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FERTILITY DETERMINANTS AND DIFFERENTIALS: THE CASES OF KENYA AND LESOTHO

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CONFORMITY TO TRADITONAL customs which place a high value on children, and the need to guard one's cultural heritage and to perpetuate the family line, transcend national efforts to curb fertility in most African countries and other developing nations. Mott and Mott (1980, 7) argue that 'the Kenyans of different tribes are equally sensitive to and aware of their relative strength in the political pecking order. As in other African countries this pecking order is perceived as closely related to population size'; hence, it is incompatible with fertility regulation, particularly when fertility reduction is more effective in one tribal group than in others.

Although most of Lesotho's socio-economic characteristics place it within the general African socio-cultural context, deviations from this general pattern are nearly as prevalent. Perhaps the most distinctive feature of the Basotho people is their strong sense of corporate identity (Spence, 1968). This ethnic heterogeneity is a missing catalyst in this elaborate brewery of pro-natalistic sentiments and behaviour. Also of significant importance is Lesotho's dualistic economy with a consequent high male migration to South Africa. Gordon (1981) maintains that approximately 40–60 per cent of the married women in the country live as wives of absent migrants at any point in time. One can speculate that this migration should have a depressant effect on fertility. Yet the high value placed on children as reincarnations of ancestors, and also as genuine economic assets, matches that of other African countries.

The trend of declining mortality, constant (and perhaps increasing) fertility, and consequent high growth rates characterizes these two countries, with Kenya's 4 per cent annual growth rate featuring as the highest in the world today. In the mix of these conflicting socio-cultural beliefs and demographic facts, Kenya, with advice sought from the Population Council, became in 1967 the first sub-Saharan African country to support family planning (UNFPA, 1979). Lesotho adopted a similar policy in 1974. While the Kenyan government currently supports family planning as a vehicle for the reduction of population growth, for non-demographic reasons of health and as a basic human right, the Lesotho government supports it largely for the last of these (Nortman, 1985).

Despite its government's intentions and efforts, Kenya experiences higher fertility than Lesotho. Kenya's total fertility rate is 8.01 births compared to 5.6

births in Lesotho (Kenya Bureau of Statistics, 1980; Lesotho Bureau of Statistics, 1981). Are the observed fertility differentials attributable to varying degrees of contraception or have the successes of the family planning programmes been so minimal that the two countries are still experiencing natural fertility?

The concept of natural fertility as defined by Louis Henry (1953; 1961) refers to fertility in the absence of any deliberate effort to limit the number of births: fertility which is not parity dependent. Spacing behaviour — which may have a latent negative effect on the cumulative fertility of an individual woman, but is intended for the health of either the child, or the mother, or both, and not for stopping child bearing — is compatible with this definition.

The study of natural fertility has increasingly become a two-level study: the 'dependent variable level', at which age patterns of fertility (or age-specific fertility rates) are studied; and the 'independent variable level', at which the direct determinants of fertility are examined as both biological and behavioural variables (Menken, 1979). The former, studying the age patterns of fertility control to determine whether or not Kenya and Lesotho are natural populations, is the focus of the first section of this paper. While this endeavour facilitates a precise description of the type of fertility experienced by the populations, implicit in such experiences are the relative degrees of success of the family planning programmes in the respective countries. The second section focuses on the proximate determinants of fertility and their relative contribution to the observed fertility differential between the two countries.

DATA AND ORDER OF ANALYSIS

This study was based on World Fertility Survey (WFS) data for Kenya and Lesotho, both of which were collected at comparable time periods: 1977/8 and 1977, respectively. All continuously and currently married women aged 15–49 years comprise the sample on which the analysis in the first section is based. Continuity of marriages is aimed at circumventing biases which may arise from marriage disruption. In the second section, the sample is further restricted to once and continuously married women who are close to the end of their reproductive careers, those aged 35–44 years, and have had at least two children (Easterlin and Crimmins, 1982). The parity restriction is intended to avoid biasing the results in favour of the theory which postulates that higher motivation to limit the number of children leads to more use of contraception. Women who have had no child, or at most one, are most likely to have never regulated their fertility, and also lack the motivation to do so because they have been sterile or subfecund for the most part of their reproductive life-spans.

Implicit in the different samples described above are different analytical frameworks and/or procedures. Thus, a description of the analytical framework and/or procedure precedes the empirical findings in each section.

RESULTS: PART ONE

The extent of deliberate fertility control

The data show a moderate prevalence of fertility control in both Kenya and Lesotho, with Kenya showing a higher degree of control. Approximately 32 per cent and 23 per cent of women in Kenya and Lesotho, respectively, are reported to have ever used some form of fertility control (Table I). Women in middle age, most of whom are still fecund and can be expected to have achieved their desired family size, are more likely to have ever practised contraception in both countries.

TABLE I

PERCENTAGE DISTRIBUTION OF CONTRACEPTIVE EVER USERS BY AGE AND COUNTRY (CURRENTLY AND CONTINUOUSLY MARRIED WOMEN ONLY)

Current age	Kenya	Lesotho
15–19	22.3	7.4
20–24	31.1	18.8
25–29	35.6	31.8
30–34	36.8	28.1
35–39	31.1	32.8
40–44	33.5	24.4
45–49	29.3	13.4
All ages	32.3	23.3
Number of cases	5,175	3,062

These figures may be misleading, however, and could be more informative if reference was made to the duration of use and the efficiency of such use. The former cannot be calculated from the data available.

A close examination of the reported current use of fertility control may shed more light on this issue. About 10 per cent and 6 per cent of continuously and currently married women aged 15–49 who are exposed to the risk of pregnancy in Kenya and Lesotho, respectively, are current users of fertility control (Table II). Note that less than 20 per cent of these contraceptors in Kenya use what WFS calls 'inefficient' methods (douche, withdrawal and rhythm) (Table *III*).[1] The corresponding proportion in Lesotho is about 49 per cent.

[1] 'Efficient' methods include the pill, IUD, diaphragm, injection, abortion and sterilization.

TABLE II

PERCENTAGE DISTRIBUTION OF CONTRACEPTIVE CURRENT USERS BY AGE AND COUNTRY

Current age	Kenya	Lesotho
15-19	3.2	2.3
20-24	8.9	3.4
25-29	9.7	7.9
30-34	14.8	8.6
35-39	9.2	9.4
40-44	14.4	3.5
45-49	13.2	2.5
All ages	10.3	5.7
Number of cases	3,843	2,936

TABLE III

PERCENTAGE DISTRIBUTION OF CONTRACEPTIVE CURRENT USERS BY TYPE OF METHOD USED

Type of method used	Kenya	Lesotho
Pill	34.4	22.9
IUD	10.6	2.4
Diaphragm	0.5	0.6
Douche	0.5	-
Condom	2.3	2.4
Rhythm	15.7	1.8
Withdrawal	2.0	47.0
Abortion[a]	14.2	[a]
Female sterilization	11.4	15.1
Male sterilization	0.3	-
Injection	7.3	4.2
Not stated	0.8	3.6
All methods	10.3	5.7
Number of cases	395	166

[a]Abortion was not included in the Lesotho survey.
– empty cell.
Note: Abstinence is excluded for comparative purposes.

