	-1.9E-06	2.9E-04	-9.1E-05	6.8E-05
Urban residence by the log of interval segment		-0.25	1.34	0.75	0.70	1.73	1.15	-1.32	0.69

	MODEL 6							
	Ethiopia		Kenya		Tanzania		Zimbabwe	
	Coeff.	Stand. Error	Coeff.	Stand. Error	Coeff.	Stand. Error	Coeff.	Stand. Error
Rural residence by parity								
1	0.00	-	0.00	-	0.00	-	0.00	-
2	10.86	4.82	0.35	0.57	2.50	3.69	-0.36	2.41
3	0.67	6.02	0.56	0.60	-1.76	4.04	0.59	3.12
4	-5.17	6.90	1.31	0.76	0.21	5.52	0.52	4.31
5	-1.69	10.67	2.06	0.84	-2.47	5.78	0.82	8.17
6	10.91	12.51	2.50	0.97	-4.85	8.26	22.53	11.69
7	38.73	22.62	2.54	1.41	-6.82	4.83	26.82	10.30
8	-15.83	16.10	2.23	2.33	-2.84	10.19	19.09	23.58
9	-12.46	21.98	7.59	2.84	-16.57	8.94	-32.29	42.42
10	-44.09	29.09	2.29	3.74	-0.52	14.66	4.97	19.93
Rural residence by interval segment and date of interval segment	-2.1E-05	2.8E-05	-4.3E-05	1.5E-05	-4.2E-05	2.5E-05	1.2E-05	1.4E-05
Rural residence by interval segment squared and date of interval segment	2.6E-08	1.1E-07	1.7E-07	6.6E-08	3.9E-08	1.2E-07	-8.6E-09	3.7E-08
Rural residence by the log of interval segment and date of interval segment	1.6E-04	6.1E-04	6.0E-04	3.4E-04	1.1E-03	5.1E-04	-2.1E-04	3.4E-04
Parity by interval segment								
1	-1.35	0.89	-0.14	0.24	0.35	0.48	0.01	1.41
2	-1.57	0.89	-0.15	0.24	0.25	0.47	-0.02	1.41
3	-1.54	0.89	-0.10	0.24	0.36	0.47	0.04	1.41
4	-1.33	0.89	-0.15	0.24	0.30	0.48	-0.03	1.41
5	-1.63	0.92	-0.07	0.24	0.45	0.49	0.01	1.42
6	-2.25	0.95	0.03	0.25	0.33	0.50	-0.28	1.42
7	-2.65	1.07	-0.07	0.25	0.59	0.50	-0.40	1.47
8	-1.39	1.06	-0.11	0.27	0.38	0.50	0.16	1.51
9	-2.08	1.11	-0.09	0.28	1.35	0.65	1.42	2.04
10	0.00	-	0.00	-	0.00	-	0.00	-
Parity by interval segment squared								
1	9.8E-03	5.0E-03	1.0E-03	1.6E-03	-3.4E-03	2.5E-03	8.7E-03	1.4E-02
2	1.1E-02	5.0E-03	1.0E-03	1.6E-03	-2.9E-03	2.5E-03	8.8E-03	1.4E-02
3	1.1E-02	5.0E-03	6.9E-04	1.6E-03	-3.2E-03	2.5E-03	8.4E-03	1.4E-02
4	9.9E-03	5.0E-03	8.5E-04	1.6E-03	-3.0E-03	2.5E-03	8.7E-03	1.4E-02
5	1.2E-02	5.2E-03	6.3E-04	1.6E-03	-3.6E-03	2.5E-03	8.5E-03	1.4E-02
6	1.5E-02	5.3E-03	-1.2E-04	1.7E-03	-2.8E-03	2.5E-03	9.9E-03	1.4E-02
7	1.7E-02	5.7E-03	4.8E-04	1.7E-03	-4.8E-03	2.7E-03	9.4E-03	1.5E-02
8	1.3E-02	6.1E-03	9.1E-04	1.8E-03	-3.2E-03	2.5E-03	7.6E-03	1.5E-02
9	1.6E-02	7.0E-03	7.9E-04	1.7E-03	-9.5E-03	4.3E-03	-5.5E-04	1.8E-02
10	0.00	-	0.00	-	0.00	-	0.00	-
Parity by the log of interval segment								
1	14.37	14.11	2.38	3.70	-1.99	7.64	-7.29	12.31
2	19.25	14.15	3.26	3.71	0.34	7.64	-6.73	12.31
3	16.80	14.23	2.18	3.72	-2.25	7.66	-7.20	12.34
4	12.12	14.23	3.45	3.76	-1.39	7.81	-5.97	12.36
5	16.59	14.78	1.25	3.79	-3.94	7.92	-6.08	12.76
6	25.22	15.18	-0.01	3.86	-3.25	8.32	1.02	13.11
7	32.75	17.82	1.00	3.96	-6.32	7.85	4.60	13.40
8	11.22	16.19	1.99	4.54	-3.53	8.53	-4.07	16.31
9	15.90	17.31	0.32	4.71	-15.02	9.08	-27.45	24.63
10	0.00	-	0.00	-	0.00	-	0.00	-

		Ethiopia		Kenya		Tanzania		Zimbabwe	
		Coeff.	Stand. Error	Coeff.	Stand. Error	Coeff.	Stand. Error	Coeff.	Stand. Error
Parity by interval segment and date of interval segment									
	1	0.00	-	0.00	-	0.00	-	0.00	-
	2	9.9E-05	4.2E-05	2.9E-06	1.5E-05	4.3E-05	3.0E-05	1.6E-05	1.5E-05
	3	8.3E-05	5.4E-05	-1.8E-05	1.7E-05	-9.4E-06	3.1E-05	-1.6E-05	2.6E-05
	4	-2.6E-05	4.3E-05	-2.0E-06	2.1E-05	1.7E-05	4.0E-05	2.0E-05	2.7E-05
	5	1.2E-04	1.1E-04	-4.3E-05	2.4E-05	-5.9E-05	5.6E-05	7.6E-06	6.9E-05
	6	3.8E-04	1.5E-04	-8.2E-05	3.1E-05	-4.4E-06	7.5E-05	1.4E-04	8.0E-05
	7	5.2E-04	2.5E-04	-7.3E-05	3.4E-05	-1.2E-04	7.4E-05	2.3E-04	1.8E-04
	8	1.2E-05	2.5E-04	-2.8E-05	6.1E-05	-4.1E-05	7.2E-05	-7.2E-05	2.5E-04
	9	2.8E-04	2.9E-04	-5.4E-05	6.5E-05	-4.3E-04	2.0E-04	-6.5E-04	7.0E-04
