BREASTFEEDING, CONTRACEPTION AND MARITAL FERTILITY IN SRI LANKA

By

INDRA GAJANAYAKE,

Demographic Training and Research Unit,
University of Colombo.

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Abstract

This paper focuses on breastfeeding and contraception and assesses their roles in determining the fertility levels and variation between urban, rural and estate women in Sri Lanka, utilizing data from the Sri Lanka Fertility Survey held in 1975. The methodology adopted is based on the framework proposed by Bongaarts (1978). The study reveals that breastfeeding and contraception alone do not sufficiently explain the levels and variation in marital fertility between the three groups, and points to the existence of at least one unidentified fertility depressing factor, more effective among the urban and estate women. Lower coital frequency or terminal abstinence at longer marriage durations or higher ages, induced abortion and conditions conducive to sub-fecundity and sterility are the more likely among those factors not yet identified.

BREASTFEEDING, CONTRACEPTION AND FERTILITY IN SRI LANKA

Introduction :

Socio-economic, cultural and environmental factors affect fertility through several biological and behavioural factors referred to as intermediate fertility variables. Biological factors such as viability of the ovum and sperm, spontaneous intra-uterine mortality, minimum post-partum amenorrhoea and natural sterility interact with behavioural factors such as durations of breastfeeding and abstinence, coital frequency, induced abortion and contraception to reduce fertility well below the biological maximum. Several historical populations bear evidence : their completed fertility even in the absence of contraception and abortion ranges between 6 and 11 children per woman compared to 30 that a woman would have during 30 years if she was to have a child every 12 months[1]. For example, contraception and coital frequency determine the level of fecundability and breastfeeding practices determine the post-partum non-susceptible period. Thus, variations in fertility between populations can often be traced to variations in one or more of the behavioural factors.

This paper focuses on breastfeeding and contraceptive behaviour and assesses their role in determining fertility levels and variation between urban, rural and estate women in Sri Lanka, utilizing data from the Sri Lanka Fertility Survey held in 1975. The total sample consists of 6810 ever-married women between the ages 15 and 45. The methodology adopted is based on a framework designed to assess the impact of inhibiting factors of fertility at population level[2].

Methodology

The rationale for the Bongaarts Model is that differences in fertility between populations are largely due to variations in only four of the variables :

(i) Proportion of married women
(ii) Duration of postpartum amenorrhoea
(iii) Contraceptive use and effectiveness
(iv) Prevalence of induced abortion.

They are inter-related in such a way that the maximum number of children a woman can possibly have, the total fecundity rate, TF, is reduced to the total marital fertility rate, TMR, by contraception and induced abortion ; and TMR is in turn reduced to the total fertility rate, T FR, by non-marriage.

Symbolically, $$C_m = \frac{TFR}{TMR}$$

$$C_c \times C_a = \frac{TMR}{TN}$$

$$C_{amen} = \frac{TN}{TF}$$

$$TFR = C_m \times C_c \times C_a \times C_{amen} \times TF$$

and, $$TMR = C_c \times C_a \times C_{amen} \times TF$$

where ; C_m is the index of non-marriage,

C_c is the index of contraception,

C_a is the index of induced abortion,

C_{amen} is the index of post-partum amenorrhoea.

1 H. Leridon. *Human fertility — the basic components*, translated by J. F. Helsner (University of Chicago Press, 1977) p. 107.

2 J. Bongaarts. 'A framework for analysing the proximate determinants of fertility *Population and Development Review*. (Vol. 4, No. 1) (New York, 1978) pp. 105-132.

The complement of each index indicates the proportionate decline in fertility that is due to that factor. The model's proven applicability in other populations and its modest data requirements make its use appropriate in this study[1]. The data required are : age-specific proportions of currently married women, prevalence and use-effectiveness of contraception, number of induced abortions per woman and mean duration of post-partum infecundability.

The model is generally operationalized with the suggested total fecundity rate of 15.3 and an average minimum birth interval of 20 months. The total fertility rate implied by the above is compared with the total fertility rate estimated from the actual fertility performance. A close fit is expected ; any discrepancy is attributed to measurement errors.