The inefficiency of methods currently used in Lesotho may suggest a relatively lower impact of contraception on fertility compared to Kenya. However, in view of the fact that in the mid-1960s about half to three-quarters of contraceptors in some European countries (Belgium, Czechoslovakia, Hungary and Turkey) which experienced significant low levels of fertility (an average of two live births or less per woman) used withdrawal and rhythm, it should be clear that use of 'inefficient' methods does not preclude fertility reduction.

The age pattern of fertility

Parity progression ratios

The definition of natural fertility has proved to have important implications for the age pattern of child bearing. That is, as long as the underlying factors to the observed fertility regimes are independent of age and parity, the shape of the fertility curves over the reproductive age span must be convex in shape and similar across populations regardless of the levels of fertility (Coale, 1971). Thus, the second procedure in evaluating the presence of deliberate fertility control was to calculate parity progression ratios for women of different marital durations. Parity progression ratio is defined as the proportion of women in a cohort who have at least $x - 1$ births who have proceeded to have at least a birth of order x. For example, P_1 is the proportion of women who had had zero births and have had at least one child. The complement of a parity progression ratio is the proportion of women who do not proceed to have another child either because they become sterile, or because they do not want more children. Natural fertility would be characterized by a gradual decline of the parity progression ratios for any given study group of women, while an abrupt decrease of the ratios at relatively low parities, for instance at any family size less than four, would be indicative of the presence of deliberate family limitation.

The parity progression ratios for both Kenya and Lesotho, particularly for those women who have been married for at least thirty years, show a gradual decline with age (Table IV), which is consistent with a natural fertility regime. Note the fast decline of Lesotho's parity progression ratios which may be indicative of higher prevalence of secondary sterility in Lesotho compared to Kenya. Also note the convex shape of the plotted parity progression ratios (Fig. 1). While both countries display a natural fertility pattern, the levels of fertility are indeed different. Although women who have been married for 15–29 years have truncated reproductive lifespans (which could confound with sterility and artificially culminate in a faster decline of parity progression ratios), inferences pertaining to the growth frequencies of families,[2] especially those of a smaller size than five births, can still be made.

[2] 'Growth in terms of live births, and not necessarily actual growth to the extent that young children may die' (Pressat, 1972).

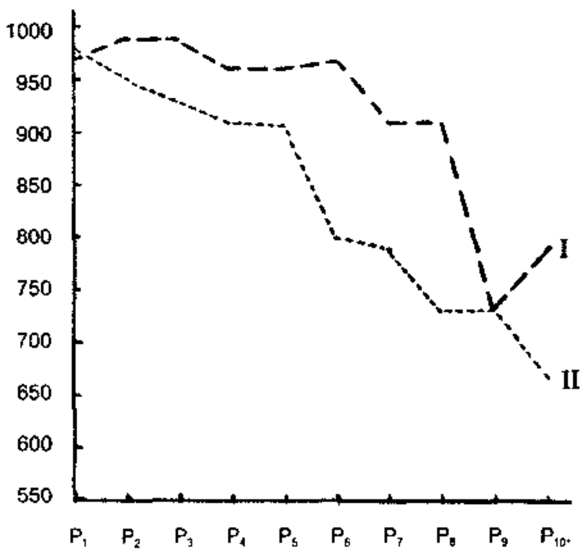
TABLE IV

PARITY PROGRESSION (P_x) RATIOS FOR CONTINUOUSLY AND CURRENTLY MARRIED WOMEN BY AGE AND COUNTRY

Marriage duration in years	P_1	P_2	P_3	P_4	P_5	P_6	P_7	P_8	P_9	P_{10+}	N
Kenya											
15–29	0.98	0.98	0.98	0.96	0.96	0.92	0.84	0.76	0.66	0.59	1,847
30 and over	0.97	0.99	0.99	0.96	0.96	0.97	0.91	0.91	0.73	0.79	176
Lesotho											
15–29	0.96	0.93	0.91	0.89	0.83	0.76	0.69	0.61	0.51	0.46	966
30 and over	0.98	0.95	0.93	0.91	0.90	0.80	0.79	0.73	0.73	0.67	101

Figure 1: PARITY PROGRESSION RATIOS FOR KENYA AND LESOTHO

I Kenya, women married for 30 years or more.
II Lesotho, women married for 30 years or more.



It is clear that the rate of growth of family sizes, or rather the 'tempo' of fertility at least up to the fifth and fourth parities in Kenya and Lesotho, respectively, is identical for the two marriage cohorts. Thus, stopping behaviour which is parity-related is non-existent even for the younger cohorts.

Age-specific marital fertility rates

The next step in investigating the prevalence of deliberate fertility control was to calculate age-specific marital fertility rates (ASMFR) for women aged 20–49 years (Table V). The 15–19-year age group was discarded since fertility rates for this age group tend to be erratic sometimes due to irregular teenage sub-fecundity and/or premarital conception (Knodel, 1977). The characteristic age pattern of natural fertility which is convex in shape is quite evident from panel A in Figure 2 in which the ASMFRs for Kenya and Lesotho are plotted along with the 'standard' marital schedules, $n(a)$ (Coale and Trussell, 1978). Also apparent in the Figure are the differential fertility levels which are consistent with those portrayed in Figure 1 in which parity progression ratios are plotted. A sharp decline in the rates occurs at ages above 35–39 in all the three populations.

