"The Fertility Transition in Kenya: Determinants of Contraceptive Use during the Late 1990s"

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1. Introduction

In view of high fertility, a number of studies have called for new approaches to family planning in sub-Saharan Africa (Caldwell and Caldwell 2002; Caldwell et al. 2002). In a number of countries however, Kenya in particular, the demographic situation has been relatively different. An examination of that program may provide lessons for more effective strategies for family planning in the future, and insights into the motivations among the different types of clients for adopting the various contraceptive methods. The trends in fertility and contraceptive prevalence in Kenya characterise this distinct demographic change – the fertility transition. From the mid-1970s to the 1990s, fertility and contraceptive use in Kenya changed significantly from a regime of natural fertility to one where controlled fertility, specifically use of modern contraceptive methods, has become more significant. The 1977/78 Kenya Fertility Survey (KFS) recorded a high total fertility rate (TFR) of 8.2 births per woman; by 1998 however, the TFR had reduced to 4.7. Similarly, contraceptive prevalence increased from 6.7% in 1977/78 to 39.3% in 1998.

As the fertility transition was underway, the national family planning also evolved. In 1967, the Government of Kenya launched the family planning program, integrating it into the Division of Maternal and Child Health (MCH) in the Ministry of Health. Subsequent to this, the first population policy guidelines were developed in 1984 and the current National Coordinating Agency for Population and Development (NCAPD) was created to coordinate population activities in the country. These policies were revised in the year 2000 to accommodate a paradigm shift towards reproductive health that was recommended during the International Conference on Population and Development (ICPD) of 1994.

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It is against this background that this study, an examination of the factors associated with contraceptive use in Kenya during the height of the fertility transition in the late 1990s is made; its objective being to contribute to a better understanding of the family planning and related factors in this transition. Within this broader goal, the immediate objective of this study is to examine the roles of fertility demand and contraceptive access in the use of family planning methods in Kenya using the 1998 Kenya Demographic and Health Survey (KDHS) and the 1999 Kenya Service Provision Assessment (KSPA).

2. Problem Statement

An examination of the contraceptive method mix and family planning service delivery outlets in 1998 illustrates the extent of the Kenyan family planning program. Breaking down the contraceptive prevalence rate of 38.8% then shows that the most commonly-used methods of contraception in 1998 among married women of reproductive age were: injectables (11.8%), pill (8.5%), female sterilization (6.2%), traditional methods (7.5%), IUDs (2.7%), condoms (1.3%), and implants (0.8%). Use of modern methods was higher in urban areas compared to the rural, but the reverse was true for natural methods (NCPD, 1999; Magadi and Curtis, 2003).

The source of modern methods also varied (Table 1). In 1998, family planning clients obtained most of their contraceptive supplies from Government health facilities, which served 58% of all contraceptive users. Private and NGO health facilities served 33% of the family planning clientele, other private sources such as shops (5%), while Community Based Distributors (CBDs) served 3%. Compared with many other countries in sub-Saharan Africa, this level of prevalence and distribution is high. A question that however arises is what role increased motivation for fertility control, and what part the family planning program, particularly access to services, have separately played in these relatively substantial levels of method use.

Table I: Percentage Distribution of Women Using a Modern Family Planning Method by Supply Source, Kenya 1993 and 1998

Level	Nairobi	Other Urban	Central Rural	Other Rural	National	Total No
1993						
Public Facility	53.1	55.6	77.5	71.4	68.7	1030
Private Facility	42.5	44.4	19.7	24.2	27.9	459
CBD	1.8	0.0	2.5	3.4	2.5	38
Other	2.7	0.0	0.4	1.1	0.9	13
Total%	100	100	100	100	100	
Total No	113	200	348	879	1540	1540
1998						
Public Facility	44.8	55.0	59.4	62.1	58.1	1030
Private Facility	54.6	43.9	38.0	32.5	38.4	672
CBD	0.0	1.1	2.6	5.2	3.4	74
Other	0.7	0.0	0.0	0.2	0.2	3
Total (%)	100	100	100	100	100	
Total No	143	281	290	1065	1779	1779

Notes: The majority of public health facilities comprise of Government, but also parastatal and city/town or urban council hospitals, health centres, and dispensaries. Private facility embraces mission or church hospitals, FPAK clinics, other private hospitals or clinics, pharmacies, private doctors, shops, friends or relatives. CBD refers to Community-based distributor or worker. Other sources cover mobile clinics, additional sources not mentioned above, and where respondents stated that they did not know the source from which they obtained the method.

A number of studies carried out in the past have attempted to answer this question - about the relationship between demand-side and supply-side factors of contraceptive use. On the one hand, two studies (Njogu 1991; Feyisetan and Casterline 2000) arrived at two conclusions. The first was that a condition for fertility decline in Africa in general and Kenya in particular is change in fertility demand, this change being primarily driven by variations in socio-economic conditions. The second was that it is nevertheless possible for increase in contraceptive prevalence to take place through satisfaction of unmet demand, without corresponding changes in fertility preferences and socio-economic factors.

Other studies carried out at the community level or within the catchment of health facilities indicated that access matters. For example, using results of the 1988/89 KDHS that were linked to a community survey, the Kenya Community Survey (KCS) conducted soon thereafter (Hammerslough 1992), it was concluded that, while at the beginning of the 1980s only 26% of the Kenyan rural population could reach a source of family planning services within 3 hours, this had increased to 87% by 1989. Similarly, a study conducted in the catchment of the Chogoria Methodist Mission Hospital in the Mount Kenya region (Goldberg et al. 1989) showed

that the family planning program operating in the area was possibly responsible for the fertility decline experienced in the region. Among the factors cited for the effectiveness of the program was the setting up of many clinics providing health services including family planning in the catchment area, as well as the presence of Health Educators (HEs) and Community Health Workers (CHWs) in the community.

In spite of the merits of these earlier studies, a number of relatively new issues related to contraceptive use in sub-Saharan Africa have come to the forefront, which encourages a re-examination of the question of contraceptive use in a new context, with relatively different perspectives. First, recent evidence from Tanzania (Ainsworth et al. 1998) and Kenya (Hill 2004) re-confirms the roles of rising infant and child mortality, and the changes in socio-economic conditions of households in affecting fertility behaviour. Secondly, as concluded in several studies (Guilkey and Jayne 1997; Angeles et al. 2005), contraceptive use is determined by both individual characteristics and community variables; there is also the question of endogeneity in fertility demand and contraceptive use. There is therefore need to provide a more complete, up-dated picture of the factors related to fertility demand, supply, and access that jointly determine changes in contraceptive use and, ultimately, fertility.

This study can be justified on several grounds. To the extent that it includes these recent contextual changes - in child mortality and household socio-economic status - the old question of fertility demand and access to family planning services is viewed from a new perspective. Secondly, from an evaluation point of view, the question of contraceptive use is a current and relevant population policy and program issue. In particular, it would be interesting to know what program strategies and modalities that address fertility intentions and family planning access are most effective. Lastly, choice of the reference year for this study deserves to be justified. The year 1998 is significant because it represents the height of the fertility transition in Kenya before the stagnation and so it is a vantage point from which to look back, and forward.

3. Data, Methods, and Hypotheses

3.1 Data Sources

Data for this study comprise of two surveys, namely the 1998 KDHS (an individual-level dataset) and the 1999 KSPA (a community and health-facility based survey). The two are linked

– half of the 530 clusters sampled for the 1998 KDHS were randomly selected for the KSPA community and health-facility survey. The objective of the 1999 KSPA survey was to provide information on reproductive and child health services in Kenya (MOH 2000). The survey contains information on the functioning and quality of health services in the key areas of family planning, maternal health, child health, sexually transmitted infections, and HIV/AIDS. It focused on services provided at the health facilities, and on the perceptions of community members on these services. One of the variables captured in the community part of the survey and used in this study is the presence of community-based distributors in the community. Similarly, from the health facility inventory questionnaire, a number of variables are used for analysis, these comprising the date in which the health facility was opened.