However, in this study, several modifications were made. The model was contracted to work within the context of marital fertility between ages 15 and 49 to enable a sharper focus on the biological and behavioural factors other than marriage. The total fecundity rate was estimated from the survey data because the suggested parameter appeared to be an over-simplified result which might not be valid for the population under consideration. Lastly, the prevalence of induced abortion was assumed to be negligible, in the absence of conclusive evidence to the contrary.

Marital Fertility by Place of Residence

In the survey each respondent was identified as an urban, rural or estate woman, according to the area in which her household was located at that time. A large majority (72%) of the respondents were classified as rural, 18% as urban and 9% as estate.

The First Country Report revealed the existence of a substantial fertility differential across the three sub-groups[2]. The women in estates have the lowest completed fertility in spite of their earliest age at marriage, and women in rural areas have the highest parity (Table 1). The difference between urban and rural women becomes smaller when standardized for age at marriage but the difference between estate women and others becomes even more pronounced.

A study of cumulative fertility within marriage cohorts confirms the lower than average estate fertility[3]. The same study reveals that the mean number of children ever born to women marrid 20 yeas or more is significantly lower for urban than for rural women.

An analysis of fertility levels and trends further confirms the fertility differen tial between urban, rural and estate women[4].

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1 For the theoretical basis and some applications see Bongaarts (1978), loc. cit. and for more applications see J. Bongaarts, 'The fertility inhibiting effects of the intermediate fertility variables'. *Paper presented at the I.U.S.S.P. — W.F.S. Seminar on the analysis of maternity histories*, London, 1980.

2 Department of Census and Statistics : *First Country Report : The Sri Lanka Fertility Survey* (*Colombo*, 1978) pp. 71-104.

3 R. J. A. Little, and S. Perera. 'Illustrative Analysis : Socio-economic differentials in cumulative fertility in Sri Lanka, a marriage cohort approach'. *WFS Scientific Reports* No. 12 (Voorburg, London, 1981).

4 I. Alam and J. Cleland. 'Illustrative Analysis : Recent Fertility Trends in Sri Lanka. *WFS Scientific Reports* No. 25 (Voorburg, London, 1981).

The mean duration ratio, (DRAT) permits a comparison based on the lifetime parity of all women[1]. DRAT is the ratio of the achieved lifetime parity to the expected parity for each individual, if she were to follow the same age pattern of childbearing as the Coale, Hill, Trussell standard fertility schedule[2]. The mean, taken over all women married for at least five years is an index of the level of marital fertility that is standardized with respect to current age and age at marriage (Table 2). The level of fertility shows a similar variation between the three groups of women, that of estate women being remarkably low. Their most recent fertility experience also confirms the pattern of variation (Table 3).

Breastfeeding and Post-partum Amenorrhoea

It is common knowledge that a woman is not fecund immediately following a birth and that the non-susceptible period is longer for the woman who breast feeds the child. There is evidence for a significant lengthening of birth intervals due to prolonged breast-feeding in populations with little or no contraception.[3]

The lengthening of the average birth interval is the result mainly of an increase in the duration of amenorrhoea and anovulation due to their hormonal suppression in lactating women. On average, the post-partum anvoulatory period and the post-partum amenorrhoeic period have been shown to be equal.[4] There is direct evidence for the effect of breastfeeding on post-partum amenorrhoea also from demographic studies[5]. The inhibiting effect of breastfeeding on ovulation weakens progressively at longer durations of breastfeeding, probably because the child is likely to be breastfed less frequently at higher ages when supplementary foods are introduced.

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1 The Duration Ratio (DRAT) is defined as follows :

$$DRAT\ (a) = \frac{C(a)}{\int_{m}^{a} n(x)\, dx}$$

where,

a is the woman's age at survey,
m is the woman's age at marriage,
C(a) is the number of children ever born to the woman,
n(x) is the natural fertility rate at age x.

The women selected for the computation were married only once at least five years ago, and continued in that marriage at the date of the survey· See B· Boulier and M. Rosenweig. Age, biological factors and socio-economic determinants of fertility : a new measure of cumulative fertility for use in the socio-economic analysis of family size'. *Demography*, Vol. 15, No· 4 (Washington, 1978) pp· 487-497.

2 A. J. Coale, A. Hill and T. J. Trussell. 'A new method for estimating standard fertility measures from incomplete data'. *Population Index*, Vol. 41, No. 2 (Princeton, 1975) pp· 182-210.