TABLE V

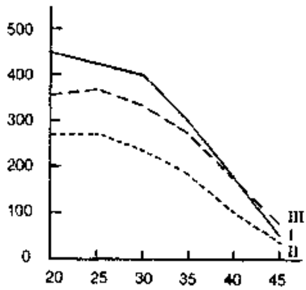
AGE-SPECIFIC MARITAL FERTILITY RATES AND COALE–TRUSSELL INDEX m OF DELIBERATE FERTILITY CONTROL BY AGE AND COUNTRY

Current age	Age-specific marital fertility rates		Index m	
	Kenya	Lesotho	Kenya	Lesotho
20–24	0.355	0.270	0.000	0.000
25–29	0.368	0.271	−0.331	−0.151
30–34	0.338	0.238	−0.143	−0.001
35–39	0.274	0.184	−0.084	0.052
40–44	0.174	0.102	−0.206	−0.009
45–49	0.077	0.039	−0.855	−0.601
TFR	7.93	5.52		
All ages m			−0.1641	0.0076
Mean square error			0.0026	0.0011

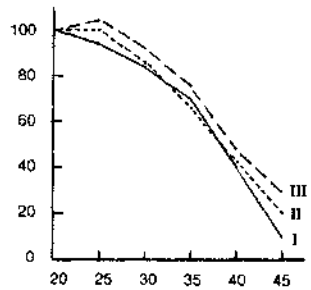
Figure 2: A COMPARISON OF KENYA, LESOTHO AND THE STANDARD COALE AND TRUSSELL NATURAL FERTILITY REGIME

I Standard Schedule; II Lesotho; III Kenya

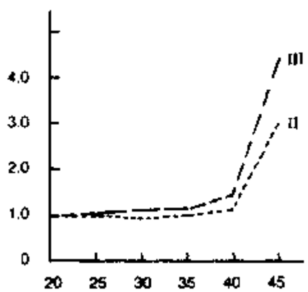
A. Age-specific marital fertility rates (ASMFR): births per 1000 women



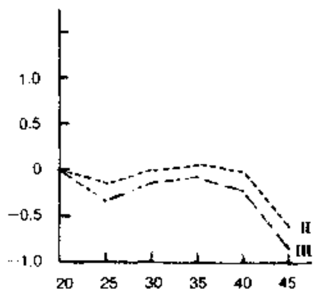
B. Index values of ASMFR with 20–24 = 100



C. Ratio of index values of ASMFR of Kenya and Lesotho to the index values of the Standard Schedule



D. Values of *m*, the index of fertility control



The convex shape of the three fertility schedules is brought out more clearly in panel B in which the index values of ASMFRs are plotted. To calculate the index values, the rate for women aged 20–24 is set equal to 100, and the rates for the subsequent age groups in each schedule are expressed as ratios to that of the 20–24 age group. Note that the index values of Kenya and Lesotho are higher than those of the 'standard' schedule. This implies that age-specific fertility rates in both Kenya and Lesotho decline even more slowly over age than those of the standard schedule.

The convexity of the curves in the three populations, and the slower decline of the age-specific marital fertility rates of Kenya and Lesotho compared to that of the standard schedule, is brought out even more clearly in panel C in which the index values of Kenya and Lesotho are expressed as ratios to those of the standard schedule. If the decline in each of the ASMFR's of both Kenya and Lesotho was a duplicate of that of the standard, the ratios would remain close to unity. The ratios of the indices falling progressively with age typify a society where deliberate fertility control exists. Ratios above 1.0 would indicate a slower decline of fertility rates of a given population compared to that of the standard schedule.

The ratios are near unity and consistently above 1.0 for both Kenya and Lesotho, up to age group 40–44 (except for the 35–39 age group in Lesotho), and peak to over 4.0 and close to 3.0 in Kenya and Lesotho, respectively. The marked deviations at the oldest age group say very little about the degree of deliberate fertility control, but rather reflect the extreme sensitivity of this rate to small absolute differences in fertility levels, since fertility is generally very low at this age group even in the absence of control (Knodel, 1977).

Coale and Trussell's index of fertility control

The age-specific marital fertility rates were used to calculate Coale and Trussell's index of deliberate fertility control, m. In their model, Coale and Trussell hypothesized that in any population, the ratio of marital fertility $r(a)$ to natural fertility $n(a)$ is given by the equation

$$\frac{r(a)}{n(a)} = M \exp\,[m \times \nu(a)]$$

where $\nu(a)$ expresses the typical age pattern of voluntary control of fertility. The value of m is made independent of the level of fertility by scaling the observed fertility rates by the factor M which is given as a ratio of the observed marital fertility rates for women aged 20–24 to women in the same age group in the standard schedule. The functions $n(a)$ and $\nu(a)$ were empirically derived by averaging ten schedules designated as natural by Henry (1953). To obtain the values of $\nu(a)$, 43 schedules, each of which was regarded as embodying its own departure from natural fertility when m was arbitrarily set equal to 1.0, were selected. For the jth schedule, (where j is an arbitrary number used by the individual researcher), $v(a)$ was then calculated as

$$v_j(a) = \ln \left\{ \frac{r_j(a)}{[M \times n(a)]} \right\}$$

The $v(a)$ schedule was then defined as

$$v(a) = \frac{\sum_{j=1}^{43} v_j(a)}{43}$$

for a = 20–24, . . . , 45–49 (Trussell, 1979, 40).

The index of fertility regulation is constructed in such a way that it will be equal to zero at all ages as long as the shape of the fertility schedule in question is identical to that of a standard natural fertility schedule. A value of m equal to 1.0 indicates that the schedule under study deviates from natural fertility by an amount that is the average deviation of the 43 fertility schedules used in the calculation of the $v(a)$s. The greater the value of m, the greater is the deviation of a given fertility schedule from the standard schedule, and, hence, a greater implied degree of fertility control. On the other hand, a negative value of m implies that fertility declines even more slowly than in the standard population. According to Coale and Trussell, an average value of m which is less than 0.2, particularly for cross-sectional data, can be taken as evidence of lack of fertility control. They also suggest that when applying the model to any data, a mean square error equal to zero would mean a perfect fit, while a value of 0.005 would indicate a mediocre fit.

Turning to the results of Kenya and Lesotho, and disregarding the value for the 40–49 age group, it is clear that the model fits the data very well. The consistency of the m values over the age groups, coupled with mean square errors of approximately 0.003 and 0.001 for Kenya and Lesotho, respectively, prove this point (Fig. 2, Table V). Also evident in Table V is the fact that, on the average, fertility declines more slowly with age compared to the standard schedule in both countries. The summary measures m for all the age groups, of approximately –0.164 and 0.008 for Kenya and Lesotho, respectively, strongly support the hypothesis that these two populations experience natural fertility.

Discussion

Although a modest proportion of married women in the reproductive age span in

Kenya and Lesotho report to have ever used some form of fertility control, other tests employed lead to the conclusion that use of fertility control in both Kenya and Lesotho is not parity-dependent. The summary measure of deliberate fertility control of −0.1641 and 0.0076 for Kenya and Lesotho, respectively, and the convex shape of the parity progression ratios and the age-specific marital fertility rates are consistent with a natural fertility regime. Thus, Kenya and Lesotho are natural fertility populations in the sense of parity-dependence.

This observation that Kenya and Lesotho can loosely be described as natural fertility populations directs attention to the 'intervening variables' which can be classified as those affecting the potential output of surviving children, measured by natural fertility factors, and those governing deliberate use of fertility control, measured by family size desires and costs of fertility control.