	10	-5.8E-04	3.6E-04	-8.8E-05	9.7E-05	1.0E-04	2.1E-04	1.3E-04	6.3E-04
Parity by interval segment squared and date of interval segment									
	1	0.00	-	0.00	-	0.00	-	0.00	-
	2	-4.03E-07	1.72E-07	2.20E-08	6.66E-08	-2.00E-07	1.26E-07	-3.76E-08	3.83E-08
	3	-5.34E-07	2.38E-07	1.47E-07	7.76E-08	-8.54E-08	1.26E-07	1.22E-07	1.09E-07
	4	-1.02E-08	1.32E-07	8.10E-08	9.81E-08	-1.58E-07	1.41E-07	-3.13E-08	1.08E-07
	5	-9.81E-07	5.84E-07	1.99E-07	1.31E-07	1.12E-07	2.64E-07	4.36E-08	2.96E-07
	6	-2.17E-06	8.26E-07	4.97E-07	1.71E-07	-2.41E-07	2.50E-07	-6.12E-07	2.75E-07
	7	-3.06E-06	1.17E-06	4.02E-07	1.71E-07	6.43E-07	4.67E-07	-5.80E-07	1.08E-06
	8	-1.32E-06	1.51E-06	1.06E-07	3.19E-07	-1.36E-08	1.83E-07	4.96E-07	1.26E-06
	9	-2.55E-06	2.17E-06	2.26E-07	3.01E-07	2.52E-06	1.48E-06	3.81E-06	5.11E-06
	10	4.04E-06	1.95E-06	5.12E-07	6.66E-07	-1.22E-06	1.08E-06	2.93E-06	6.39E-06
Parity by the log of interval segment and date of interval segment									
	1	0.00	-	0.00	-	0.00	-	0.00	-
	2	-2.2E-03	8.6E-04	-3.0E-04	3.5E-04	-8.7E-04	6.8E-04	-2.6E-04	3.9E-04
	3	-1.0E-03	1.1E-03	6.4E-05	3.8E-04	3.5E-04	7.4E-04	3.6E-05	5.6E-04
	4	1.3E-03	1.1E-03	-3.7E-04	4.5E-04	-1.3E-04	1.1E-03	-6.5E-04	6.5E-04
	5	-9.8E-04	2.1E-03	7.2E-04	5.1E-04	1.3E-03	1.2E-03	-6.7E-04	1.6E-03
	6	-4.7E-03	2.6E-03	1.1E-03	6.0E-04	9.8E-04	1.7E-03	-3.9E-03	2.3E-03
	7	-7.3E-03	4.7E-03	1.3E-03	7.3E-04	2.1E-03	1.0E-03	-6.2E-03	2.3E-03
	8	1.3E-03	3.6E-03	3.7E-04	1.2E-03	1.3E-03	1.8E-03	-1.4E-03	4.9E-03
	9	-2.7E-04	4.5E-03	1.2E-03	1.3E-03	5.8E-03	2.4E-03	9.7E-03	1.1E-02
	10	6.2E-03	5.8E-03	1.5E-03	1.6E-03	-6.7E-05	3.4E-03	-4.8E-03	5.6E-03
Rural residence by parity and interval segment									
	1	0.00	-	0.00	-	0.00	-	0.00	-
	2	0.20	0.11	0.01	0.01	0.08	0.07	0.04	0.04
	3	0.12	0.14	0.00	0.01	-0.03	0.08	-0.01	0.06
	4	-0.03	0.14	0.01	0.01	0.03	0.09	0.09	0.09
	5	0.16	0.30	0.02	0.01	-0.10	0.14	-0.01	0.16
	6	0.00	0.39	0.02	0.02	-0.02	0.17	0.40	0.18
	7	1.36	0.62	0.09	0.02	-0.16	0.19	0.46	0.41
	8	-0.27	0.64	0.01	0.04	-0.04	0.18	-0.17	0.57
	9	0.20	0.75	0.03	0.04	-0.84	0.47	-1.38	1.48
	10	-2.23	0.97	0.04	0.10	0.10	0.49	-0.26	1.44

		Ethiopia		Kenya		Tanzania		Zimbabwe	
		Coeff.	Stand. Error	Coeff.	Stand. Error	Coeff.	Stand. Error	Coeff.	Stand. Error
Rural residence by parity and interval segment squared									
	1	0.00	-	0.00	-	0.00	-	0.00	-
	2	-7.9E-04	4.7E-04	-4.1E-05	3.6E-05	-3.1E-04	3.1E-04	-8.8E-05	1.0E-04
	3	-9.0E-04	6.5E-04	-2.5E-05	4.1E-05	-8.5E-05	3.1E-04	2.2E-04	2.5E-04
	4	1.8E-04	6.5E-04	-2.5E-05	5.4E-05	-1.9E-04	3.2E-04	-4.5E-04	4.0E-04
	5	-2.1E-03	1.6E-03	-4.1E-05	5.3E-05	3.1E-04	6.5E-04	2.9E-04	6.8E-04
	6	-3.1E-03	2.1E-03	-3.8E-05	6.3E-05	-3.3E-04	5.7E-04	-1.8E-03	6.9E-04
	7	-7.8E-03	3.0E-03	-4.1E-04	1.1E-04	1.3E-03	1.2E-03	-9.2E-04	2.5E-03
	8	-1.2E-03	3.8E-03	-1.0E-04	1.8E-04	1.1E-04	5.0E-04	1.6E-03	2.8E-03
	9	-3.6E-03	5.4E-03	-2.3E-04	1.7E-04	5.4E-03	3.6E-03	9.4E-03	1.1E-02
	10	1.5E-02	5.5E-03	-1.5E-04	5.3E-04	-1.9E-03	2.5E-03	1.0E-02	1.4E-02
Rural residence by parity and the log of interval segment									
	1	0.00	-	0.00	-	0.00	-	0.00	-
	2	-5.04	2.27	-0.15	0.20	-1.57	1.65	-0.24	1.06
	3	-1.22	2.85	0.12	0.22	0.79	1.77	-0.12	1.40
	4	1.63	3.11	-0.24	0.28	-0.20	2.34	-0.81	1.90
	5	0.12	5.35	-0.32	0.30	1.56	2.72	-0.11	3.63
	6	-8.02	6.50	-0.25	0.35	1.95	3.79	-9.62	4.82
	7	-20.82	11.44	-1.60	0.51	2.82	2.63	-12.17	5.74
	8	7.91	9.39	-0.18	0.91	1.45	4.42	-3.06	11.32
	9	5.23	11.68	-0.28	0.97	11.34	5.64	19.05	21.83
	10	29.94	15.64	-1.17	1.57	0.18	7.86	-3.17	13.47
Rural residence by parity and interval segment and date of interval segment									
	1	0.00	-	0.00	-	0.00	-	0.00	-
	2	-9.2E-05	4.9E-05	-	-	-3.3E-05	3.3E-05	-1.4E-05	2.1E-05