3 See for example, P. Cantrelle and H. Leridon. "Breastfeeding, mortality in childhood and fertility in a rural zone of Senegal". *Population Studies*, Vol. 25, No. 3, (London, 1971) pp. 505-533.

4 A. Perez, P. Vela, R. Potter and G. S. Masnick, 'Timing sequence of resuming ovulation and menstruation after childbirth'· *Population Studies*, Vol. 25, No. 3, (London, 1971), pp· 491-503·

5 R. G. Potter, M. L. New, J· B. Wyon and J. E. Gordon. 'Application of field studies to research on the physiology of human reproduction : lactation and its effects upon intervals in eleven Punjab Villages, India'. *Public health and population change : current research issues.* Editors : M. C. Sheps, J. C. Ridley. (Pittsburgh, 1965) pp. 377-399. L. Chen, S. Ahmed, M. Gesche and W. Mosley, 'A prospective study of birth interval dynamics in rural Bangladesh'· *Population Studies*, Vol. 28, No. 2 (London, 1974), pp. 277-297.

No question was asked about post-partum amenorrhoea at the Sri Lanka Fertility Survey. However, questions on breastfeeding were included and they permit the estimation of post-partum amenorrhoea by indirect means. Use of the classic life table approach that combines both retrospective and current status data for all births in a given period is the preferred method in the analysis of breastfeeding[1]. This cannot be adopted in the case of Sri Lanka because information on breastfeeding is available only for the two most recent births. It is possible, however, to use only the current status data[2].

In this procedure, the proportion still breastfeeding among women who gave birth x months ago is taken as the equivalent to the survivorship function l_x at duration x.

$$l_x = \frac{\text{number of children born x months ago who are still being breastfed}}{\text{total number of births that occurred x months ago}}$$

This method does not require reported durations of breastfeeding and is therefore robust to rounding errors. It is based on births that occurred within a reference period, hence is robust to truncation and selection biases. It remains, however, sensitive to systematic misreporting of the date of birth. Unlike in a true life table, the series of l_x estimates obtained from current status data do not necessarily decline in a monotonic sequence because the sample is heavily fragmented. The series can be smoothed by taking averages, or by the use of model schedules or by taking durations greater than one month.

The estimation of breastfeeding from the sample was limited to children who were either currently alive or who survived at least one year among all children born during the five years immediately prior to the survey. Thus the effect of mortality within the first year of life was eliminated. Table 4 reveals that the average duration of breastfeeding is longest among estate women and is shortest among urban women. Correspondingly the average duration of post-partum non-susceptibility could be expected to have a similar pattern of variation.

Among the procedures of estimating the average duration of amenorrhoea from that of beast-feeding, the empirically verified curvilinearity in their relationship is embodied in equations established independently by Lesthaeghe and Page,[3] and by Bongaarts.[4] The first method is designed to make the best use of data that may be defective, through model schedules created from reliable information. The estimating equations are :

$$A\text{am} = -2.757 + .1833\ \text{Mebf} - .0024\ \text{Me}^2\text{bf}$$

$$(-A/B)\text{am} = -1.5013A\text{am} - .2756A^2\text{am}$$

1 H. Page, R. Lesthaeghe and I. H. Shah. 'Breast-feeding in Pakistan : Illustrative Analysis'. *WFS Scientific Reports* No· 37 (Voorburg, London, 1982).

2 D. P. Smith. 'Life Table Analysis'. *WFS Technical Bulletin* 1365 (Voorburg, (London 1980)

3 R. Lesthaeghe and H. J. Page. 'The post-partum non-susceptible period : development and application of model schedules'. *Population Studies*, Vol. 34, no· 1, (London 1980) pp. 143-169.

4 J. Bongaarts. 'The proximate determinants of natural marital fertility'. *Determinants of fertility in developing countries : a summary of knowledge.* (Forthcoming).

where,

Me_{bf} is the median duration of breast-feeding
A_{am}, B_{am} are two parameters reflecting the shape of the distribution of proportions resuming menstruation. The estimated median duration of amenorrhoea is that duration associated with the $(-A/B)_{am}$ value in the standard schedule of amenorrhoea.