In the next section, fertility (the number of children ever born to a woman) is therefore linked to its proximate determinants. The aim is to clarify the effect on observed fertility of the proximate determinants of fertility often encountered in the literature (Henry, 1953; Davis and Blake, 1956; Bongaarts, 1978), including the use of contraception, which is of particular interest. Subsequently, statistical analysis showing the relative contribution of each of the proximate determinants to the fertility differential between the two countries will be undertaken.

THE PROXIMATE DETERMINANTS OF FERTILITY

Nature and measurement of the variables

The 'Synthesis Framework' (Crimmins and Easterlin, 1982) adopted in this study views the number of children ever born to a continuously married woman as a function of the following eight natural fertility variables:

i) Duration of marriage (DURMAR), which is measured in completed years, is a proxy for exposure to the risk of intercourse, particularly in those societies where premarital sex is limited. Duration of marriage was measured as the algebraic difference between a respondent's current age and her age at marriage. The cumulative fertility of a continuously married woman is expected to be greater, the longer her duration of marriage.

ii) Length of the first birth interval (FBI), measured in months. This variable was obtained by differencing the respondent's age at first birth from her age at first marriage. The main components of the first birth interval, assuming no foetal wastage, are the waiting time to conception and the period of pregnancy which leads to the terminating birth. Duration of pregnancy is of little interest when assessing fertility determinants since it is a constant in normal circumstances, but the waiting time to conception is, and can vary from individual to individual. Thus, the first birth interval is a proxy for the respondent's fecundability in the absence of contraception. For this reason, respondents who have negative birth intervals were excluded from the analysis. It is also necessary to exclude those respondents who used contraceptives in their first birth intervals; however, there is no information on the date of the adoption of fertility control in either Kenya or Lesotho. Thus, the first birth interval may reflect not only the respondent's fecundability but also her practice of deliberate fertility control. However, this bias should be minimal since fertility regulation is very low in both countries. The first birth interval can also be affected by customs about marriage and cohabitation. For instance, a fairly long first birth interval can be expected if marriage takes place in childhood but is not consummated until puberty, a practice which is also not common in either Kenya or Lesotho. A negative relationship between the first birth interval and number of children ever born to a woman is expected.

iii) Length of the second birth interval (SBI), also measured in months. The second birth interval was computed by subtracting the date of birth of the respondent's first child from the date of birth of the second child. The composition of the second birth interval differs from that of the first birth interval in that after the birth of the first child there is a post-partum amenorrhoea period, which can vary. Consequently, the second birth interval is expected, on the average, to be longer than the first birth interval. The second birth interval is therefore aimed at capturing the effect of post-partum amenorrhoea. Both intervals indicate the 'tempo' or rate of childbearing; the shorter the birth intervals are, the faster the tempo is. The cumulative fertility of a continuously married woman is expected to be greater, the faster the tempo of her early childbearing.

iv) The proportion of the population which is not secondarily sterile (NSS). Women were classified as secondarily sterile if (a) they reported a fecundity impairment, or (b) they were not currently regulating their fertility, had had no birth in the last five years, and were not currently pregnant. Respondents who were fecund were given a value of one, and a zero was assigned to those who were not fecund. Note that only women who had at least two children were included in the sample. This means that the prevalence of sterility reported does not reflect primary sterility; the proportion sterile would be higher in both populations if all continuously married women regardless of parity were considered. Fecundity is expected to be positively associated with fertility.

v) Duration of breastfeeding (MOBF) in the last closed birth interval, measured in months. This is a direct response to the question regarding the total number of months a woman breastfed her infant. However, a significant number of respondents in Lesotho had their breastfeeding terminated by the death of the infant. For these cases, duration of breastfeeding in the open interval, only for those women who had completed breastfeeding, was used. It is hoped that there is little variation between the length of breastfeeding of children of different parities. A number of studies have shown that breastfeeding prolongs the period of post-partum amenorrhoea. The prolongation varies widely, reaching an extreme of eighteen months in rural Java (van Ginnikan, 1974). Duration of breastfeeding is, therefore, a proxy for the protection from pregnancy conferred to nursing mothers by the subsequent prolonged infecundable period.

vi) Proportion of pregnancy wastage (PREGWAS). This is the ratio of the total number of wasted pregnancies to the total number of pregnancies. This captures miscarriages, spontaneous abortions and still births. Lumping these experiences together alleviates a possible bias which may arise from the interviewees', and sometimes interviewers', lack of clarity as to the differences between these terms, and sometimes from a complete lack of local terminology for such experiences.

Foetal wastage is one of the components of birth intervals. A birth interval which includes a miscarriage is extended by an additional period of unovulatory exposure as well as additional months of pregnancy, amenorrhoea, and perhaps an ovulatory cycle (Potter, 1963). Thus, the total number of children born to a woman is expected to be greater, the lower her rate of foetal wastage.

vii) Proportion of child mortality (IMR), measured as the ratio of the difference between the number of children ever born to a woman and the number of children currently living, to the total number of children ever born. The 'Synthesis Framework' also views infant and child mortality as positively related with fertility since child mortality shortens the non-susceptible period conferred by breastfeeding. The other variable of special interest which also affects fertility is:

viii) Use of fertility control (EVERUSE), which refers to the proportion of all the women who report to have ever used contraceptives. This includes 'efficient' methods (pill, IUD, other female scientific methods such as diaphragm, foam and tablets, condom and injection), and 'inefficient' methods (douche, withdrawal and rhythm). Induced abortion and sterilization are also included as efficient methods though the former was not used in Lesotho. Abstinence was also not considered a contraceptive method in Lesotho. Respondents who reported that they had ever practised contraception were given a value of one, while the rest were given a value of zero. Use of fertility control is expected to be negatively associated with the observed household's fertility. However, one should be aware of the fact that the response to the question on everuse of fertility control elicits information on use irrespective of the duration of such use. A better measure of use would be the duration of use; however, it was not available, neither could it be estimated since there was no information, at least, on the age at which respondents started using fertility control.

Two other variables which are used in the first stage in which use of contraception is estimated are: desired family size (Cd) and cost of fertility regulation (RC). Desired family size is the response to the following question: 'If you could choose exactly the number of children to have in your whole life, how many children would that be?' Clearly this question would elicit less biased information if it were addressed to women who have not had any births. Since this is not always the case, the criticism often levelled against this measure is that it does not reflect the respondent's desired number of children *per se*, but her current parity. It is expected that repondents are more likely to give a desired number of children which is either equal to or greater than the number of children they already have, thus biasing the response upwards. However, there is evidence that the magnitude of this bias is not great enough to invalidate the usefulness of the responses on desired family size (Knodel and Pachuabmoh, 1973; Jejeebhoy, 1981).