So constituted, the two datasets enable examination of individual and community-level factors involved in contraceptive use, taking into account both fertility demand and supply factors. From the 7,881 women of reproductive age interviewed in the 1998 survey, only those in the 536 clusters (communities) covered in the KSPA 1999 survey were retained. Within this new dataset, further restrictions were applied in order to comply with the requirements of the analysis. Women who were currently married, not pregnant, not sterilized, but fecund were retained; also those who indicated being undecided about their ideal family size were excluded from the analysis. This was done in order to ensure that one of the key variables in the analysis, the number of additional children desired, could be rendered continuous. This process resulted in a total sub-sample of 1,923 women, and the type of health facility they were associated with was then matched with each woman.

Among the problems encountered while merging the KSPA survey with the individual dataset, identification of the health facilities with the respective community or cluster they were associated with initially turned out to be difficult. This is because the main identifier – cluster number or community name – was not always indicated in all the community and health facility questionnaires. Nevertheless, the availability of two GIS datasets in the internet greatly facilitated the merging and matching of health facilities, clusters, and women respondents. These were, first, a Geographic Information System (GIS) on the location of health facilities in the country which is maintained by the Nairobi-based International Livestock Research Institute (ILRI). The second was a similar databse on the location of health facilities in the country's administrative set-up, which is hosted by the website of the Ministry of Health. This resulted in a

matching, which although not perfect, was informed by the location of the health facilities provided in the two GIS databases.

Secondly, while it was desired that the distance to the nearest health facility be recorded, this variable was not available in the data, and extricating this measure from the available longitudinal and latitudinal coordinate system was not possible within the scope of this study. Instead, the location of the health facility - whether in an urban or rural area – is used in this analysis as a proxy for proximity of a health facility to (potential) family planning clients. To address the possible limitations arising from not perfectly matching the individual and health facility datasets, two separate probit regressions of contraceptive use as dependent variable are made - one with the merged individual-woman and community-level data, and the other comprising only the 1998 KDHS individual dataset.

3.2 Causal Model, Statistical Methods, and Hypotheses

Among popular theories of fertility change, contraceptive use (which is a proximate determinant of variation in fertility) is considered a function of basic determinants, with fertility demand acting as an intermediate variable (Easterlin and Crimmins 1985). In the straight-forward case of this model, the determinants of contraceptive use can be grouped into two parts: those which directly influence it, and the others which do so only indirectly through fertility demand (motivation for fertility control). However, it is quite possible that unobserved variables affect both motivation for fertility control, and contraceptive use - in which case there will be endogeneity between the two variables. The estimates of the magnitude of the coefficients (and not just that for motivation but for other determinants such as exposure to family planning messages and access to family planning facilities as well) are likely to be biased, in this case overestimated.

Given the polychotomous nature of the endogenous variables – current contraceptive use and fertility intentions - a number of options are available to address the biasing effect of endogeneity on coefficients of parameter estimates. For the multinomial regression that would consequently be required, one solution would be a system of simultaneous equations, which is resolved through the full information maximum likelihood (FIML) method (Guilkey and Jayne 1997). However, this undertaking is beyond the scope of this analysis and readily available software: requiring, for example, the application of a special generalised linear and latent mixed

model (GLLAMM) or writing out the entire system of simultaneous equations and then using the maximum simulated likelihood method to address the unobserved heterogeneity (Haan and Uhlendorff 2006).

If the endogenous variables are regrouped into either continuous or binary coding, a second solution would be to apply the instrumental variables (IV) method (Kmenta 1997; Wooldridge 2000; Kennedy 2003). The limitations of this approach are the difficulty in finding a good instrument and the larger variances that consequently result; its strength lies in yielding consistent estimates of the parameters when an appropriate instrument is applied. A third solution would involve ignoring the endogeneity between contraceptive use and the number of additional children desired. The last two approaches are applied in this paper, using the probit distribution, with motivation for fertility control (additional children desired) being considered as a continuous variable.

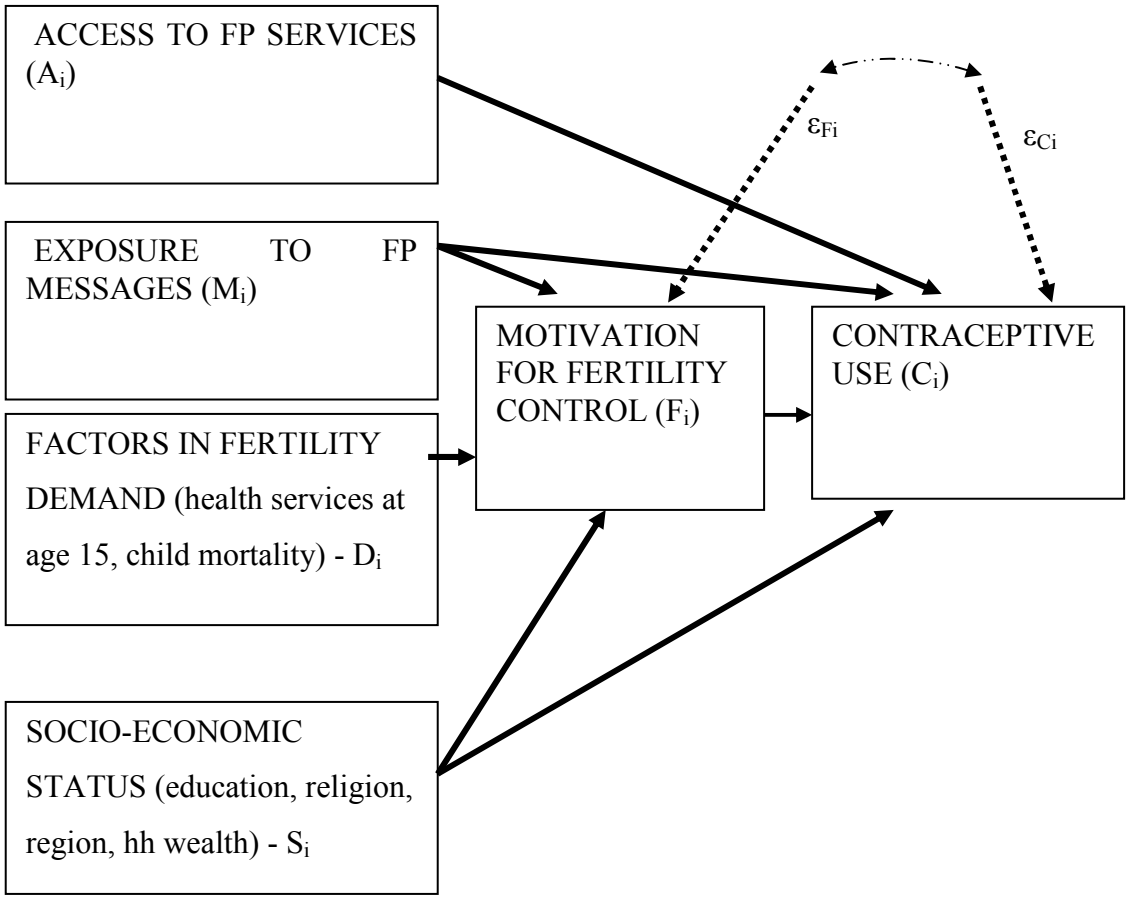
While it would have been useful to consider contraceptive use as a polychotomous variable - categorised into not using, using a modern method, and using a traditional method - this is not possible with the instrumental variables model applied here. Instead, contraceptive use is simply grouped into using a method (modern and traditional) and not using. In the final analysis, the focus of the regressions performed is the simple probit in which the problem of endogeneity is ignored – past studies having shown that it might be better to apply this simpler method than more complicated techniques (Bollen et al. 1995). The binary probit distribution is also preferred to the corresponding logit because of the symmetry between probit and ordinary least squares (OLS). Finally, a multinomial logit regression in which the endogeneity between motivation for fertility control and contraceptive use is not taken into account is also applied, the purpose being limited to alternatively evaluating the significance and direction of hypothesized effects.