The second method rests on the following equation which embodies the empirical relationship between breastfeeding and amenorrhoea found in 26 different populations and has high explanatory power ($R^2 = .96$).

$$A = 1.753e^{.1396B - .001872B^2}$$

where A is the average duration of post-partum amenorrhoea in months,
B is the average duration of breastfeeding in months.

The two procedures yield similar estimates (Table 5) suggesting that breastfeeding data collected in the survey are not seriously distorted.

Index of Lactational Amenorrhoea

The fertility inhibiting effect of lactational amenorrhoea is quantified by relating the average birth interval one would expect in the absence of breastfeeding to that in the presence of breastfeeding. The two intervals differ by the average duration of amenorrhoea added as a consequence of breastfeeding.

Taking an average minimum birth interval[1] of 20 months an index of the effect of breastfeeding on fertility (C_{amen}) can be estimated as follows :

$$C_{amen} = \frac{20}{20 - 1.5 + AMEN}$$

where, AMEN is the observed mean duration of post-partum amenorrhoea and 1.5 is the average minimum duration of post-partum amenorrhoea.

Then, C_{amen} is the proportion to which fertility is lowered and $(1 - C_{amen})$ is the proportion by which fertility is lowered, as a consequence of breastfeeding.

The results derived from the estimated mean duration of amenorrhoea in table 6 clearly bring out the differential effect of breastfeeding between the three groups of women. The pattern of C_{amen} implies that on average, marital fertility of urban women is the least affected and that of estate women is the most affected by breastfeeding. The number of children urban women can bear is reduced to 66% by lactational amenorrhoea, whereas the fertility of rural and estate women is lowered to 58% and 54% respectively. On the whole, in recent times 59% of the potential marital fertility in Sri Lanka is actually realised because of the prevalent breastfeeding practices.

1 The average minimum birth interval of 20 months is made up as follows :

waiting time to conception	—	7.5
time lost due to spontaneous abortion	—	2.0
period of gestation	—	9.0
minimum post-partum amenorrhoea		1.5
		20.0

These typical values are based on the results of several studies·For more details see Leridon (1977) op. cit.

Contraception

Behaviour that aims to control the number or spacing of births may be either contraception, induced abortion or both. The term contraception includes traditional as well as modern methods. All methods other than sterilization lowers the monthly risk of conception to a level determined by the effectiveness of the method used. Voluntary sterilization usually ends the reproductive period irreversibly, just as natural sterility would do, but at some age before the usual onset of menopause. Much of the variation in marital fertility between populations can be attributed to contraception. The gap between natural and realised marital fertility can be bridged by C_c, the index of contraception, as follows :

$$TM = C_c \times TNM,$$

where,

TM is the total marital fertility rate,

TNM is the total natural marital fertility rate in the absence of contraception and induced abortion.

When there is no practice of contraception C_c would be unity and gains expression in entirety ; when all fecund women in the reproductive years practice 100% effective contraception, C_c would be zero and none of the potential fertility is realised. The factors that make up the index of contraception are :

(i) prevalence of current contraceptive use, and

(ii) average use-effectiveness.

Prevalence of Contraceptive Use

The prevalence of current contraceptive use is simply the average of age-specific current contraception use rates, weighted by the number of women between ages 15 and 49. On average, the current contraceptive use rate is 31% among married women. There is considerable variation in the prevalence of contraceptive use between the subgroups. Prevalence is most pronounced among urban women and is least pronounced among estate women, at 38% and 18% respectively (Table 7)

Average Use-Effectiveness

The average use-effectiveness of the user-dependent methods is a function of knowledge and motivation to control fertility and is an obscurequantity for Sri Lanka. A reliable direct estimate of the use-effectiveness of different methods in a given population can only be derived from prospective data. An indirect estimate of the average use-effectiveness can be made by applying a schedule of method-specific effectiveness derived for another population. The values used here are based on data from the Philippines[1]. The sum of the products

1 J. Laing. 'Estimating the effects of contraceptive use on fertility'. *Studies in Family Planning*. Vol. 9, No· 6 (New York, 1978) pp. 150-162. The Philippine data may not be strictly applicable under local conditions. However, C_c, the complement of an aggregate measure is not likely to be seriously distorted by minor differences.

obtained by applying the methodwise distribution of women in Sri Lanka to the standard effectiveness rates is the estimated average use-effectiveness in Sri Lanka.