The 'Synthesis Framework' conceptualizes cost of fertility regulation as encompassing a household's subjective attitudes towards the use of fertility control, their information about methods of control and the economic costs of obtaining additional knowledge about techniques of control and of purchasing supplies or services needed for control (Easterlin, 1978; Easterlin *et al.*, 1980). Data prior to the household's decision to regulate fertility would be ideal. Since most of the respondents would have had children, one is often wary of the fact that the greater knowledge of contraception often exhibited by regulators compared to non-regulators may be a consequence of the regulators' practice of fertility control and not the reverse.

The number of methods of fertility control known to the respondent, and reported without prompting, is the principal measure of cost of fertility regulation used in the present analysis. This variable falls far short of the ideal.

The analytical procedure

The dependent variable, the number of children ever born (CEB), is viewed as a linear function of the seven natural fertility variables (listed and discussed above) plus use of fertility control. However, a two-stage procedure is used to estimate the resulting simultaneous-equation model (Crimmins and Easterlin, 1982). First, use of fertility control is viewed as a function of the seven natural fertility variables plus two other variables: cost of fertility regulation proxied by the number of methods known (NOMETH) and the desired number of children (Cd). The predicted probability of use is the instrumental variable which is then used along with the natural fertility determinants to estimate fertility, using ordinary 'least squares' equations. The instrumental use variable is estimated by the logit technique.

Theoretically, one would expect the probability of use of fertility control by a continuously married woman to be higher,

1) the longer her duration of marriage;
2) the shorter her first and second birth intervals, which imply a fast rate of her early childbearing;
3) the higher her fecundity as measured by secondary sterility (NSS);
4) the shorter her duration of breastfeeding and consequent amenorrhoea;
5) the less her physiological problems of production as proxied by the rate of foetal wastage;
6) the lower a couple's rate of child mortality;
7) the greater her knowledge of contraception; and
8) the lower a couple's number of desired children.

RESULTS: PART TWO

Fertility and the proximate determinants

The proximate variables which vary the most between Kenya and Lesotho are, in order: breastfeeding, second birth interval, secondary sterility and child mortality (Table VI). Breastfeeding, the second birth interval and child mortality impinge on fertility via their relationship with post-partum amenorrhoea, and are therefore referred to as post-partum amenorrhoeic variables. Ever use of fertility control, duration of marriage and first birth interval are within six percentage points of each other. The level of pregnancy wastage is similar across countries. This rating would not be surprising in view of Bongaarts's (1982) conclusion that the variablity of use of contraceptives across population accounts for the fertility differential between low fertility populations, while that of breastfeeding accounts for the fertility variation observed amongst high fertility (natural) populations. However, the irony is that there is a higher prevalence of contraception in Kenya, which experiences higher fertility. Higher child mortality in Lesotho compared to Kenya is consistent with the higher mortality level of Lesotho. However, the remarkable higher prevalence of secondary sterility, a variable which is often similar across populations (Bongaarts, 1982), is quite intriguing. A closer examination of the derivation of the variable (Fig. 3) shows that Lesotho has a higher level of secondary sterility at each of the three levels of the variable's construction. Note that 24 per cent of the women in Lesotho reported that they were not fecund, while 14 per cent reported so in Kenya. Similarly, 22 per cent of women in Lesotho versus 15 per cent in Kenya reported that they were fecund

TABLE VI

MEAN STANDARD DEVIATION AND CORRELATION MATRIX FOR VARIABLES IN INTERVENING VARIABLES ANALYSIS (POPULATION WITH BIRTH INTERVAL GREATER THAN SIX MONTHS)

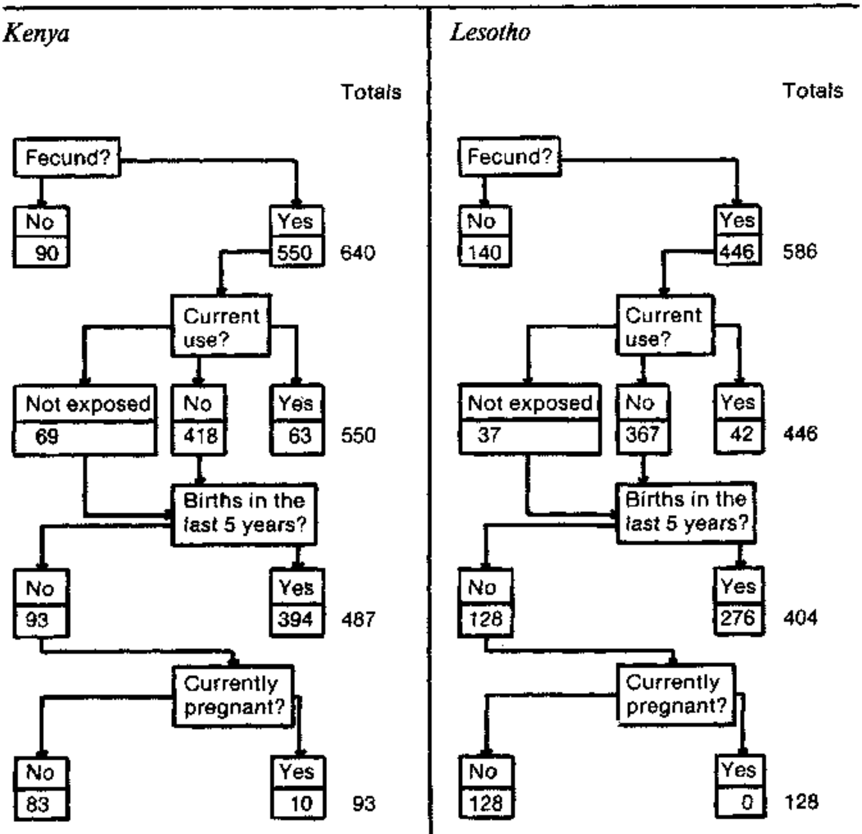
Variable	EVERUSE	DURMAR	FBI	SBI	NSS	MOBF	PREGWAS	IMR	Mean	Standard deviation
Kenya										
CEB	0.05	0.32*	−0.27*	−0.21*	0.14*	−0.10*	−0.11*	0.09*	7.55	2.31
EVERUSE		−0.01	−0.11*	0.01	0.08*	−0.12*	0.05	−0.12*	0.33	0.47
DURMAR			0.19*	0.10*	−0.29*	−0.00	0.00	0.09*	21.78	4.08
FBI				0.02	0.07	0.02	0.02	0.02	31.48	31.57
SBI					−0.01	0.15	0.03	−0.10*	28.47	15.99
NSS						0.08*	−0.03	−0.06	0.73	0.44
MOBF							−0.18*	0.04	12.17	7.22
PREGWAS								0.02	0.04	0.08
IMR									0.14	0.15
Lesotho										
CEB	0.18*	0.33*	−0.16*	−0.26*	0.35*	−0.02	−0.19*	0.14*	5.50	2.23
EVERUSE		−0.05	−0.06	−0.14*	0.17*	−0.14*	0.03	0.02	0.32	0.47
DURMAR			0.27*	0.07	−0.31*	0.10*	−0.06	0.01	20.81	4.80
FBI				0.00	−0.08*	−0.01	0.01	−0.05	28.05	25.09
SBI					−0.09*	−0.09*	0.13*	0.10*	36.17	19.01
NSS						0.04	−0.11*	−0.06	0.54	0.50
MOBF							−0.31*	−0.18*	18.07	10.58
PREGWAS								0.12*	0.05	0.11
IMR									0.16	0.19