The following models are therefore implemented. First, an ordinary least squares regression (OLS) is carried out with the additional number of children desired as the dependent variable: this step assesses the factors that determine the additional number of children desired - a key determinant of contraceptive use. Secondly, a simple probit regression is run that ignores the problem of enodogeneity. Thirdly, to test the exogeneity of additional children desired, a probit regression is effected with contraceptive use as the dependent variable, and the residual term from the first (OLS) regression included as part of the regressors. The fourth regression

involves applying the two-step instrumental variables technique – whether health facilities were available in the community when the woman was 15 years old, and the community child mortality ratio acting as the identifying variables for the contraceptive use equation. This set of variables is thought to be correlated with the endogenous variable. Finally, contraceptive use is determined in reduced form, without including additional children desired in the regression, and the five regressions closely compared. Two other simple probit regressions implemented for further comparisons, are those constrained to the merged 1998 KDHS (individual level) and the 1999 KSPA (community) survey data, and to the 1998 KDHS survey alone. Lastly, a multinomial regression that takes into account the polychotomous categorization of the dependent variable (contraceptive use) and motivation for fertility control is also run for general comparison purposes.

The pathways for the influence of basic determinants and motivation for fertility control on contraceptive use are illustrated in the path diagram below (Figure 1) in which two equations, which comprise additional children desired and contraceptive use as dependent variables, arise. First, contraceptive use is determined by the endogenous variable (additional children desired) which includes the indirect effects of exogenous variables acting through the endogenous variable, but also through their direct influences. Current access to family planning facilities is modelled to affect contraceptive use directly. The predetermined variables include those grouped under socio-economic status, the factors in fertility demand, exposure to family planning messages, current access to facilities, and whether the health facility to which the respondent's community is affiliated was open by the time the respondent was 15 years old. Secondly, motivation for fertility control (the number of additional children desired) is affected by the exogenous variables. Nevertheless some of the predetermined variables - community mortality, and whether the health facility was open when the woman was 15 years old - are assumed to affect contraceptive use only indirectly through motivation for fertility control.

Figure 1: Path Diagram for Relationship between Basic Determinants, Motivation for Fertility Control, and Contraceptive Use



Given these relationships, the following equations are modelled in order to address the problem of endogeneity:

1. OLS Regression: $F_i = \beta_{0F} + \beta_{1F}M_i + \beta_{2F}D_i + \beta_{3F}S_i + \varepsilon_{Fi}$

2. Simple Probit ignoring endogeneity: $C_i = \beta_{0C} + \beta_{1C}F_i + \beta_{2C}A_i + \beta_{3C}M_i + \beta_{4CP}S_i + \varepsilon_{Ci}$

3. Probit with motivation manually predicted:
   $C_i = \beta_{0C} + \beta_{1C}F_{i(est)} + \beta_{2C}A_i + \beta_{3C}M_i + \beta_{4C}S_i + \varepsilon_{Ci}$

4. IV Probit with access to health facilities at age 15 and child mortality as exclusions:
   $C_i = \beta_{0C} + \beta_{1C}F_{i(pred)} + \beta_{2C}S_i + \beta_{3C}A_i + \beta_{4C}M_i + \varepsilon_{Ci}$

5. Reduced-form Probit:
   $C_i = \beta_{0C} + \beta_{1C}S_i + \beta_{2C}A_i + \beta_{3C}M_i + \varepsilon_{Ci}$

In the equations, the coefficient with a zero subscript (β_0) refers to the intercept, while the others pertain to the following variables as defined in the path diagram: A: current access to family planning services; M: having been exposed to a family planning message in the last six months before the survey; D: factors in fertility demand; S: socio-economic variables; F: motivation for fertility control. The subscripts F and C in the coefficients relate to the dependent variables – motivation for fertility control and contraceptive use respectively, while ε refers to the error term in the respective equation.

The five models can be explained as follows. First, an ordinary least squares regression (OLS) is carried out with the additional number of children desired as the dependent variable: this step assesses the factors that determine the additional number of children desired, a key determinant of contraceptive use. Secondly, a simple probit regression is run that ignores the problem of enodogeneity. Thirdly, to test the exogeneity of additional children desired, a probit regression is effected with contraceptive use as the dependent variable, and the residual term from the first (OLS) regression included as part of the regressors. The fourth regression involves applying the two-step instrumental variables technique – whether health facilities were available in the community when the woman was 15 years old, and the community child mortality ratio acting as the identifying variables for the contraceptive use equation. This set of variables is thought to be correlated with the endogenous variable. Finally, contraceptive use is determined in reduced form, without including additional children desired in the regression, and the five regressions closely compared. In addition to these five regression equations, two other simple probit regressions are implemented for further comparisons – one constrained to the merged 1998 KDHS (individual level) and the 1999 KSPA (community) survey data, the other to the 1998 KDHS survey alone. Lastly, a multinomial regression that takes into account the polychotomous categorization of the dependent variable (contraceptive use) and motivation for fertility control is also run for general comparison purposes.

Given these linkages, a number of hypotheses on the determinants of use of family planning methods are tested. First, it is hypothesiszd that age and region of residence influence contraceptive use. The idea of parity-specific fertility control is pertinent here - being more more likely to stop further childbearing, older women are expected to show a higher likelihood of using a contraceptive method. Contraceptive use is expected to differ by region of residence: women from more modernised settings, such as rural Central Province, are expected to be more

predisposed to contraceptive use. Secondly, it is expected that contraceptive use depends on motivation for fertility control - women who are more motivated will use a contraceptive method; those who are less motivated will corresspondigly be less likely to use one. Thirdly, it is hypothesized that contraceptive use is a function of access – it it is expected that contacts with community based distributors (CBDs) or proximity to health facilities play significant and positive roles in the use of a family planning method.

4. Results

4.1 Descriptive Statistics

The two datasets were finally matched; analysis commenced with an exploratory examination of the descriptive statistics (means and standard deviations) for the exogenous and endogenous variables. In particular, the means for variables which form the basis of the regressands later used in the analysis - ideal family size, current contraceptive method, number of births and deaths – are presented in Table II below. The results show that for ideal family size, 120 women (5.6% out of the selected sub-sample) reported that they were undecided about their ideal family size. Similarly, while 30.8% of the women in the selected and weighted sub-sample (of 2,043 women out of the total KDHS sample of 7,881) are currently using a modern method, a much smaller proportion - 9.5% - is using a traditional method.

Table II: Descriptive Statistics for Ideal Family Size and Contraceptive Use, Kenya 1998

	Percentage	Number of Cases
Ideal Family Size:		
0-3	34.6	667
4-5	45.7	947
6+	14.1	308
Non-numerical	5.6	120
Total	100.0	2042
Current Use of Methods:		
Using Modern	30.8	597
Using Traditional	9.5	170
Not using	59.7	1276
Total	100	2043

Notes: The percentages and number of cases are weighted. The means and standard errors (included in parentheses) have been calculated using the Taylor Linearization method for complex sample design used in the KDHS (NCPD 1999). The rounding off associated with weighting the samples explains the small differences in the sample sizes.

To decide on the categorization of the two dependent variables, a number of exploratory model specifications were conducted. One of these comprised grouping the endogenous variable (fertility intentions) into the dichotomy of wanting no more children versus the rest (wanting within two years, after two years, undecided). Contraceptive use was also similarly categorized into the binary categories of currently using a modern method versus a traditional method or not using any. When these and other specifications were applied in the probit regression with instrumental variables, the models would either not converge, or produced disappointing results.