	3	-5.6E-05	6.3E-05	-	-	2.1E-05	3.4E-05	5.3E-06	2.9E-05
	4	2.7E-05	6.4E-05	-	-	-9.2E-06	4.2E-05	-3.6E-05	4.0E-05
	5	-7.0E-05	1.3E-04	-	-	5.9E-05	5.8E-05	1.5E-05	7.2E-05
	6	-2.7E-04	1.7E-04	-	-	2.5E-05	7.7E-05	-1.8E-04	8.7E-05
	7	-5.6E-04	2.7E-04	-	-	9.1E-05	7.8E-05	-2.6E-04	1.8E-04
	8	9.6E-05	2.8E-04	-	-	5.3E-05	8.1E-05	8.0E-05	2.6E-04
	9	-6.7E-05	3.3E-04	-	-	3.5E-04	2.1E-04	6.6E-04	7.1E-04
	10	9.1E-04	3.9E-04	-	-	-7.3E-06	2.2E-04	-7.3E-06	6.4E-04
Rural residence by parity and interval segment squared and date of interval segment									
	1	0.00	-	0.00	-	0.00	-	0.00	-
	2	3.62E-07	2.13E-07	-	-	1.26E-07	1.32E-07	2.79E-08	5.44E-08
	3	4.03E-07	2.90E-07	-	-	3.99E-09	1.33E-07	-9.91E-08	1.15E-07
	4	-1.24E-07	2.92E-07	-	-	8.42E-08	1.46E-07	1.82E-07	1.78E-07
	5	8.68E-07	7.01E-07	-	-	-1.72E-07	2.68E-07	-1.59E-07	3.03E-07
	6	1.35E-06	9.20E-07	-	-	1.10E-07	2.56E-07	8.61E-07	3.36E-07
	7	3.23E-06	1.25E-06	-	-	-6.37E-07	4.83E-07	7.25E-07	1.10E-06
	8	5.92E-07	1.66E-06	-	-	-1.72E-07	2.29E-07	-7.05E-07	1.30E-06
	9	1.46E-06	2.35E-06	-	-	-2.19E-06	1.51E-06	-4.13E-06	5.13E-06
	10	-5.94E-06	2.19E-06	-	-	6.20E-07	1.10E-06	-3.60E-06	6.42E-06

		MODEL 6							
		Ethiopia		Kenya		Tanzania		Zimbabwe	
		Coeff.	Stand. Error	Coeff.	Stand. Error	Coeff.	Stand. Error	Coeff.	Stand. Error
Rural residence by parity and log of interval segment and date of interval segment									
	1	0.00	-	0.00	-	0.00	-	0.00	-
	2	2.3E-03	1.0E-03	-	-	5.7E-04	7.5E-04	-1.4E-05	5.2E-04
	3	5.4E-04	1.3E-03	-	-	-5.7E-04	8.1E-04	1.3E-05	6.7E-04
	4	-9.6E-04	1.4E-03	-	-	1.5E-05	1.1E-03	2.5E-04	9.0E-04
	5	3.4E-05	2.3E-03	-	-	-1.1E-03	1.2E-03	-2.2E-04	1.7E-03
	6	3.7E-03	2.9E-03	-	-	-1.4E-03	1.7E-03	4.3E-03	2.4E-03
	7	8.6E-03	4.9E-03	-	-	-1.6E-03	1.2E-03	6.6E-03	2.5E-03
	8	-3.0E-03	4.1E-03	-	-	-1.4E-03	2.0E-03	1.2E-03	5.2E-03
	9	-2.5E-03	5.1E-03	-	-	-5.1E-03	2.6E-03	-9.8E-03	1.1E-02
	10	-1.2E-02	6.5E-03	-	-	-8.3E-04	3.5E-03	2.6E-03	6.1E-03
Intercept		-26.20	49.24	-17.98	13.60	-16.52	28.55	26.52	29.54

Appendix 10: Regression model 7 (birth intervals and duration-specific fertility by contraceptive use and residence)

	MODEL 7							
	Ethiopia		Kenya		Tanzania		Zimbabwe	
	Coeff.	Stand. Error	Coeff.	Stand. Error	Coeff.	Stand. Error	Coeff.	Stand. Error
Mothers age at interval segment								
<15	-0.01	0.08	-0.10	0.06	-0.10	0.07	-0.07	0.08
15-19	0.06	0.02	-0.05	0.02	0.02	0.02	-0.01	0.02
20-24	0.08	0.01	0.08	0.01	0.08	0.01	0.09	0.01
25-29	0.00	-	0.00	-	0.00	-	0.00	-
30-34	-0.13	0.01	-0.15	0.01	-0.15	0.01	-0.17	0.02
35-39	-0.43	0.02	-0.44	0.02	-0.48	0.02	-0.54	0.02
40-44	-1.02	0.04	-1.05	0.04	-1.02	0.03	-1.22	0.04
45-49	-2.06	0.10	-2.02	0.11	-2.00	0.09	-2.24	0.12
Parity								
1	0.00	-	0.00	-	0.00	-	0.00	-
2	0.51	0.46	0.20	0.33	0.91	0.28	-0.61	0.35
3	0.79	0.55	-0.18	0.43	0.34	0.33	0.37	0.39
4	0.72	0.68	-0.16	0.45	-0.14	0.52	-0.05	0.53
5	0.04	0.79	-0.40	0.62	-0.41	0.51	1.03	0.73
6	2.87	0.97	-1.33	0.70	-0.96	0.68	-0.86	1.38
7	-0.78	1.38	1.56	0.89	1.28	0.75	-0.22	1.20
8	-0.20	1.73	0.33	1.17	-1.88	1.32	-2.17	1.54
9	-4.02	2.22	-2.72	2.11	-1.36	1.59	-8.97	7.02
10	0.78	2.45	0.03	2.78	0.10	2.21	0.37	9.98
Five year period of interval segment								
1960-64	0.48	1.35	1.27	0.78	1.84	0.62	-0.02	2.86
1965-69	0.65	0.56	0.91	0.62	1.55	0.49	-0.02	2.29
1970-74	0.37	0.41	0.68	0.47	1.19	0.37	0.00	1.72
1975-79	0.27	0.27	0.49	0.31	0.83	0.25	0.02	1.15
1980-84	0.10	0.14	0.27	0.16	0.41	0.12	0.14	0.57
1985-89	0.00	-	0.00	-	0.00	-	0.00	-
1990-94	-0.07	0.14	-0.35	0.16	-0.36	0.12	-0.20	0.57
1995-99	-0.20	0.27	-0.58	0.31	-0.74	0.25	-0.23	1.15
2000-04	-0.37	0.41	-0.68	0.47	-1.07	0.37	-0.13	1.72
2005-11	-0.55	0.55	-0.84	0.62	-1.41	0.49	-0.17	2.29