* significant at the 0.05 level or below.

Number of cases: Kenya = 560; Lesotho = 566.

and not currently using fertility control, but had not had a birth five years prior to the date of the survey. Lastly, 22 per cent of the women in Lesotho compared to 13 per cent in Kenya reported that they were fecund, not current contraceptors, had no births within five years prior to the survey, and were not currently pregnant.

Figure 3: DERIVATION OF NSS (POPULATION WITH TWO OR MORE CHILDREN)



Kenya		Lesotho	
NSS = 0	83 + 90 = 173 = 27%	NSS = 0	140 + 128 = 268 = 46%
NSS = 1	63 + 394 + 10 = 467 = 73%	NSS = 1	42 + 276 + 0 = 318 = 54%

Another measure of the prevalence of sterility, both primary and secondary, are the parity progression ratios of all married women who have completed childbearing, those aged 45–49 years. Assuming that married women do not contracept to avoid childbearing completely, and that, if there are such cases, the proportions are similar in both populations, one can conclude that the prevalence of primary sterility, as measured by the proportion of women who had no births and had not proceeded to at least parity one, is higher in Lesotho compared to Kenya, 4 per cent and 2 per cent, respectively (Table VII). It can be assumed that in both Kenya and Lesotho cessation of childbearing, as evidenced by the decline

TABLE VII

PARITY PROGRESSION RATIOS (P_x) FOR WOMEN MARRIED ONCE AND CONTINUOUSLY

	Age	P_1	P_2	P_3	P_4	P_5	P_6	P_7	P_8	P_9	P_{10+}	N
Kenya	45–49	0.98	0.99	0.98	0.96	0.97	0.95	0.94	0.87	0.75	0.74	437
Lesotho	45–49	0.96	0.93	0.91	0.90	0.86	0.83	0.80	0.75	0.70	0.64	202

All women in the respective age groups are included in the analysis regardless of their parities.

of parity progression ratios, is mostly due to secondary sterility rather than contraception. The parity progression ratios for Kenya remain constantly above 0.9 up to parity seven, while a gradual decline from the second parity is evident in Lesotho. The probability of reaching parity seven for women with at least one child is 0.79 in Kenya compared to 0.42 in Lesotho.[3] This implies that approximately 58 per cent and 21 per cent of women in Lesotho and Kenya, respectively, do not reach parity seven. (Note that these percentages cannot be translated into secondary sterility since the initial proportion takes account of women who are primarily sterile.) The consistency of the results on the levels of sterility suggests that the measure of secondary sterility used in the model is not a definitional artifact.

Returning to Table VI, one finds that the simple correlation between the

[3] The probability of reaching any parity is the inclusive product of the parity progression ratios up to the parity in question.

dependent variable, children ever born, and each of the independent variables has the same sign in both countries. However, the magnitude of the coefficients is different. Among the independent variables correlations are generally low. The correlation coefficient between breastfeeding and the second birth interval in Kenya does not seem to support the idea that breastfeeding is an important determinant of birth intervals as suggested by Jain and Bongaarts (1981); however, the relationship between the two variables is stronger in Lesotho. This finding may partly be explained by the fact that breastfeeding refers to the last closed birth interval in the present study. Also, worth noting is that the simple correlation between the number of children ever born and fecundity (NSS) is much higher in Lesotho compared to Kenya: 0.35 and 0.15, respectively.

Turning to the results of the multivariate regression equations which estimate the instrumental use variable, one finds that the expected directions of relationships between ever use of fertility control and the exogenous variables hold, except that of the second birth interval in Kenya and those of the two mortality variables (pregnancy wastage and child mortality) in Lesotho (Table VIII). The variables which are significant in all equations in both Kenya and Lesotho are: fecundity (NSS), months of breastfeeding, and the number of methods known by a respondent; and they all have the expected signs. The

TABLE VIII

FIRST STAGE OF THE PROXIMATE DETERMINANTS ANALYSIS: REGRESSION OF USE OF FERTILITY CONTROL (EVERUSE) ON SPECIFIED VARIABLES

Variable	Metric coefficients (standard error in parentheses)				Summary statistics		
	Kenya		Lesotho		No. of cases		D
DURMAR	0.0196	(0.0245)	0.0595*	(0.0241)	Kenya	640	0.13
FBI	−0.0087*	(0.0036)	−0.0035	(0.0042)	Lesotho	586	0.17
SBI	0.0002	(0.0055)	−0.0158*	(0.0067)			
NSS	0.5093*	(0.2229)	−0.9047*	(0.2229)			
MOBF	−0.0292*	(0.0133)	−0.0277*	(0.0105)			
PREGWAS	−0.1313	(1.1405)	0.6772	(0.9673)			
IMR	−1.1384	(0.6279)	0.0227	(0.5451)			
NOMETH	0.5041*	(0.0703)	0.6390*	(0.0875)			
Cd	−0.0071	(0.0335)	0.0826	(0.0449)			
Constant	−1.3101		−1.3001				

* significant at the 0.05 level or below.

explanatory power of the model as evidenced by the D statistic is higher in Lesotho compared to Kenya: 17 per cent versus 13 per cent.

An examination of the results of the multivariate regression equation estimating fertility (Table IX) shows that the expected directions of relationships hold on all the variables except ever use of fertility control in both Kenya and Lesotho. All the coefficients are significant except that of child mortality in Kenya, and ever use in both countries. The relative importance of the intermediate variable compares roughly between the two countries: duration of marriage, followed by the two fecundity variables, secondary sterility and the first birth interval, then the second birth interval which is followed by a group consisting of breastfeeding, the two mortality variables and ever use of fertility control.