The form of dependent variables ultimately chosen was additional number of children desired (continuous) and contraceptive use (dichotomised into using a modern or traditional method and not using any method). The first choice was made in order to conform to the requirement of continuous or binary variables for solutions of systems of equations that involve endogenous variables (Bollen et al. 1995). For the second, contraceptive use, it is worth noting that in Kenya, traditional or natural methods of family planning are often considered side by side with the modern: funding and implementation of the family planning program officially comprises the two, with the Kenya Catholic Secretariat implementing the natural family planning component in the national program. In the regression analyses that follow, the number of additional children desired is treated as a continuous variable, and is calculated as the ideal number of children reported minus the number of living children. This is in spite of the categorical presentation in Table II, and the bias in ideal number of children as a measure of fertility demand notwithstanding (Bongaarts 1990; Pritchett 1994). The results in Table III show that among women who report the number of living children they have as being equal to or more than their ideal family size, i.e. those who are content with or have exceeded their lifetime fertility desire, 48.1% are using either a modern or traditional method of family planning. The proportion using a contraceptive method decreases with increasing fertility preferences: for example, only 10% of women who report wanting six or more additional children are using a method of family planning.

Table III: Distribution of Dependent Variables among Currently-Married Women, Kenya 1998

Additional Children Desired	Current Contraceptive Use		
	No	Yes	Total
≤0	51.9	48.1	923
1-3	61.2	38.8	833
4-5	81.2	18.8	132
6+	90.0	10.0	34
Total	58.6	41.4	1922

Note: Respondents who reported a non-numerical response for ideal family size are not included in this tabulation.

In addition to the above outcome variables, the means and standard errors of independent variables - most of which are constructed as dummies but a number being continuous – are shown in Table IV. The upper part of the table comprises variables at the individual level – these are age, religious affiliation, spouses' educational levels, births, child deaths, the community child mortality index (at the level of the community, estimated as the ratio of the total number of children who have died divided by the number ever born), the wealth index, the presence of the husband in the household, and exposure to a family planning message (a variable that might be potentially endogenous in motivation for fertility control, but which is nevertheless considered as predetermined here).

Several features of the distribution of the independent variables are worth pointing out. From the age distribution, it is apparent that most of the respondents are concentrated around the peak childbearing ages groups, and in particular between ages 25 and 29 inclusive, which comprises 24% of the women in the sub-sample. When the distribution is examined by religious affiliation, it emerges that Protestants predominate, forming 67% of the women represented. For the educational levels of husband and wife alike, the primary level is most frequent, constituting 47.1% and 57.2% of the respective spouses. While the mean number of children ever born per woman is 3.976, the results also show that if all the number of dead children were distributed to the women interviewed, it would come to about 0.4 child deaths per woman. Subtraction of the means of child deaths from that of the number of children ever born implies a mean of 3.5 surviving children per woman. The table also shows that at the level of the community, about 10% of all children ever born have passed away. Regarding husbands, 26.3% were reported to be away from the household at the time of the interview. In contrast to all women of reproductive

age interviewed in the 1998 KDHS, among whom only about 15% had been exposed to a family planning message over the radio or television, a substantial proportion of the women in this sub-sample, 61.2%, have been exposed to a family planning message (through the radio, television, or newspapers) at some point during the six months before the survey. The increased proportion could be related to the selection of only some clusters, as well as to the increased number of media included in the estimation of exposure for this sub-sample.

Table IV: Descriptive Statistics for Exogenous Variables, Kenya 1998/1999

Variable	Mean	Standard Error
Age:		
15-19	0.060	0.006
20-24	0.198	0.012
25-29	0.242	0.012
30-34	0.181	0.011
35-39	0.174	0.010
40-44	0.085	0.071
45-49	0.061	0.006
Religion:		
Catholic	0.261	0.017
Protestant	0.670	0.019
Muslim	0.035	0.009
Other	0.034	0.006
Husband's Education:		
None	0.083	0.011
Primary	0.471	0.017
Secondary+	0.445	0.019
Wife's Education:		
None	0.127	0.013
Primary	0.582	0.017
Secondary+	0.291	0.019
Births:	3.878	0.093
Child Deaths:	0.394	0.033
Community Child Mortality Ratio:	0.094	0.007
Wealth Index:		
Low	0.389	0.025
Medium	0.239	0.015
High	0.363	0.025
Husband Away:	0.263	0.014
F.P. Message:	0.612	0.017
Region:		
Nairobi	0.088	0.024
Other Urban	0.133	0.026
Central Rural	0.094	0.019
Other Rural	0.685	0.035
Access to Facility:		
Hospital	0.075	0.023
Health Centre	0.055	0.018
Dispensary	0.076	0.023
Maternity/Nursing Home	0.085	0.022
Clinic	0.101	0.025
CBD	0.311	0.033

Notes: Results based on currently married women in the 1998 KDHS, and linked to the 1999 KSPA community survey

In the expectation that community factors also play an important role in influencing motivation for fertility control and contraceptive use, a number of community variables were examined and are shown in the lower part of Table IV. Starting with the locality in which the respondent resides, the results show that most of the clusters or villages visited during the 1999 KSPA community and health facility survey, 68.5%, are found in other rural areas, with Nairobi and rural Central Province constituting only 8.8% and 9.4% respectively of the sub-sample. The other community variables relate to whether the health facilities were open by the time the respondent was starting her reproductive career, and current access to family planning services. The first of the health facility variables is measured by whether the nearest health facility was open by the time a woman was 15 years of age, starting in 1963 when the country received political independence and when significant expansion in all development sectors including health infrastructure commenced. Following past applications (Bollen et al. 1995), this set of dummy variables (access when the woman was 15 years old) – together with the community mortality ratio - is used as the exclusion constraint for identifying the contraceptive use equation in the regression analysis. It appears in the regression in which additional children desired is a dependent variable, but not in the contraceptive use equation. It is assumed that once opened (starting in the year 1963 or later) health facilities remain so throughout the period of observation. For current access to a facility, the results show that few of the communities (and hence facilities) are in urban areas.

One of the problems encountered in the health facility data is that it was not possible to determine the date of opening for 51 out of the 388 health facilities. A second problem had to do with the allocation of health facilities to the catchment community or cluster to which each is attached - it was not possible to do this accurately for all the health facilities. As a result of these two problems, in addition to the fact that many health facilities opened much later than the year set here for the start of observation (i.e. 1963), many of the means for the health facility are low, as can be seen in Table IV.

Another variable that was used to capture current access to family planning services is whether a community-based distributor (CBD) operates in the community, and the results indicate that 31.1% of the communities have a CBD agent, a figure that seems to be exaggerated in comparison to the 20.7% obtained in the 1993 KDHS (NCPD 1994).

The location of the community - whether in an urban or rural area – to which each of the five types of health facilities is associated was used as a proxy for the more accurate measure of access to family planning services, such as distance to the health facility; the assumption being that communities living in urban areas are within closer proximity to the facilities offering family planning services than those living in completely rural areas. In addition to this physical access, people living in urban areas would also be expected to have better access to information (through better education and exposure to media) about family planning services.

4.2 Results of Regression Analysis

4.2.1 Effects on Additional Children Desired

Motivation for fertility control is one of the important variables hypothesized to influence contraceptive use, and it is useful to understand the factors that determine it. Table V shows the probit regression results of the factors that affect additional children desired, with most regressands having been constructed as dummy independent variables. Several coefficients are worth noting, the focus being on the effects of three variables that were hypothesized to influence contraceptive use – age, region of residence, and exposure to family planning messages. As the table shows, the age effects are strong, significant, and in the expected direction: the desire for additional children decreases with age, being highest among young women, and lowest among the oldest. Whether this significant trend is associated with parity-specific fertility control is however not clear at this point of the analysis. For the other hypothesized relationships, the effect of exposure to family planning messages on desire for additional children is non-significant. For region of residence, living in Nairobi is positively and significantly associated with desire for additional children (possibly because of a younger age structure of women within reproductive age) as the effects of habitation in rural Central province and other rural areas significantly decrease with additional children desired.