Interval segment (months)								
0-8	-3.59	0.43	-2.50	0.34	-1.34	0.28	-4.69	0.52
0-9	-1.02	0.14	-0.78	0.11	-0.29	0.10	-1.18	0.18
18-23	-0.38	0.08	-0.11	0.07	0.17	0.06	-0.06	0.10
24-29	-0.08	0.05	0.19	0.05	0.34	0.04	0.32	0.06
30-35	-0.05	0.03	0.06	0.03	0.20	0.02	0.22	0.03
36-41	0.00	-	0.00	-	0.00	-	0.00	-
42-47	-0.15	0.03	-0.15	0.03	-0.28	0.03	-0.32	0.03
48-53	-0.27	0.06	-0.25	0.05	-0.54	0.04	-0.61	0.06
54-59	-0.43	0.09	-0.35	0.08	-0.73	0.06	-0.92	0.09
60-65	-0.58	0.12	-0.46	0.10	-0.87	0.08	-1.25	0.12
66-71	-0.69	0.15	-0.50	0.12	-1.06	0.10	-1.57	0.15
72-83	-0.91	0.19	-0.78	0.15	-1.37	0.12	-2.14	0.20
84-95	-1.01	0.25	-0.88	0.20	-1.56	0.16	-2.88	0.26
96-107	-0.98	0.31	-1.09	0.26	-1.73	0.20	-3.32	0.32
108-119	-1.00	0.40	-1.19	0.33	-2.07	0.24	-3.81	0.39
120-131	-0.61	0.50	-1.32	0.44	-1.85	0.27	-4.09	0.45
132-143	-0.79	0.65	-1.82	0.56	-2.14	0.31	-4.68	0.51
144-179	-0.44	0.96	-2.36	0.88	-2.60	0.37	-5.54	0.62
180-239	1.09	1.96	-4.24	1.92	-3.36	0.60	-6.23	0.82
240+	11.42	8.15	-11.33	8.61	-5.59	2.82	-3.36	1.33

	Ethiopia		Kenya		Tanzania		Zimbabwe	
MODEL 7								
	Coeff.	Stand. Error	Coeff.	Stand. Error	Coeff.	Stand. Error	Coeff.	Stand. Error
Ever-married at interval segment	-0.73	0.33	-0.26	0.13	-0.14	0.13	0.59	0.12
Rural vs urban residence	1.03	2.38	2.29	1.55	4.28	1.63	-3.21	2.18
Ever-users of contraception	15.41	4.81	9.34	3.57	0.36	3.88	1.54	2.22
Parity by date of interval segment								
1	3.3E-04	1.1E-03	2.4E-04	1.2E-03	-1.6E-04	9.8E-04	3.5E-04	4.7E-03
2	9.6E-05	1.1E-03	1.2E-04	1.2E-03	-6.3E-04	9.9E-04	5.5E-04	4.7E-03
3	2.9E-05	1.1E-03	2.4E-04	1.2E-03	-3.6E-04	9.9E-04	1.4E-05	4.7E-03
4	7.2E-05	1.1E-03	2.3E-04	1.2E-03	-1.1E-04	1.0E-03	2.5E-04	4.7E-03
5	3.9E-04	1.1E-03	3.9E-04	1.3E-03	3.9E-05	1.0E-03	-2.6E-04	4.8E-03
6	-7.9E-04	1.1E-03	8.5E-04	1.3E-03	3.6E-04	1.0E-03	6.9E-04	4.8E-03
7	7.8E-04	1.2E-03	-4.4E-04	1.3E-03	-7.1E-04	1.0E-03	5.0E-04	4.8E-03
8	4.8E-04	1.3E-03	2.2E-05	1.4E-03	7.2E-04	1.1E-03	1.1E-03	4.8E-03
9	2.0E-03	1.4E-03	1.4E-03	1.6E-03	5.5E-04	1.2E-03	4.9E-03	5.9E-03
10	0.00	-	0.00	-	0.00	-	0.00	-
Interval segment by date of interval segment	3.1E-05	2.6E-05	1.2E-05	1.2E-05	1.6E-05	1.3E-05	2.9E-05	1.7E-05
Interval segment squared by date of interval segment	-1.3E-07	1.2E-07	-3.4E-08	3.2E-08	-2.0E-08	5.3E-08	-8.1E-08	3.7E-08
Log of interval segment by date of interval segment	-4.7E-04	5.0E-04	-1.4E-04	2.8E-04	8.0E-06	3.1E-04	-3.1E-04	4.1E-04
Never-married by date of interval segment	-4.1E-04	1.5E-04	-3.5E-04	6.0E-05	-2.4E-04	5.9E-05	1.2E-04	5.7E-05
Urban residence by date of interval segment	1.1E-03	1.1E-03	1.6E-03	7.4E-04	2.2E-03	7.7E-04	-8.4E-04	1.1E-03
Rural residence by ever-users of contraception	-14.71	7.02	-5.90	3.99	-6.00	4.79	2.47	2.57
Ever-users of contraception by date of interval segment	-7.0E-03	2.2E-03	-4.7E-03	1.7E-03	-5.9E-04	1.8E-03	-1.5E-03	1.1E-03
Rural residence by date of interval segment and ever-users of contraception	7.1E-03	3.0E-03	3.1E-03	1.9E-03	2.9E-03	2.2E-03	-1.1E-03	1.3E-03
Urban residence by interval duration segment	-5.8E-02	5.9E-02	-8.1E-02	3.1E-02	-7.6E-02	3.0E-02	2.0E-02	3.9E-02
Urban residence by interval duration segment squared	1.3E-04	2.7E-04	2.6E-04	1.2E-04	1.1E-04	1.2E-04	-2.5E-05	8.3E-05
Urban residence by log of interval segment	0.97	1.16	1.57	0.68	2.17	0.71	-0.93	0.95
Rural residence by parity								
1	0.00	-	0.00	-	0.00	-	0.00	-
2	-0.43	0.49	0.10	0.35	-0.92	0.30	0.84	0.40
3	-0.49	0.58	0.78	0.45	-0.34	0.35	-0.22	0.44
4	-0.61	0.70	0.47	0.47	-0.01	0.53	0.40	0.58
5	0.42	0.82	0.72	0.64	0.30	0.54	-0.72	0.80
6	-2.05	1.01	2.11	0.73	0.93	0.71	0.52	1.44