The profile of use-effectiveness is quite different from that of prevalence (Table 7). Estate women, most of whom accept sterilization as a method of fertility control have the highest average use-effectiveness. Urban and rural women, being more evenly distributed among temporary methods, have a lower average use-effectiveness than do their estate counterparts. The interaction between prevalence and use-effectiveness together determine the impact of contraception on marital fertility.

Index of Contraception :

The index of contraception, C_c, can be estimated from the following equation:

$$C_c = 1 - sue$$

where, e is the average use effectiveness

u is the prevalence of contraceptive use

and, s is the sterility correction factor.

The sterility correction factor is defined as

$$S = \frac{\Sigma F_n(a) / f(a)}{\Sigma F_n(a)}$$

where, $F_n(a)$ is the natural fertility rate among all women at age a,

and, f (a) is the proportion of women fecund at age a

Data limitations do not permit the estimation of the sterility factor for the country or for each sub-group. Therefore, the estimate of 1.10 made from the experience of other countries is used[1]. Table 7 indicates that contraception has the least effect on estate fertility and the greatest effect on urban fertility. Overall, only 69% of the natural fertility is actually realised within marriage because of the practice of contraception.

Policy makers should perhaps note that the variation between urban, rural and estate women in the effect of contraception is due more to the variation in current contraceptive use rates than the proportion of women currently using each method. Given the current methodwise distribution, contraception among rural and estate women could be made as effective as that of urban women by increasing the current use rates to 38% and 29% respectively.

Combined Effect on Fertility

The combined effect of breastfeeding and contraception quantified as the product of the individual effects does not show a large variation between the three groups of women (Table 8).

1 The value is used on the presumption that the incidence of sterility, a physiological phenomenon, varies little among populations where venereal disease or other predisposing conditions are not widespread. See Bongaarts (1978), 1980) loc. cit.

The Total Fecundity Rate

The potential number of children a woman can bear on average, the total fecundity rate, can be estimated for the population from the age specific sterility rates given an average minimum birth interval of 20 months. The rationale for this approach is that the total number of live births a woman can possibly have is determined by (i) the time she spends in the fecund state within the reproductive years, and (ii) the average minimum interval between two successive live-births. The ratio of the first to the second, both measured in the same units, is the total fecundity rate.

The expression,

$$_{39}L_{10} = \sum_{a=10}^{45} (S_{a,a+5} - S_{a-5,a})(\bar{a} - a) + a\,5\,(1 - S_{a,a+5}), \text{ where}$$

$_{39}L_{10}$ is the number of years spent in the fecund state,

$S_{a,a+5}$ is the proportion sterile between ages a and a+5, and,
$\bar{a}$ is the mean age between a,a+5 at which the sterile state is ascertained, when applied to the data in table 9 yields 16.7 as the total fecundity rate.

The estimation could not be done separately for each group of women under consideration because of small numbers; it is assumed that the average total fecundity rate of all women is a good estimate for women in each place of residence.

Application of the model also requires an estimate of the recent total marital fertility rate. It is derived from births in the most recent 12–month period (Table 3).

Results and Discussion

Since the combined fertility inhibiting effect of breastfeeding and contraception is marginally lower among estate women, if all had the same reproductive potential, they could be expected to have a marginally higher total marital fertility rate. Observation, however, runs contrary to expectation (Tables 10 and 11).

Overall, the observed total marital fertility rate is about 10% higher than the expected ; the most probable explanation is that the fertility inhibiting effects of amenorrhoea and/or contraception have been overestimated. Since the two variables were estimated in the same manner for each sub-group their effect is likely to be overestimated in each case, to the extent that there was no differential under-reporting. Even so, the total marital fertility rates apparent among urban and estate women are lower than the rates implied.

It is the wide disparity between the implied and apparent total marital fertility rates of estate women that is particularly striking. It is very likely that this result is caused by an unidentified factor, one that is behavioural, environmental or biological in nature.

Among possible environmental and biological factors are poor nutrition and high secondary sterility. The status of nutrition in relation to fecundity is a matter of controversy. On the one hand, within the fecundable years there is no conclusive evidence that chronic malnutrition *per se* has a major effect on fertility at population level.[1] Mosley argues for an indirect effect of chronic malnutrition : since fecundability is so closely related to coital frequency a malnourished, hardworking rural agrarian population could have a lower than average coital frequency due to fatigue.