To get more insight into the relationship of the variables, and the robustness of the model, variables were alternately excluded from the equations. It is clear that the directions of relationships do not change when the respective variables are excluded except that on use (Table X). Note that the sign on EVERUSE in Kenya becomes negative when duration of marriage and child mortality are alternately left out of the model. Since both duration of marriage and child mortality are positively related with the number of children ever born and negatively related with use, the reversal of sign means that use has a direct positive relationship and an indirect negative relationship via child mortality and duration of marriage on the dependent variable. In Lesotho EVERUSE becomes more positive when the fecundity variables, the second birth interval and breastfeeding, are alternately left out of the equation. Thus, EVERUSE has a direct and indirect positive effect of fertility via these four variables.

Fertility differential between Kenya and Lesotho

It was shown earlier that the variables whose means varied the most and therefore were possible candidates for being sources of differential fertility between Kenya and Lesotho were, in order: duration of breastfeeding, the second birth interval, secondary sterility, and infant and child mortality. Looking at the means as an attempt to explain fertility variation is the simplest model one can use at the expense of precision of conclusions made. A variable can vary immensely across populations and can have very little impact on fertility. That is, if large changes in a variable cause minuscule changes in fertility, the mean of such a variable would be a very bad indicator of its relative importance. In view of this problem the following procedure was used. For each of the fertility determinants, the excess of Kenya's mean value over that of Lesotho, as derived from Table VI, was multiplied by the average of the two countries' corresponding regression

TABLE IX

REGRESSION OF CHILDREN EVER BORN ON SPECIFIED VARIABLES IN INTERVENING VARIABLES ANALYSIS (EVERUSE AS MEASURE OF CONTRACEPTION)

Variable	Metric coefficients (standard error in parentheses)				Standardized coefficients	
	Kenya		Lesotho		Kenya	Lesotho
EVERUSE	0.0860	(0.4955)	0.6508	(0.4027)	0.0066	0.0662
DURMAR	0.2836*	(0.0190)	0.2596*	(0.0157)	0.5027	0.5381
FBI	−0.0280*	(0.0026)	0.0238*	(0.0028)	−0.3781	−0.2621
SBI	−0.0350*	(0.0044)	−0.0240*	(0.0039)	−0.2517	−0.1949
NSS	1.6859*	(0.1784)	1.9996*	(0.1602)	0.3263	−0.4275
MOBF	−0.0397*	(0.0106)	−0.0159*	(0.0073)	−0.1239	−0.0655
PREGWAS	−3.3145	(0.8803)	−2.4372*	(0.6695)	−0.1199	−0.1299
IMR	0.8996	(0.4888)	1.4513*	(0.3618)	0.0612	0.1227
Constant	2.5151		0.5588			

* significant at the 0.05 level or below.

Summary statistics			
No. of cases		R^2	F
Kenya	640	0.39	51.14
Lesotho	586	0.49	68.05

TABLE X

REGRESSION OF NUMBER OF CHILDREN EVER BORN ON SPECIFIED VARIABLES

Constant	EVERUSE	DURMAR	FBI	SBI	NSS	MOBF	PREGWAS	IMR	R^2	N
Kenya										
2.5151	0.0860	0.2836*	−0.0280*	−0.0350*	1.6859*	−0.0397*	−3.3145*	0.8996	0.39	640
	(0.4955)	(0.0190)	(0.0026)	(0.0044)	(0.1784)	(0.0106)	(0.8803)	(0.4888)		
2.5478		0.2838*	−0.0282*	−0.0351*	1.6957*	−0.0402*	−3.2974*	0.8729	0.39	640
		(0.0189)	(0.0024)	(0.0044)	(0.1692)	(0.0101)	(0.8740)	(0.4636)		
8.7133	−0.1273		−0.0205*	−0.0272*	0.9614*	−0.0389*	−3.2313*	1.5524*	0.18	640
	(0.5783)		(0.0029)	(0.0051)	(0.1982)	(0.0124)	(1.0242)	(0.5651)		
2.6800	0.8477	0.2341*		−0.0342*	1.3583*	−0.0348*	−3.6034*	1.1718*	0.26	640
	(0.5275)	(0.0204)		(0.0048)	(0.1921)	(0.0117)	(0.9706)	(0.5373)		
1.8592	0.2319	0.2650*	−0.0275		1.6514*	−0.0423*	−3.6923*	1.3827*	0.33	640
	(0.5193)	(0.0197)	(0.0027)		(0.1870)	(0.0111)	(0.9217)	(0.5087)		
4.5535	0.5352	0.2287*	−0.0224*	−0.0344*		−0.0289*	−3.6002*	0.7956	0.30	640
	(1.0140)	(0.0195)	(0.0027)	(0.0047)		(0.0113)	(0.9449)	(0.5268)		
2.0521	0.2262	0.2823*	−0.0277*	−0.0357*	1.6176*		−2.7305*	0.8440	0.39	640
	(0.4948)	(0.0192)	(0.0026)	(0.0044)	(0.1785)		(0.8823)	(0.4959)		
2.4045	−0.1440	0.2839*	−0.0286*	−0.0359*	1.7267*	−0.0342*		0.7213	0.38	648
	(0.4975)	(0.0026)	(0.0026)	(0.0044)	(0.1800)	(0.0106)		(0.4917)		
2.5934	0.0519	0.2875*	−0.0281*	−0.0361*	1.6722*	−0.0388*	−3.2045*		0.39	648
	(0.4828)	(0.0025)	(0.0025)	(0.0043)	(0.1790)	(0.0107)	(0.8784)			