7	1.62	1.43	-1.08	0.93	-1.39	0.79	0.97	1.31
8	1.39	1.80	0.54	1.22	1.26	1.36	0.05	1.84
9	5.05	2.34	4.03	2.19	1.07	1.68	9.56	7.08
10	1.57	2.62	0.76	2.85	0.57	2.27	-0.49	10.03

	Ethiopia		Kenya		Tanzania		Zimbabwe	
MODEL 7								
	Coeff.	Stand. Error	Coeff.	Stand. Error	Coeff.	Stand. Error	Coeff.	Stand. Error
Rural residence by interval segment and date of interval segment	-3.0E-05	2.7E-05	-3.8E-05	1.4E-05	-4.0E-05	1.4E-05	2.2E-06	1.9E-05
Rural residence by interval segment squared and date of interval segment	6.1E-08	1.2E-07	1.0E-07	5.3E-08	6.0E-08	5.4E-08	-2.8E-10	4.2E-08
Rural residence by log of interval segment and date of interval segment	7.1E-04	5.4E-04	9.2E-04	3.2E-04	1.1E-03	3.3E-04	-1.5E-04	4.6E-04
Rural residence by parity and date of interval segment								
1	0.00	-	0.00	-	0.00	-	0.00	-
2	1.9E-04	2.2E-04	-7.3E-05	1.7E-04	4.5E-04	1.4E-04	-3.4E-04	1.9E-04
3	1.8E-04	2.6E-04	-3.5E-04	2.2E-04	1.7E-04	1.7E-04	2.4E-04	2.2E-04
4	2.0E-04	3.2E-04	-2.2E-04	2.3E-04	4.3E-06	2.5E-04	-6.3E-05	2.9E-04
5	-2.5E-04	3.6E-04	-3.5E-04	3.0E-04	-1.4E-04	2.5E-04	4.9E-04	4.0E-04
6	7.7E-04	4.4E-04	-1.0E-03	3.4E-04	-5.0E-04	3.2E-04	-1.3E-04	7.4E-04
7	-8.0E-04	6.2E-04	4.0E-04	4.4E-04	6.3E-04	3.6E-04	-4.0E-04	6.2E-04
8	-6.5E-04	7.9E-04	-2.5E-04	5.9E-04	-5.6E-04	6.0E-04	3.7E-04	9.3E-04
9	-2.2E-03	9.8E-04	-1.9E-03	9.9E-04	-5.4E-04	7.7E-04	-4.7E-03	3.5E-03
10	-7.2E-04	1.1E-03	-2.2E-04	1.3E-03	-4.9E-04	1.0E-03	4.6E-04	4.8E-03
Ever-users of contraception by interval duration	9.1E-02	8.2E-02	6.5E-02	5.8E-02	2.9E-02	8.6E-02	5.6E-02	3.9E-02
Ever-users of contraception by interval duration squared	-1.2E-04	3.1E-04	-1.6E-04	2.0E-04	-4.4E-04	4.3E-04	-1.2E-04	9.4E-05
Ever-users of contraception by log of interval segment	-5.29	2.02	-3.33	1.50	-0.26	1.75	-1.00	0.97
Ever-users of contraception by parity								
1	0.00	-	0.00	-	0.00	-	0.00	-
2	0.22	1.06	-0.10	0.71	-0.82	0.66	0.82	0.41
3	0.05	1.12	-0.10	0.72	-0.07	0.68	-0.27	0.46
4	1.13	1.59	-0.62	0.86	0.27	0.90	0.26	0.62
5	-1.61	1.82	-1.63	1.20	1.29	0.97	-1.21	0.89
6	-6.28	2.47	0.11	1.57	0.78	1.40	1.29	1.58
7	-2.99	3.50	-0.74	2.09	0.72	1.58	1.55	1.71
8	5.31	5.19	-2.89	2.35	3.57	2.12	-3.29	2.42
9	-10.47	6.17	-6.74	4.44	-0.15	3.54	10.53	7.23
10	-17.57	10.10	6.98	7.97	1.77	3.19	2.37	10.04
Ever-users of contraception by interval segment and date of interval segment	-3.4E-05	3.7E-05	-1.8E-05	2.7E-05	4.6E-06	3.7E-05	-1.2E-05	1.9E-05
Ever-users of contraception by interval segment squared and date of interval segment	4.9E-08	1.4E-07	4.0E-08	9.1E-08	1.2E-07	1.8E-07	1.8E-09	4.7E-08
Ever-users of contraception by log of interval segment and date of interval segment	2.3E-03	9.1E-04	1.5E-03	7.0E-04	2.9E-05	7.8E-04	5.1E-04	4.7E-04

		MODEL 7							
		Ethiopia		Kenya		Tanzania		Zimbabwe	
		Coeff.	Stand. Error	Coeff.	Stand. Error	Coeff.	Stand. Error	Coeff.	Stand. Error
Ever-users of contraception by parity and date of interval segment									
	1	0.00	-	0.00	-	0.00	-	0.00	-
	2	-8.3E-05	4.6E-04	-5.6E-05	3.3E-04	4.4E-04	2.9E-04	-4.1E-04	1.9E-04
	3	-6.1E-05	4.9E-04	2.6E-07	3.4E-04	5.5E-05	3.1E-04	2.0E-04	2.2E-04
	4	-5.6E-04	6.9E-04	2.2E-04	4.0E-04	-1.4E-04	4.1E-04	-9.6E-05	3.1E-04
	5	6.6E-04	7.9E-04	6.5E-04	5.5E-04	-6.0E-04	4.4E-04	6.0E-04	4.3E-04
	6	2.6E-03	1.1E-03	-2.0E-04	7.2E-04	-4.4E-04	6.3E-04	-6.6E-04	8.0E-04
	7	1.0E-03	1.5E-03	2.1E-04	9.5E-04	-2.3E-04	7.2E-04	-7.0E-04	8.1E-04
	8	-2.5E-03	2.2E-03	1.3E-03	1.1E-03	-1.5E-03	9.5E-04	1.9E-03	1.2E-03
	9	4.6E-03	2.5E-03	2.9E-03	2.0E-03	1.7E-04	1.6E-03	-5.2E-03	3.5E-03
	10	7.3E-03	4.1E-03	-3.1E-03	3.8E-03	-8.7E-04	1.4E-03	-7.1E-04	4.8E-03