Although not among the directly hypothesized relationships, two effects – those for the index of community child mortality and educational level - turned out to be significant. The effect of the first (child mortality) is big (3.987), highly significant (at the 0.001% level), and in the positive direction. On the other hand, the effect of the wife's primary-level education

(-0.824) is in the negative direction, at the 0.01 level of significance, with secondary and higher education being non-significant.

Table V: Ordinary Least Squares Regression of Additional Children Desired on Independent Variables, KDHS 1998/KSPA 1999

Age group:	Coefficient
15-19	4.340***
20-24	3.587***
25-29	2.600***
30-34	1.843***
35-39	1.278***
Wealth Index:	
Medium	0.266
High	-0.393**
Religion:	
Catholic	-0.521
Religion:	
Protestant	-0.425
Muslim	0.776
Community Mortality Ratio:	3.987***
Wife's Education:	
Primary	-0.824**
Secondary	-0.530
Husband's Education:	-0.001
Region:	
Nairobi	0.583**
Central Rural	-0.376*
Other Rural	-0.365*
FP Message:	-0.177
Access to health facilities at age 15:	
Hospital	0.240
Health Centre	0.072
Dispensary	0.004
Maternity and Nursing Home	0.257
Clinic	-0.282
Constant:	-0.599
R-squared	0.32

Note: ***: p<0.001; **: p<0.01; *: p<0.05

4.2.2 Effects on Contraceptive Use

Results for the simple probit regression, in which the problem of endogeneity is ignored, are shown in Table VI below. Of the hypothesized effects, those for age, region of residence, and exposure to a family planning message are significant, and are discussed in turn. The results show that it is the two peak ages of child-bearing, 25 to 29 and 30-34 years, that are significantly associated with contraceptive use – in the positive direction. Thus, column two in Table VI indicates that age group 25-29 is associated with a 0.342 increase in contraceptive use, while age group 30-34 is even more significant, with a higher effect of 0.390.

Among the regions, residence in Nairobi city is associated with increased contraceptive use at the 0.5% level of significance, while rural Central province shows a very significant association – at the 0.1% level of significance. This confirms the previous observation of the high contraceptive rates in the two regions. Thus, the effect of residence in Nairobi city is to positively change contraceptive prevalence by 0.404 units. For rural Central province, the effect is even higher, at 0.717 units.

Having been exposed to a family planning message in the past six months before the survey is associated with increased contraceptive prevalence. This is by order of magnitude of 0.232, which is highly significant at the 1% level. Despite this positive and significant association, it is not clear whether exposure to messages leads to increased contraceptive use. The possible explanation of reverse causality, i.e. women who use contraceptives being selectively included in the sub-sample so much that by virtue of their contraceptive use, they are more exposed to family planning messages could also count.

A number of variables, which did not form part of the hypothesized effects, are also observed to significantly affect contraceptive use. These include ownership of household assets, and the wife's education. The first, ownership of durable household goods, has a small effect (0.082) which is also significant only at the 5% level. On the other hand, the wife's primary and secondary or higher levels of education have large effects. A woman with primary education is associated with a 0.320 change in contraceptive use, while secondary or higher education is associated - as expected - with a change that is very significant and more than twice (0.657) higher.

Results for the simple probit regression, in which the problem of endogeneity is ignored, are shown in Table VI below. Of the hypothesized effects, those for age, region of residence, and exposure to a family planning message are significant and are discussed in turn. The results show that one of the peak age groups for child-bearing, 30-34 years, is significantly associated with increased contraceptive use. Thus, column two in Table VI indicates that age group 30-34 is associated with a 0.270 increase in contraceptive use.

Among the regions, residence in Nairobi city is slightly associated with increased contraceptive use (at the 5% significance level), while rural Central province shows a stronger level of significance – 1%. This confirms the previous observation of the high contraceptive rates in the two regions. Thus, the effect of residence in Nairobi city is to positively change contraceptive prevalence by 0.436 units. For rural Central province on the other hand, the effect is even higher, at 0.594 units. Regarding motivation for fertility control, as expected, contraceptive use significantly decreases with an increasing number of additional children desired; the possibility that this result overestimates the effect of desire for additional children on contraceptive use being treated in greater detail further on in the article.

Having been exposed to a family planning message in the past six months before the survey is significantly associated with increased contraceptive prevalence - by order of magnitude of 0.250, which is highly significant at the 0.1% level. Despite the accord, in terms of significance of this result with other research findings (Westoff and Rodriguez 1995), the effect of exposure to mass media messages on contraceptive use could be underestimated. This is because, in spite of the expectation of increasing use of contraceptive methods with intensification of IEC campaigns, the purposive targeting of regions of low contraceptive use (areas in which fertility desires are high and respondents are unlikely to remember having heard messages in the last six months) with media messages could result in reducing the IEC effect on contraceptive use (Briscoe et al. 1990; Bollen et al. 1995; Wonnacott and Wonnacott 1995; Guilkey and Jayne 1997).

Nevertheless, assuming that ownership of the most popular medium of communication (radio) does not vary greatly between regions with high and low fertility, exposure to messages may be considered to be generally random across the country - in other words, a predetermined or exogenous variable. Given the question of the endogeneity or exogeneity of media messages in the determination of contraceptive use, empirical testing of the endogenous model would help

resolve the issue - however this is an undertaking that was not central to this dissertation, and therefore not addressed.

A number of variables which did not form part of the hypothesized effects also significantly affect contraceptive use. These include belonging to a household of high wealth index, and the wife's education. The first, coming from a household of high wealth, has a 0.270 effect on contraceptive use, which is significant at the 0.1% level. On the other hand, the wife's primary and secondary or higher levels of education have much larger effects. A woman with primary education is associated with a 0.414 change in contraceptive use, while secondary or higher education is associated - as expected - with a change that is very significant and of magnitude 0.751 or 81% higher.

Table VI: Probit Regression Results of Contraceptive Use on Independent Variables, by Type of Regression, Kenya 1998/1999

	Simple Probit	Probit With Error Term	IV Probit	Reduced Form Probit
Additional Children Desired:	-0.071***	-0.648***	-0.579***	
Residual		0.593***		
Age group:				
15-19	-0.031	2.512***	2.227***	-0.352*
20-24	0.089	2.212***	1.964***	-0.182
25-29	0.164	1.697***	1.480***	-0.031
30-34	0.270*	1.348***	1.163***	0.128
35-39	0.083	0.827***	0.686***	-0.019
Wealth Index:				
Medium	-0.086	0.069	0.105	-0.107
High	0.270**	0.004	0.033	0.298**
Religion:				
Catholic	-0.028	-0.302	-0.132	0.008
Protestant	-0.094	-0.284	-0.095	-0.067
Muslim	-0.176	0.325	0.431	-0.223
Wife's Education:				
Primary	0.414**	-0.091	0.079	0.455***
Secondary	0.751***	0.391*	0.473**	0.775***
Husband's Education:	0.004	0.005	0.012*	0.004
Region:				
Nairobi	0.436*	0.719***	0.719**	0.405*
Central Rural	0.594**	0.360	0.438*	0.627**
Other Rural	-0.072	-0.160	-0.185	-0.054
Husband Away:	-0.092	-0.119	0.014	-0.105
FP Message:	0.250***	0.148*	0.163	0.260***
Access:				
CBD	-0.063	-0.046	-0.087	-0.054
Hospital	-0.167	-0.029	-0.062	-0.163
Health Centre	-0.039	-0.009	0.055	-0.052
Dispensary	-0.016	-0.002	-0.077	-0.019
Maternity and Nursing Home	0.020	0.107	0.028	0.031
Clinic	-0.068	-0.125	-0.046	-0.074
Constant:	-0.953**	-1.194***	-1.503***	-0.897**
Observations	1895	1895	1895	1896