On the other hand there is evidence that body weight plays a critical role in the reproductive function[2]. Slight deviations below the ideal body weight may disrupt the release of gonadotropins or alter estrogen metabolism in such a manner as to cause menstrual dysfunction and infertility. Direct and indirect effects of chronic malnutrition could apply to the estate women though the statement cannot be substantiated on the basis of available fragmentary data on the status of nutrition. Extreme anaemia is cited as the main cause of morbidity among estate mothers[3] and estate women can be identified as the least fecund group in the place of residence classification (table 12).

Sterility could also play a role in lowering estate marital fertility ; there are higher proportions childless among estate women than among others (table 13). The estimated proportion among never-users of contraception who will ever progress from a first order birth to a higher order birth is also lower for estate women (table 14).

Populations with a high prevalence of sterility are often confined to limited geographical areas or specific social groups.[4] This suggests that factors leading to high levels of sterility are closely related to localized ecological, social and health conditions. Such groups also reflect the existence of endogamy, a feature that is largely the rule in the estate population. Three causes of primary and secondary sterility have been identified in populations : (a) gonorrhoea (b) post-abortal or post-partum sepsis, obstetrical trauma, and (c) tuberculosis.[5] Whether any of these factors were influencing estate marital fertility is a matter of conjecture. Nevertheless, sterility and sub-fecundity could be identified as depressors of estate fertility, apart from breastfeeding and contraception.

Use of induced abortion, prolonged spousal separation and progressive lowering of coital frequency with marriage duration or terminal abstinence are behavioural factors that could well lower marital fertility. Data limitations, however, do not permit a direct assessment of their effect for the population.

Although the prevalence of induced abortion is assumed to be virtually negligible in the population, Langford argues that among estate women, induced abortion may be far from negligible.[6] The net fertility effect of an induced

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1 W. H. Mosley, 'The effects of nutrition on natural fertility'. *Patterns and Determinants of Natural Fertility*. Editors : H. Leridon and J. Menken. (Liege, 1979). pp. 85 - 100

2 G.W. Bates et al 'Effects of body weight control on reproductive function. *Abstract Supplement of Fertility and Sterility*, Vol. 35, No. 2. (London, 1981), p. 248.

3 L. U. R. Fernando. *Medical Director's Report for 1969, Planters' Association Health Scheme*, p. 12.

4 World Health Organisation. 'The Epidemiology of Infertility Report of a W.H.O. Scientific Group'. *W.H.O. Technical Report Series*, 582, (Geneva, 1975).

5 R. H. Gray. 'Biological factors other than nutrition and lactation which may influence natural fertility : a reviw'. *Patterns and Determinants of Natural Fertility*, Editors : H. Leridon and J. Menken (Liege, 1979) pp. 219-251.

6 C. Langford. 'The Fertility of Tamil Estate Workers in Sri Lanka'. *WFS Scientific Reports*, No. 31, (Voorburg, London, 1982).

abortion has been found to be modest ; one induced abortion always averts less than one birth primarily because a woman resumes ovulation much sooner than would have been the case if she had carried the pregnancy to term, especially if children were breastfed for a long period[1]. However, recent evidence of a higher incidence of spontaneous mid-trimester foetal losses after induced abortions suggests that the net fertility effect of an induced abortion may be greater[2].

Some regular spousal separation for occupational reasons may occur in the population ; its impact on fertility is considered too small unless a minimum of 3 to 5 percent of married women are affected[3]. The degree of impact depends on the duration of separation: Hill and Shorter suggest that couples would have to be separated for at least 3 years for separation to have the same effect as marriage dissolution, and that short absences such as seasonal migration would have a much lower effect. The chances are that separation is more common among urban women whose husbands, being non-farmers, may find work far from home. It is probably minimal among the estate women whose husbands are also mostly working in the same or adjoining plantation. The estate worker expatriation scheme moves entire families and does not lead to spousal separation.