Rural residence by ever-users of contraception and interval segment		-0.12	0.15	-0.11	0.07	-0.11	0.11	0.01	0.05
Rural residence by ever-users of contraception and interval segment squared		-6.8E-05	7.6E-04	2.6E-04	2.7E-04	4.8E-04	5.8E-04	-3.8E-05	1.2E-04
Rural residence by ever-users of contraception and log of interval segment		5.59	3.17	2.76	1.70	2.67	2.19	-0.52	1.12
Rural residence by ever-users of contraception and parity									
	1	0.00	-	0.00	-	0.00	-	0.00	-
	2	0.98	1.46	0.09	0.77	1.86	0.77	-0.97	0.46
	3	-0.44	1.49	0.21	0.79	0.69	0.80	0.19	0.52
	4	0.90	1.91	0.16	0.93	0.23	1.01	-0.50	0.69
	5	1.44	2.19	1.16	1.27	-1.06	1.10	1.19	0.97
	6	6.43	2.87	-0.76	1.64	-0.82	1.54	-0.74	1.66
	7	0.17	3.88	-0.06	2.18	-1.16	1.78	-2.18	1.82
	8	-7.85	5.66	2.40	2.49	-2.99	2.32	5.94	2.66
	9	4.47	7.09	4.22	4.59	-1.21	3.78	-11.44	7.34
	10	10.84	10.72	-7.77	8.09	0.03	3.37	-3.38	10.17
Rural residence by ever-users of contraception, interval segment and date of interval segment		6.4E-05	6.5E-05	4.4E-05	3.1E-05	4.5E-05	4.8E-05	-8.2E-06	2.2E-05
Rural residence by ever-users of contraception, interval segment squared and date of interval segment		-3.1E-08	3.2E-07	-9.8E-08	1.2E-07	-1.8E-07	2.5E-07	3.3E-08	6.1E-08
Rural residence by ever-users of contraception, log of interval segment and date of interval segment		-2.7E-03	1.4E-03	-1.3E-03	7.8E-04	-1.2E-03	9.7E-04	2.8E-04	5.4E-04

		MODEL 7							
		Ethiopia		Kenya		Tanzania		Zimbabwe	
		Coeff.	Stand. Error	Coeff.	Stand. Error	Coeff.	Stand. Error	Coeff.	Stand. Error
Rural residence by ever-users of contraception, parity and date of interval segment									
	1	0.00	-	0.00	-	0.00	-	0.00	-
	2	-4.0E-04	6.3E-04	5.6E-05	3.6E-04	-8.9E-04	3.5E-04	4.5E-04	2.2E-04
	3	2.3E-04	6.4E-04	-3.7E-05	3.7E-04	-3.3E-04	3.6E-04	-1.9E-04	2.5E-04
	4	-2.3E-04	8.2E-04	-2.6E-05	4.3E-04	-1.1E-04	4.6E-04	1.7E-04	3.4E-04
	5	-5.8E-04	9.4E-04	-4.6E-04	5.8E-04	4.8E-04	5.0E-04	-6.2E-04	4.7E-04
	6	-2.6E-03	1.2E-03	5.0E-04	7.5E-04	4.8E-04	6.9E-04	3.8E-04	8.3E-04
	7	1.5E-04	1.7E-03	1.9E-04	9.9E-04	4.3E-04	8.0E-04	9.4E-04	8.6E-04
	8	3.6E-03	2.4E-03	-1.1E-03	1.2E-03	1.3E-03	1.0E-03	-3.1E-03	1.3E-03
	9	-2.2E-03	2.9E-03	-1.7E-03	2.1E-03	4.8E-04	1.7E-03	5.6E-03	3.6E-03
	10	-4.5E-03	4.3E-03	3.6E-03	3.8E-03	2.0E-04	1.5E-03	1.2E-03	4.8E-03
Intercept		-5.69	3.65	-9.39	3.34	-13.83	2.83	0.14	10.40

Appendix 11: Regression model 8 (birth intervals and duration-specific fertility by education and residence)

	Ethiopia		Kenya		Tanzania		Zimbabwe	
	Coeff.	Stand. Error	Coeff.	Stand. Error	Coeff.	Stand. Error	Coeff.	Stand. Error
Mothers age at interval segment								
<15	-0.01	0.08	-0.03	0.06	-0.07	0.07	-0.01	0.08
15-19	0.07	0.02	0.03	0.02	0.05	0.02	0.03	0.02
20-24	0.08	0.01	0.12	0.01	0.10	0.01	0.10	0.01
25-29	0.00	-	0.00	-	0.00	-	0.00	-
30-34	-0.13	0.01	-0.17	0.01	-0.15	0.01	-0.16	0.02
35-39	-0.43	0.02	-0.46	0.02	-0.48	0.02	-0.51	0.02
40-44	-0.99	0.04	-1.06	0.04	-1.01	0.03	-1.18	0.04
45-49	-2.03	0.10	-2.02	0.11	-1.97	0.09	-2.19	0.12
Parity								
1	0.00	-	0.00	-	0.00	-	0.00	-
2	0.53	0.50	1.14	0.55	0.78	0.51	2.04	1.03
3	0.64	0.59	0.62	0.58	-0.12	0.55	0.36	1.05
4	1.14	0.72	0.60	0.66	-0.08	0.66	2.26	1.13
5	0.33	0.86	1.09	0.91	0.28	0.67	1.58	1.18
6	1.87	1.00	-0.26	0.92	0.09	0.98	4.40	1.49
7	-1.18	1.53	3.34	1.27	1.98	0.86	0.11	1.39
8	0.52	1.89	2.39	1.22	-0.36	1.83	-3.83	2.34
9	-5.08	2.44	-4.67	2.37	-0.80	2.12	0.04	2.81
10	-2.18	3.71	7.70	3.90	-1.27	2.30	7.15	18.70
Five year period of interval segment								
1960-64	1.18	1.86	2.28	1.43	1.10	1.12	5.47	5.72
1965-69	1.18	1.16	1.72	1.14	0.98	0.89	4.40	4.58
1970-74	0.76	0.87	1.30	0.86	0.76	0.67	3.33	3.43
1975-79	0.53	0.58	0.92	0.57	0.54	0.45	2.24	2.29