Notes: 1. ***: $p<0.001$; **: $p<0.01$; *: $p<0.05$;

2. A number of dummy variables were omitted for the following groups of variables: age (40-44 and 45-49); religion (other); wife's education (none); Region (other urban)

4.2.3 Exogeneity of Additional Children Desired

In modeling the effects of the determinants of contraceptive use, the central issue is whether motivation for fertility control (the number of additional children desire in this case) is exogenous or endogenous in the system of relationships. When it is assumed, as in this paper, that endogeneity does in fact exist, then the error terms for the equations on additional children desired and on contraceptive use would be correlated, and this would have the effect of rendering the above results of the simple probit regression, to be biased. A method therefore needs to be devised to control for this simultaneity. Column four in Table VI above presents some of the results that take into account the problem by using the two-stage least squares approach, which is a modification of the instrumental variables technique. However, first, the question arises as to whether the variable - additional children desired - is really endogenous. This exogeneity or otherwise is tested by including the residuals from the regression comprising additional children desired as dependent variable, in a subsequent regression which has as dependent variable, contraceptive use. In this new regression, the number of additional children desired is also included as an independent variable.

Confidence in this regression is bolstered by the fact that in the first regression, with additional children as the dependent variable, the value of R^2 is quite high, namely 0.32. This means that the independent variables explain quite a substantial amount of variation in additional children desired: a predicted value of the latter would not therefore arise simply out of chance. Secondly, in column three of Table VI, the residual term is highly significant, implying that there is a problem of endogeneity; use of the instrumental variables technique can therefore continue. The t-test on the coefficient of the residual was also applied to the equation, and the results were significant at the 0.1% level, with a chi-square of 31.4. This means that the variable, additional children desired, is endogenous in the equation for contraceptive use.

4.2.4 Instrumental Variables and Two-Stage Least Squares

The results of the two-step regression (StataCorp. 2007) of contraceptive use on independent variables are shown in column four of Table VI above. The Wald test led to the rejection of the hypothesis of exogeneity of the instrumented variable (additional children desired) – the chi-square value of 32.4 being significant at the 0.1% level. As can be observed in

the table, the magnitude of the coefficients in comparison with those in the simple probit (column two) is not the same, and a brief comparison is made of these quantities. For age group 30-34, the coefficient of the two-step regression is higher by over 3.3 times, which is a very big difference. The coefficients for region of residence, particularly Nairobi, show a much smaller amount of increase, i.e. 64.9%. For rural Central province on the other hand, the coefficient of the regression using the instrumental variable technique is lower than that for the simple probit that ignores the problem of endogeneity – by 26.2%. It is also noted that the coefficient of the impact of desire for additional children, while remaining significant as in the simple probit regression, is now much lower in accordance with the model of endogenous placement where it is presumed to be overestimated.

4.2.5 Reduced Form Regression

Column five of Table VI shows probit regression results in reduced from, i.e. without the endogenous variable - additional children desired - being included. A number of observations can be made concerning the hypothesized effects. First, among the age groups, only being 15 to 19 years old is significant. Secondly, the coefficients for the two regions of residence - Nairobi and rural Central province - remain significant, in the same direction, and with about the same order of magnitude as in the simple probit regression that ignores endogeneity; similar observations appertain to having been exposed to a family planning message in the six months before the survey.

The four columns of results in Table VI help to explain the impact of a number of significant variables such as having been exposed to a family planning message, region of residence (rural Central province in particular), and secondary education on contraceptive use. For family planning messages, it should be noted that in the simple probit regression (significant coefficient of 0.232), desire for additional children is simply one of the independent variables and endogeneity is not taken into account. In column three, which comprises results from the probit regression with the predicted value of additional children desired included, the unobserved effects of endogeneity is removed, so to say manually, and it is not precise enough. Consequently, with the predicted additional children desired included in the model, the coefficient for the effects of family planning messages is reduced (0.177). In column four of Table VI, the influence of endogeneity is removed by the use of a more accurate method, the

two-step approach, and the effect of messages attains 0.163 but is not significant. In the last column (results from the reduced form probit) the coefficient for messages increases to 0.260, and represents the total effect of messages on contraceptive use, without separating into the direct and indirect effects (through desire for additional children). The coefficients for rural Central province and secondary education follow a similar pattern. Considered together, these results show that when the endogeneity between motivation for fertility control and contraceptive use is taken into account, a number of variables which comprise region of residence, and education have direct impact on contraceptive use, with exposure to family planning messages surprisingly not being significant in the two-step regression.

4.2.6 Community and Individual-Level Results

Two other probit regressions – first the regression of contraceptive use on independent variables but in which only the individual 1998 KDHS and 1999 community data are used, and secondly one restricted to the 1998 KDHS dataset alone – were conducted. The purpose of running them was to evaluate the 1998 KSPA community and health facility data, and the results are presented in Table VII below. The findings for the community-level regression show some similarities to the simple probit regression of contraceptive use. First, as in the simple probit, only age group 30-34 is significant. Secondly, both regions of residence which were significant earlier - Nairobi city and rural Central province – remain so. Lastly, exposure to a family planning message is also (very highly) significant.

When the regression is conducted using only the 1998 KDHS data, a number of similarities and differences also emerge. First, the age effects remain significant, but this time extend from age group 20-24 right upto 35-39. The biggest effects nevertheless remain with age groups 25-29 and 30-34. Secondly, the significance of Nairobi city and rural Central province persist, but the magnitudes of coefficients are reduced. Thirdly, the influence of exposure to a family planning message remains very highly significant (at the 0.1% level), however the size of the coefficients is lower than in the simple probit. These findings indicate that the results obtained in the simple probit regression using the 1999 health facility and community data which are merged with the 1998 survey data for the individual woman - on age, region of residence, and exposure to a family planning message as well as education – generally agree with those from other regressions in terms of the significance and directions of the coefficients.

Table VII: Results of Probit Regression of Contraceptive Use on Independent Variables, by Type of Dataset, Kenya 1998/1999

	Including Community Data	1998 KDHS Alone
Additional Children Desired:	-0.0707***	-0.073***
Age Group:		
15-19	-0.033	-0.020
20-24	0.098	0.207*
25-29	0.168	0.334***
30-34	0.274*	0.309***
35-39	0.088	0.219*
Wealth Index:		
Medium	-0.092	-0.057
High	0.265**	0.243***
Religion:		
Catholic	-0.583	0.849
Protestant	-0.646	0.771
Muslim	-0.733	0.758
Other	-0.567	0.867
Wife's Education:		
Primary	0.406**	0.347***
Secondary	0.738***	0.795***
Husband's Education:	0.004	0.005
Region of Residence:		
Nairobi	0.365*	0.264*
Central Rural	0.634***	0.591***
Other Rural	-0.029	-0.034
Husband Away:	-0.097	-0.119*
Exposure to FP message:	0.255***	0.236***
Constant	-0.464	-1.945**
Observations	1895	3633

*** p<0.001, ** p<0.01, * p<0.05

4.2.7 Multinomial Regression

With the probit regressions conducted above, it was possible to take into account endogeneity between exposure to family planning messages and contraceptive use. Nevertheless, one of the limitations of these models is that they do not incorporate the polychotomous nature of the endogenous dependent variables – motivation for fertility control, and contraceptive use. Consequently, a simple multinomial logit regression, which overcomes this problem but nevertheless does not address the problem of unobserved heterogeneity, was applied and the results are shown in Table VIII. To accomplish this regression, fertility intentions were categorized into: want more children within two years from now, want more children two or

more years from now, want no more children, and undecided. Similarly, contraceptive use was categorized into using a modern family planning method, using a traditional method, and not using any.