Constant	EVERUSE	DURMAR	FBI	SBI	NSS	MOBF	PREGWAS	IMR	R^2	N
Lesotho										
0.5573	0.7234	0.2571*	–0.0238*	–0.0236*	1.9420*	–0.0140	–2.5460*	1.4388*	0.48	586
	(0.4027)	(0.0158)	(0.0029)	(0.0039)	(0.1599)	(0.0073)	(0.6672)	(0.3612)		
0.7995		0.2627*	–0.0245*	–0.0257*	2.1135*	–0.0201*	–2.3686*	1.4119	0.48	586
		(0.0156)	(0.0028)	(0.0037)	(0.1440)	(0.0069)	(0.6691)	(0.3164)		
6.0235	0.0482		–0.0124*	–0.0228*	1.4174*	–0.0089	–3.1069*	1.6895*	0.23	586
	(0.5071)		(0.0033)	(0.0047)	(0.1873)	(0.0089)	(0.8162)	(0.4416)		
0.4369	0.8902*	0.2251*		–0.0228*	1.9745*	–0.0125*	–2.6239	1.7207*	0.42	586
	(0.4245)	(0.0161)		(0.0041)	(0.1698)	(0.0078)	(0.7098)	(0.3821)		
–0.3507	1.3221*	0.2520*	–0.0229*		1.9400*	–0.0168*	–3.1926*	1.7424*	0.44	586
	(0.4003)	(0.0162)	(0.0029)		(0.1650)	(0.0076)	(0.6795)	(0.3702)		
–0.4843	1.3930*	0.1927*	–0.0236*	0.0253*		–0.0096	–3.4125*	1.2380*	0.30	586
	(0.4592)	(0.0174)	(0.0033)	(0.0045)		(0.0085)	(0.7736)	(0.4213)		
0.2957	0.8150*	0.2555*	–0.0235*	0.0246*	1.9654*		–2.0198*	1.5633*	0.48	586
	(0.3930)	(0.0156)	(0.0028)	(0.0039)	(0.1597)		(0.6505)	(0.3597)		
0.2983	0.6686	0.2632*	–0.0241*	–0.0263*	2.0507*	–0.0082		1.3382*	0.47	586
	(0.4069)	(0.0158)	(0.0029)	(0.0038)	(0.1607)	(0.0072)		(0.3638)		
0.9325	0.5366	0.2630*	0.0249*	–0.0260*	1.9879*	–0.0202*	–2.1935*		0.47	586
	(0.4070)	(0.0159)	(0.0029)	(0.0039)	(0.1622)	(0.0074)	(0.0074)			

* significant at the 0.05 level or below.

coefficients. The following are the contributions of each proximate determinant to Kenya's higher fertility, measured in number of births:

ever use of contraception	+0.01
duration of marriage	+0.23
first birth interval	−0.03
second birth interval	+0.22
secondary sterility	+0.35
breastfeeding, last interval	+0.16
pregnancy wastage	0.00
infant mortality rate	−0.02
Total	+0.92

Based on this calculation, fertility differences between countries due to proximate determinants related to post-partum amenorrhoea (second birth interval, duration of breastfeeding and child mortality) account for 39 per cent of Kenya's higher fertility. Differences of the fecundity variables (first birth interval and secondary sterility) account for about 35 per cent. However, note the sizeable contribution of Kenya's higher fecundity to its higher fertility. The post-partum amenorrhoeic variables play a relatively smaller role than in Bongaarts's (1980) analysis. Part of the difference may be explained by the differences in the measurements used.

LESSONS TO BE LEARNT

High fertility, declining mortality and an unprecedented high rate of population growth are characteristic not only of Kenya and Lesotho, but of most African and other developing nations, including Zimbabwe. Yet a number of biological and socio-cultural factors directly and/or indirectly impinge upon these important components of growth. Accordingly, eight African governments have taken an official stance to support family planning as a vehicle for reducing growth rates; nineteen governments support family planning activities as a basic human right and for other demographic reasons, mostly of maternal and child health (Nortman, 1985). It is important to note that although the anti-natalist by-product of family planning activities is not the pronouncement of the governments of these nineteen countries, it is, however, the ulterior motive of most.

Contraceptive use has been the *sine qua non* of family planning, hence the most important determinant of fertility decline; it is the focus of the following discussion. To what extent are the objectives of family planning programmes achieved once policies are formulated and programmes implemented? A related question is: How readily acceptable are family planning services once they are provided? After a decade and about four years of providing family planning services in Kenya and Lesotho, respectively, the limited success of the programmes is evidenced by the contraceptive prevalence of only ten per cent in Kenya and six per cent in Lesotho. A natural fertility pattern characterizes the two countries. Three possible explanations for this seemingly paradoxical situation of the presence of contraceptive prevalence in natural fertility regimes can be suggested.

Firstly, contraceptive prevalence is still too low to have a significant impact on aggregate fertility. Secondly, modern contraception may simply be replacing traditional mechanisms of spacing — a behaviour which is consistent with natural fertility. Spacing is deeply rooted in many African cultures; however, spacing mechanisms change with modernization. Yet this change does not always occur concomitantly with that of family size desires. Hence, situations where fairly high levels of modern contraception are reported without the expected proportionate reduction in fertility — perhaps a new variant of the transitional scenario — may emerge. Lastly, contraceptive prevalence might simply be a misreporting artifact, an error which was apparent in my study on Kenya and Lesotho. The most poorly-reported methods of contraception were abstinence in Kenya, withdrawal and female sterilization in Lesotho. While 44 per cent of the current abstainers in Kenya spontaneously reported that they knew abstinence, 14 and 18 per cent of women currently practising withdrawal, and those sterilized, respectively, spontaneously reported knowledge of the two methods in Lesotho. While misreporting may not be wilful, this may be less likely so particularly when respondents are answering questions which they may perceive as connoting modernity and possibly conformity to governments' policies.

It is quite evident from Kenya and Lesotho that provision of family planning services does not necessarily translate into acceptance and use of such services. Multiple reasons can be suggested, but the most important determinant of adoption of contraception is motivation *vis-à-vis* cost (both economic and subjective) of regulating fertility. Motivation is a function of supply for children (potential fertility as perceived by the couple) and the demand for children (desired number of children). If the demand for children is higher than the supply for children, a deficit situation exists and natural fertility prevails. Yet supply for children might be slightly higher than the demand for children and couples still resist fertility regulation for its high costs — particularly subjective costs — those relating to the socio-cultural nexus in which fertility takes place. A detailed discussion of the determinants of contraception *per se* is beyond the scope of this article; however, I must posit that the timing and provision of family planning services must take cognizance of these two factors, including the costs and benefits of children as perceived by parents.

It was noted earlier that only breastfeeding and fecundity (NSS) were significantly related to ever use of fertility control — a suggested direction for policy makers. This relationship is not coincidental considering the central role these two variables play in fertility. While breastfeeding must be encouraged for its immunological and nutritional benefits to the infant, its ovulation-inhibiting quality, hence a depressant on fertility, places breastfeeding in the centre of a family planning package. Secondly, an attempt to reduce infertility must be made. Contraception assumes a couple's fecundity. Since this assumption is not valid for all couples, a condition dreaded by most (including single) adults, reassuring individuals of the dimensions of their capability to achieve this goal — having fertility within one's calculus — is inevitable for a hastened acceptance of family planning. My assertion is that helping a few sub-fecund couples to have children will earn family planning programmes more confidence than thousands of posters with ecstatically happy two-child families. While most programmes consider the above factors theoretically, the practical implementation is greatly hampered by ineffective communication between the providers and beneficiaries of family planning programmes. To family planning evaluators: do not be impressed by the face value of contraceptive prevalence! The impact of contraception on fertility is indeed variable.

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