1980-84	0.23	0.29	0.49	0.29	0.27	0.22	1.26	1.14
1985-89	0.00	-	0.00	-	0.00	-	0.00	-
1990-94	-0.20	0.29	-0.57	0.29	-0.22	0.22	-1.30	1.14
1995-99	-0.48	0.58	-1.00	0.57	-0.47	0.45	-2.43	2.29
2000-04	-0.81	0.87	-1.30	0.86	-0.65	0.67	-3.42	3.43
2005-11	-1.16	1.15	-1.67	1.14	-0.83	0.89	-4.55	4.58
Interval segment (months)								
0-8	0.31	1.68	-4.23	1.49	-1.76	1.46	0.28	3.24
0-9	1.26	0.55	-0.38	0.54	-0.11	0.51	-0.32	1.09
18-23	1.06	0.34	0.53	0.32	0.41	0.29	-0.11	0.50
24-29	0.82	0.23	0.72	0.21	0.53	0.18	0.07	0.27
30-35	0.38	0.12	0.35	0.11	0.30	0.09	0.02	0.12
36-41	0.00	-	0.00	-	0.00	-	0.00	-
42-47	-0.54	0.13	-0.47	0.11	-0.39	0.10	-0.02	0.12
48-53	-1.00	0.25	-0.88	0.22	-0.76	0.19	0.07	0.24
54-59	-1.47	0.37	-1.29	0.33	-1.07	0.29	0.16	0.38
60-65	-1.91	0.49	-1.69	0.44	-1.32	0.38	0.27	0.52
66-71	-2.27	0.61	-2.00	0.55	-1.63	0.48	0.40	0.67
72-83	-2.84	0.77	-2.63	0.72	-2.10	0.62	0.52	0.91
84-95	-3.32	0.96	-3.08	0.93	-2.49	0.82	0.67	1.22
96-107	-3.59	1.15	-3.49	1.16	-2.84	1.03	1.09	1.53
108-119	-3.81	1.35	-3.63	1.40	-3.31	1.28	1.39	1.83
120-131	-3.55	1.61	-3.63	1.67	-3.21	1.58	1.82	2.12
132-143	-3.79	1.92	-3.83	1.99	-3.57	1.93	1.84	2.36
144-179	-3.30	2.84	-3.23	2.78	-4.05	2.84	1.95	2.78
180-239	-0.58	6.02	-0.54	5.27	-4.31	5.62	2.02	3.21
240+	20.96	27.72	26.86	20.97	-0.11	22.96	-3.39	1.99

		MODEL 8							
		Ethiopia		Kenya		Tanzania		Zimbabwe	
		Coeff.	Stand. Error	Coeff.	Stand. Error	Coeff.	Stand. Error	Coeff.	Stand. Error
Rural residence by parity									
	1	0.00	-	0.00	-	0.00	-	0.00	-
	2	-0.39	0.52	-1.09	0.59	-0.67	0.52	-1.90	1.09
	3	-0.33	0.61	-0.09	0.61	0.19	0.57	0.15	1.10
	4	-0.89	0.75	-0.62	0.69	-0.01	0.69	-1.69	1.19
	5	0.14	0.89	-0.85	0.94	-0.57	0.70	-1.17	1.26
	6	-0.94	1.04	1.09	0.96	0.03	1.01	-3.64	1.58
	7	2.12	1.57	-3.05	1.33	-2.09	0.92	0.68	1.53
	8	0.62	1.95	-1.27	1.31	-0.14	1.88	3.43	2.51
	9	5.71	2.55	6.35	2.46	-0.05	2.19	1.34	3.10
	10	3.86	3.83	-6.96	3.99	2.66	2.37	-6.75	18.75
Rural residence by interval segment and date of interval segment		-2.0E-05	3.6E-05	1.9E-05	2.7E-05	-2.4E-05	1.9E-05	-7.4E-05	4.3E-05
Rural residence by interval segment squared and date of interval segment		1.9E-08	1.6E-07	-1.1E-07	1.2E-07	1.9E-09	5.3E-08	1.6E-07	9.4E-08
Rural residence by log of interval segment and date of interval segment		4.4E-04	6.9E-04	-4.6E-04	6.0E-04	7.6E-04	5.2E-04	1.6E-03	1.4E-03
Rural residence by parity and date of interval segment									
	1	0.00	-	0.00	-	0.00	-	0.00	-
	2	1.6E-04	2.4E-04	5.2E-04	2.9E-04	2.9E-04	2.6E-04	1.0E-03	5.4E-04
	3	1.2E-04	2.8E-04	1.0E-04	3.0E-04	-1.3E-04	2.9E-04	-1.2E-04	5.5E-04
	4	3.7E-04	3.4E-04	3.4E-04	3.4E-04	1.3E-05	3.3E-04	8.8E-04	5.9E-04
	5	-8.6E-05	3.9E-04	3.9E-04	4.5E-04	2.6E-04	3.4E-04	5.6E-04	6.2E-04
	6	3.2E-04	4.5E-04	-5.3E-04	4.5E-04	-7.4E-05	4.7E-04	1.9E-03	8.0E-04
	7	-9.2E-04	6.8E-04	1.4E-03	6.2E-04	9.2E-04	4.3E-04	-4.0E-04	7.4E-04
	8	-2.7E-04	8.6E-04	5.7E-04	6.4E-04	1.5E-04	8.6E-04	-1.5E-03	1.2E-03
	9	-2.5E-03	1.1E-03	-2.7E-03	1.1E-03	-7.5E-05	9.9E-04	-6.9E-04	1.5E-03
	10	-1.7E-03	1.6E-03	3.4E-03	1.9E-03	-1.3E-03	1.1E-03	3.8E-03	8.9E-03
No education by interval segment		4.1E-02	8.6E-02	1.9E-01	5.9E-02	3.4E-02	6.4E-02	-1.9E-01	8.2E-02
No education by interval segment squared		-1.7E-04	3.8E-04	-7.3E-04	2.3E-04	-8.6E-05	3.0E-04	4.3E-04	1.6E-04
No education by log of interval segment		1.43	1.76	-3.25	1.33	-0.68	1.38	3.58	2.57
Primary + education by parity									
	1	0.00	-	0.00	-	0.00	-	0.00	-
	2	0.05	0.76	-1.05	0.67	-0.45	0.57	-2.09	1.05
	3	0.80	0.89	-1.05	0.69	0.26	0.63	-0.45	1.07
	4	0.16	1.30	-1.31	0.81	-0.07	0.83	-2.40	1.17
	5	-1.57	1.48	-2.93	1.13	-0.44	0.83	-2.08	1.27
	6	-0.09	1.89	-1.58	1.30	-1.50	1.19	-4.86	1.70