With respect to the hypotheses set for this study, the results of the multinomial logit regression are consistent with those obtained from the probit regression - at least with regard to the direction and significance of coefficients. Wanting no more children, wanting to space after at least two years, and being undecided are positively associated with using a modern method of family planning: this is true with reference to women who are not using any method as well as with those using a traditional. The results of effects for Nairobi and rural Central province on modern contraceptive use, relative to not using any method, also show very high significance, as do those for exposure to a family planning message.

Table VIII: Results of Multinomial Logit Regression of Contraceptive Method Used on Independent Variables, Ignoring Endogeneity, Kenya 1998/1999

	Modern/ Not using	Traditional/ Not using	Modern/ Traditional
Age Group:			
15-19	-0.338	0.347	-0.685
20-24	0.262	-0.274	0.536
25-29	0.292	0.012	0.279
30-34	0.418	0.398	0.021
35-39	0.175	-0.106	0.281
Religion:			
Catholic	0.235	-0.615	0.850
Protestant	-0.012	-0.353	0.341
Muslim	0.241	-1.790*	2.031*
Wealth Index:			
Medium	0.089	-0.601**	0.690*
High	0.632***	-0.172	0.805**
Husband's Education:	0.002	0.010	-0.008
Wife's Education:			
Primary	0.871***	0.376	0.495
Secondary	1.470***	0.807	0.662
Region:			
Nairobi	0.970***	0.316	0.654
Central Rural	1.173***	-0.072	1.246*
Other Rural	-0.198	-0.030	-0.168
Husband Away:	-0.367*	0.205	-0.571*
Fertility Intentions:			
Wants after 2+ years	1.970***	0.361	1.609***
Wants no more	2.335***	0.523	1.811***
Undecided	1.826***	0.617	1.208
Exposure to FP Message:	0.462**	0.373	0.089
Access:			
CBD	-0.021	-0.180	0.158
Hospital	-0.639*	0.170	-0.809
Health Centre	-0.149	0.311	-0.460
Dispensary	0.038	0.098	-0.061
Maternity/Nursing Home	-0.102	0.542	-0.643
Clinic	0.009	-0.547	0.556
Constant	-4.338***	-2.404***	-1.934*

Notes: 1. ***: p<0.001; **: p<0.01; *: p<0.05; 2. The reference categories are not using any method (columns two and three), and using a traditional method (column three)

5. Discussion and Conclusion

To study the pathways by which the decision to use contraception is made, a number of research hypotheses were developed and tested. First, it was hypothesized that age and region of residence each play a significant role in influencing contraceptive use. Secondly, it was expected that women who have higher motivation for fertility control would show higher propensities for contraceptive use. Thirdly, it was hypothesized that access to family planning services – which comprises exposure to a family planning message and proximity to a source of family planning services – is an important variable affecting contraceptive use. Each of the results is discussed in the light of findings from other studies.

The results of the analysis show that one of the peak age groups for childbearing, 30-34, is positively and significantly associated with increased contraceptive use. That the height of contraceptive use might be related with spacing behaviour is evident from a number of observations. First, the results are not significant among younger women (aged 15 to 30 years) many of whom are in their early reproductive careers. Being older than 35 years, which is expected to be strongly associated with the practise stopping behaviour, is similarly not significant. Nevertheless, it should be noted that women who adopted stopping methods such as sterilization, were excluded from the analysis. Secondly, the most commonly used methods - injections and the pill (Magadi and Curtis 2003) - are for medium and short-term use and would be expected to feature among those used by the women in this statistically significant age group. Thirdly, as observed in the results on the trends in contraceptive use, the level of use of modern contraceptive methods is higher among women in the middle reproductive age groups (ages 25 to 39) and less among those aged 40 years or above, and much less among those aged 15 to 24 years. This goes to support the importance of women aged between 30 to 34 years in contraceptive use. Lastly, the proportion of women who want no more children is highest among women older than 40 years, and lowest among those aged 15 to 24, with those aged 25 to 39 years in between, implying spacing motivations. For these reasons, the bulk of contraceptive use concentrated among women in their mid-reproductive careers seems to be for spacing purposes.

Residence in the more modernised settings, Nairobi city and rural Central province, is significantly associated with increased contraceptive use, as expected. Several observations support this finding. First, use of modern contraceptive methods is observed to be highest in the

two regions. Secondly, motivation for fertility control, in terms of the proportion of women who want no more children, is also highest in the two provinces.

Increasing motivation for fertility control over time would be the most important factor in the statistical significance of Nairobi and rural Central province with regard to contraceptive use. Yet a follow-up question would be what is associated with the increased motivation in the two regions; the reasons are not necessarily the same for both settings. It is women's labour force participation, and urban lifestyles that mainly explain the greater motivation for fertility control in Nairobi. As opposed to their rural counterparts, couples, parents and women in particular residing in the city (whether in the upper class areas of Nairobi city, the middle income estates, or the sprawling slums) have to grapple with two important issues related to childbearing and rearing. These are a time schedule focussed on work, and the higher cost and quality of children's upbringing in general and education in particular.

In neighbouring rural Central province, three factors – historical context, proximity to Nairobi city, and the industry of Kikuyu women (the last point being more of personal insight and observation rather than tangible research findings) can be called upon to explain the higher motivation for fertility control in the province, which translates into significantly increased contraceptive use. It is in three ways that the historical context has prevailed in bringing about greater motivation for fertility control. First, in the colonial days, loathe as might the Kikuyu community the occupying British settler community and administration, they were also keen about some of their ways of life, and in particular how they managed to achieve smaller family sizes. Interviews with Dr. Mwathi, a pioneer obstetrician and gynaecologist in the family planning movement in Kenya reveal how people from the Nyeri district in Central province were curious about the means of fertility control applied by the white couples (Watkins 2000; Chimbwete et al. 2005). Thus from early on, since the colonial days, the population of Central province was exposed to western ideas about fertility control. Secondly, increasing scarcity of land – a precious factor in the production of lucrative agricultural commodities destined for overseas markets such as coffee and tea, or edible farm produce for local consumption – compelled families to change attitudes about family sizes. Not only was land becoming more and more expensive for immediate agricultural and residential use, but also less and less was available for families to bequeath to children. The problem of land has come about in two ways – first due to increased population growth in the province, but also because of the Mau Mau war of

independence and the resettlement elsewhere that ensued following the struggle. Thirdly, the political capital of Central province (Weinreb 2001) – the fact that it has been the dominant political community in the country – producing two of the three presidents the country has had so far, has meant that the province has been better supplied with health and related resources and services to ensure that in this case, motivation for fertility control more readily translates into use.

The proximity of Central province to Nairobi city has meant that there is a persistent influence of modern ideas through frequent direct or indirect contacts – through family members, relatives, friends, and the media - with the city. Lastly, regarding the third point (the enterprising Kikuyu woman), to the curious observer, the sight of the Kikuyu woman toiling in the family farm through the afternoon, hawking her farm produce in the city estate, or selling behind the counter of the family shop, in a way sets her apart. Like of her equally industrious husband, bystanders will be heard to comment with admiration, "anatafuta". The literal translation of this Kiswahili-language expression into English (she is looking for business), is not exactly faithful to the idea in the woman's mind as she goes about her business. Rather, empowered to a certain extent, she is adding value to - and complementing - the family's wellbeing by generating more income. It is different from the situation painted in the expression "se debrouiller" (getting by) in studies on the effects of the socio-economic context on reproduction in sub-Saharan Africa (Johnson-Hanks 2004). The pre-occupation with development, with the need to get out of the poverty trap, and with child quality, has meant that more time has to be devoted to work, and to do so fertility may have to be controlled.

While, contrary to expectations, access to health facilities turned out to be non-significant, exposure to messages on family planning is significant. There are several possible reasons why proximity to health services might turn out to be non-significant. Three issues regarding non-significance of access to health services are worth pointing out – definition of access, distinguishing between access and motivation for fertility control, and reverse causality and each is discussed in turn. Access by the population to health facilities was defined by the type of the locality or cluster – whether it is in an urban or rural area. One would have expected that women residing in urbanised communities would show significance in contraceptive use, but this is not the case and other factors might matter much more.