	7	1.26	2.87	-3.38	1.82	-1.68	1.29	0.64	1.90
	8	2.53	4.01	-6.45	1.90	-0.28	2.10	-1.26	2.92
	9	-3.15	5.39	-2.81	4.52	-1.56	2.77	1.65	3.73
	10	1.71	5.25	-10.04	5.36	3.30	2.84	-4.86	18.77
Primary + education by interval segment and date of interval segment		2.3E-05	4.0E-05	8.9E-05	2.7E-05	2.6E-05	2.8E-05	-8.2E-05	4.2E-05
Primary + education by interval segment squared and date of interval segment		-8.2E-08	1.8E-07	-3.3E-07	1.0E-07	-7.9E-08	1.3E-07	1.9E-07	9.0E-08

		MODEL 8							
		Ethiopia		Kenya		Tanzania		Zimbabwe	
		Coeff.	Stand. Error	Coeff.	Stand. Error	Coeff.	Stand. Error	Coeff.	Stand. Error
Primary + education by log of interval segment and date of interval segment		4.6E-04	8.2E-04	-1.4E-03	6.3E-04	-4.2E-04	6.4E-04	1.6E-03	1.3E-03
Primary + education by parity and date of interval segment									
	1	0.00	-	0.00	-	0.00	-	0.00	-
	2	-6.1E-05	3.4E-04	4.4E-04	3.3E-04	1.8E-04	2.8E-04	1.0E-03	5.2E-04
	3	-3.9E-04	4.0E-04	4.6E-04	3.3E-04	-2.1E-04	3.1E-04	5.6E-05	5.3E-04
	4	-8.4E-05	5.7E-04	5.9E-04	3.9E-04	9.6E-06	3.9E-04	1.1E-03	5.8E-04
	5	7.2E-04	6.5E-04	1.3E-03	5.3E-04	1.7E-04	3.9E-04	8.4E-04	6.2E-04
	6	-4.8E-06	8.2E-04	6.5E-04	6.0E-04	6.2E-04	5.5E-04	2.3E-03	8.5E-04
	7	-5.5E-04	1.2E-03	1.6E-03	8.4E-04	7.4E-04	5.9E-04	-4.6E-04	9.1E-04
	8	-1.1E-03	1.8E-03	2.9E-03	9.1E-04	3.0E-04	9.6E-04	6.1E-04	1.4E-03
	9	1.3E-03	2.2E-03	1.4E-03	2.0E-03	6.6E-04	1.3E-03	-7.6E-04	1.8E-03
	10	-8.2E-04	2.2E-03	4.8E-03	2.5E-03	-1.4E-03	1.3E-03	3.2E-03	8.9E-03
Rural residence by primary + education and interval segment		-0.06	0.12	0.13	0.07	0.04	0.07	-0.18	0.09
Rural residence by primary + education and interval segment squared		2.9E-04	5.1E-04	-6.3E-04	3.3E-04	-2.6E-04	3.2E-04	3.7E-04	1.7E-04
Rural residence by primary + education and log of interval segment		2.09	2.41	-1.94	1.54	-0.09	1.49	4.61	2.67
Rural residence by primary + education and parity									
	1	0.00	-	0.00	-	0.00	-	0.00	-
	2	-0.27	0.94	1.55	0.71	0.53	0.60	2.16	1.11
	3	-0.94	1.10	1.11	0.73	-0.21	0.67	0.03	1.13
	4	-0.37	1.52	1.61	0.86	0.19	0.87	2.02	1.23
	5	2.55	1.74	2.70	1.18	1.03	0.89	1.97	1.35
	6	1.12	2.24	0.82	1.35	1.35	1.25	4.00	1.80
	7	-4.15	3.39	2.96	1.88	1.71	1.37	-1.23	2.04
	8	-0.26	4.56	5.55	2.01	0.31	2.19	1.72	3.10
	9	2.71	6.52	0.29	4.62	2.21	2.96	-3.55	4.03
	10	-2.95	6.63	9.54	5.47	-4.13	2.99	3.25	18.85
Rural residence by primary + education by interval segment and date of interval segment		1.5E-05	5.2E-05	-6.7E-05	3.4E-05	-2.8E-05	3.1E-05	7.9E-05	4.4E-05
Rural residence by primary + education by interval segment squared and date of interval segment		-8.6E-08	2.3E-07	3.1E-07	1.5E-07	1.5E-07	1.4E-07	-1.6E-07	9.7E-08
Rural residence by primary + education by log of interval segment and date of interval segment		-7.1E-04	1.1E-03	1.0E-03	7.3E-04	2.7E-04	6.9E-04	-1.9E-03	1.4E-03
Rural residence by primary + education by parity and date of interval segment									
	1	0.00	-	0.00	-	0.00	-	0.00	-
	2	1.4E-04	4.2E-04	-6.9E-04	3.5E-04	-2.1E-04	2.9E-04	-1.1E-03	5.5E-04
	3	4.4E-04	4.8E-04	-5.2E-04	3.6E-04	1.8E-04	3.3E-04	1.0E-04	5.6E-04
	4	2.0E-04	6.7E-04	-7.6E-04	4.2E-04	-7.8E-05	4.1E-04	-9.5E-04	6.1E-04
	5	-1.1E-03	7.5E-04	-1.2E-03	5.6E-04	-4.4E-04	4.2E-04	-8.1E-04	6.6E-04
	6	-3.3E-04	9.6E-04	-3.4E-04	6.3E-04	-5.3E-04	5.7E-04	-1.9E-03	9.0E-04
	7	1.8E-03	1.4E-03	-1.4E-03	8.7E-04	-7.4E-04	6.3E-04	6.6E-04	9.7E-04
	8	3.3E-04	2.0E-03	-2.5E-03	9.6E-04	-3.2E-04	9.9E-04	-8.5E-04	1.5E-03
	9	-1.1E-03	2.7E-03	-2.0E-04	2.1E-03	-9.5E-04	1.3E-03	1.8E-03	1.9E-03
	10	1.4E-03	2.8E-03	-4.5E-03	2.5E-03	1.7E-03	1.3E-03	-2.5E-03	9.0E-03
Intercept		-1370	10.66	-2.54	9.45	-8.98	8.74	-35.09	27.40