The comprehensive programs for community-based distribution (CBD) of contraceptives that have been set up in Kenya are meant to bridge the social distance between the formal service provision in the clinics (static or mobile outreach) and the informal networks in the community. Studies conducted in the past on the CBD program indicate that CBD sites are found in regions where 48% of the population live, and that only about 20% of women report having had contact with CBD agents (Rutenberg and Watkins 1997). Studies also indicate that CBDs, community health workers (CHWs), and health educators (HEs) were positively associated with the increased contraceptive prevalence in some parts of the country, specifically among the Meru community in the Mount Kenya region (Goldberg et al. 1989; Chege and Askew 1997). Yet the non-significant association empirically found in this study raises the question about the effectiveness of the CBD approach. Similar questions have been raised in the past (Kaler and Watkins 2001), but for a different part of the country, Western Kenya, where fertility is higher and contraceptive prevalence lower. In the last study, it is noted that CBD agents are more interested in protecting their prestige in the community and avoiding possible blame for what may go wrong in the use of contraceptive pills and injectable contraceptives, particularly in the climate of ambivalence and suspicion about side effects associated with oral contraceptives and injectables. If the regions in the sub-sample fall in these areas of low contraceptive prevalence, then the presence of a CBD agent in the community can show a significantly negative association with contraceptive method choice.

Studies conducted in the past document a number of findings on access to static family planning facilities in Kenya, and indicate that access should be positively related to choice of modern contraceptive methods. First, the network of health facilities from which family planning and other health services is provided is comprehensive, and comprises over 4,700 service delivery points that range from hospitals, to health centres, and dispensaries, with most of these facilities being managed by the Government (MOH 2000). In addition, maternities, nursing homes, and clinics also provide family planning services. Apart from the Government, other providers that operate health facilities include Non-Governmental Organizations (NGOs) including faith based organizations (FBOs), and private providers. Secondly, the results of the situation analysis of the functioning of family planning facilities in the country (Ndhlovu et al. 1997) indicate that most of the facilities provide a wide range of family planning services including oral contraceptives, injectables, IUDs, and condoms. The majority of the facilities with

contraceptive stock-outs are located in rural areas, and it takes clients about three quarters of an hour to get to a service delivery point. Thirdly, an inventory of health facilities providing family planning services (MOH 2000) indicated that 90% of the facilities surveyed offered family planning services, 88% of which offered at least three methods of family planning. In addition, the last study finds considerable variation among the provinces in the availability of family planning methods; with only about 33% offering IUDs in Coast or Nyanza provinces, but 60% and 77% in Central and Nairobi provinces respectively.

In view of these past studies, the result of non-significance in access to health facilities is surprising, and there could be three possible explanations. First, the measure of access applied in this analysis was whether the locality and by implication the health facility is in an urban area or not; a more valid and accurate measure would have been distance to the health facility or travel time, but none of these were readily available from the data. Thus, it will be necessary to build a better indicator of access in future studies on the impact of access on contraceptive use - for example by aggregating individual use of modern family planning services at the level of the community. Secondly, the sub-sample in the analysis may have focussed on communities in the country where fertility is high and contraceptive prevalence low. In such a situation, even if health facilities offering family planning were available nearby, this would not necessarily translate into greater use of these services, given the preferences for high fertility. Thirdly, as the results indicate, access to health facilities may indeed not be the critical factor determining contraceptive use, other factors perhaps being more important.

Even if access to health services turned out to be significant, the question of separating the effect of access from that of motivation for fertility control would remain. Studies conducted in Bangladesh for example indicate that it is not easy to disentangle the two (Phillips et al. 1988; Simmons 1996). The studies further indicate that in Matlab, a region where fertility demand was initially low, the introduction of contraceptive innovation and technology through the community-based program had the effect of increasing contraceptive use and reducing fertility. This supply-side factor was nevertheless able to act on ambivalent demand and turn it into contraceptive adoption. Focus group discussions later held with women from the program show that supply-side variables, i.e. the availability of contraceptive services, prompted demand-side factors by making people aware that the world around them was changing. Thus, it appears that

the issue is not supply versus demand factors, but rather the simultaneous action of supply and demand to affect contraceptive use.

Having been exposed to a family planning message in the six months preceding the 1998 KDHS interview is significantly and positively associated with contraceptive use. Studies have documented a possible positive linkage between the mass media campaigns mounted in the country during the late 1980s and contraceptive use (Westoff and Rodriguez 1995). As an extension of this suggestion, a recount of the important elements of the Kenyan mass media strategies that might have led to this association with increased contraceptive use is made: the channels and forums through which family planning messages were relayed being comprised of population seminars, the radio, print media, and personal communication.

In the late 1980s and early 1990s, population leaders' conferences and seminars were intensively mounted by the then National Council for Population and Development (NCPD). These sensitization activities, aimed at population policy makers and implementers, started with a National Leaders' conference - political, religious, Government and NGO leaders converged in Nairobi to deliberate on the high population growth in the country and were apprised about the Government's policy and intentions on how it would address the issue. Directly or indirectly, commitment and support of the leaders was sought and to varying degrees, obtained. Then there followed a series of seminars for Government functionaries and NGO executives - in particular the district population seminars for District Officers, Chiefs, and Assistant Chiefs that were coordinated from the powerful Office of the President. Anecdotal reports of results were in a way amazing since they showed a change in attitude by a group that was thought to be highly conservative in matters f fertility. Without going into the details of how the chiefs implemented this Government policy as they held their regular monthly "barazas" (meetings), many - by status polygamous and pro-natalist - were heard to say after the seminars that they advise their people to "do as I say but not as I do".

The second medium by which the family planning message was propagated was through the radio, an effective tool whose reach covers most of the country through the national broadcaster, the Kenya Broadcasting Corporation (KBC), with the message being relayed mainly in the Kiswahili language but in a number of vernaculars as well. A series of radio programmes on population were continuously mounted on KBC, and included the following radio plays in the Kiswahili language (NCPD 1994): *Panga uzazi* (Plan your family), *Mwenda pole hajikwai* (He

who proceeds slowly never falters), *Maisha ya jamii yako* (Your family's welfare), *Jifunze na uendelee* (Learn, and you will develop), *Maisha bora* (Better living), *Afya yako* (Your health), *Daktari akushauri* (The Doctor is here for counselling), *Kuelewana ni kuzungumza* (Understanding one another as couples means communicating with each other). It is possible that this rich variety of captivating audio messages that was frequently aired may have persuaded an attentive rural and urban audience (either listening separately as married women, men, or as couples) to think twice about their reproductive behaviours.

The third avenue by which the family planning message was passed was through the print media. The most prominent of the print materials so produced and distributed to households included calendars that bore pictures and printed messages about the advantages of smaller family sizes. Others were t-shirts bearing the NCPD logo and message of a small family size, distributed to and worn mainly by the (younger) men. Posters bearing similar drawings and messages about the disadvantages of large families and merits of smaller ones were also produced and distributed to households and offices. Lastly, personal media, mainly in the form of health talks by health personnel in the clinics but also during mobile outreaches, may also have been an effective medium of reaching women with family planning messages and health education in general. The family planning message in the form f the personal medium was also passed on by CBD agents in their interactions with women in the villages.

Conclusion

It can be equivocally said that motivation for fertility control, measured here by the number of additional children desired, has a significant effect on using a contraceptive method. The same cannot be said about access to health facilities save that a related aspect - exposure to messages about family planning - is significant and positive. This does not however prove that access is unimportant; the hypothesis has to be tried with other data. Thus, of all the policy variables, three turn out to be important. These are the wife's education, exposure to family planning messages, and motivation for fertility control. They merit continued consideration in family planning policy and programs.

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