Prpgressive lowering of coital frequency with increasing marriage duration or terminal abstinence has its impact on fertility through fecundability. It is estimated that, among the Yoruba in Nigeria, 20% of the decline in fertility in older women is due to total abstinence within marriage ; two-thirds of the older women abstain sexually by age 40, and nine-tenths by age 45[4]. Abstinence is thus a demographically significant regulator of fertility in middle age. In some cultures, a woman is not expected to have a child when she becomes a grandmother. However, research carried out so far has failed to uncover a strong grandmother effect in Sri Lanka[5]. Low coital frequency or terminal abstinence could be an important fertility inhibitor among non-contraceptors. As table 15 demonstrates there is a considerable degree of resistance to the use of contraceptives among Sri Lanka women.

In any case, spousal separation for economic reasons, lower coital rates at older ages (or higher marriage duration) and terminal abstinence are unlikely to be thought of and declared as methods of birth cotrol.

Summary and Conclusion

While nearly all urban, rural and estate women breastfeed their children, they do so for a varying length of time. Urban women breastfeed for the shor-

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1 R. G. Potter. 'Additional births averted when abortion is added to contraception' *Studies in Family Planning* Vol. 7, No· 8 (New York, 1978) pp. 224-230.

2 S. Harlap, P. H. Shiono, S. Ramachandran, H· Berendes, et al. 'A prospective study of spontaneous foetal losses after induced abortion'. *New England Journal of Medicine*, Vol. 301, No· 13 (Boston, 1979) pp. 671-681.

3 A. Hill and F. Shorter. 'Intermediate variables in fertility analysis—a practical guide'. *Regional paper of the Population Council in West Asia and North Africa.* (Cairo, 1979).

4 International Planned Parenthood Federation. *I. P. P. F. Medical Bulletin* Vol. 13, No. 1, (London, 1979).

5 Personal communication by Jee-Peng Tan, Princeton University, 1981. He bases his conclusions on the results of logit analysis.

test period while estate women breastfeed for the longest period. Accordingly, the fertility inhibiting effect of lactational amenorrhoea is weakest for urban women and is strongest for estate women.

Contraception is fairly widespread with nearly 42% of the exposed women being current users. Urban, rural and estate women differ in the prevalence of current use as well as in use-effectiveness. While current use is most prevalent among urban women, use-effectiveness is highest among estate women. The fertility inhibiting effect of contraception is strongest for the urban women and is weakest for the estate women.

Together, lactational amenorrhoea and contraception depress natural marital fertility of the three groups to nearly the same extent. Their combined effect, however, does not sufficiently explain the variation in marital fertility between the three groups, pointing to the existence of at least one other fertility inhibiting factor.

A high degree of fertility control among urban women, either by the efficient use of declared contraception or other fertility checks compensates for their relatively high fecundability and short duration of breast-feeding, and results in below average fertility. Lower coital frequency or terminal abstinence at longer marriage durations or higher ages, or/and induced abortion are the more likely fertility checks prevalent among urban women.

A long duration of breastfeeding, low fecundability and high sterility in combination with some declared contraception and perhaps an unidentified fertility regulator result in a very low level of marital fertility among estate women. Induced abortion may be widespread among estate women ; but conditions conducive to sub-fecundity and sterility are likely to be more prevalent among them.

Relative to urban women, the lower fecundability and longer breastfeeding duration of rural women are counter balanced by a lower degree of delcared contraception and other fertility inhibitors ; as a result rural women achieve higher fertility.

Volitional and non-volitional factors, apart from breastfeeding and contraception inhibit marital fertility in Sri Lanka. The possible volitional checks are reduced coital frequency, terminal abstinence, and induced abortion, whereas the non-volitional may be spousal separation and conditions conducive to sterility. Clearly there is a need for further research to elucidate how the proximate determinants affect marital fertility in Sri Lanka.

TABLE 1.

Mean parity of ever-married women aged 45—49 years.

Series	*Urban*	*Rural*	*Estate*
Observed	5·5	6·2	5·2
Standardized for age at marriage	5·9	6·1	4·9

Source : Department of Census and Statistics· Sri Lanka First Country Report 1978 Table 5·3, Page 78·

TABLE 2.

Mean Duration Ratio (DRAT) for each place of residence.

Place of Residence	*DRAT*
Urban	·71
Rural	·74
Estate	·63
All	·72

TABLE 3

Marital fertility schedule based on births in the most recent period of 12 months before the survey.

Age	*Place of Residence*			
	Urban	*Rural*	*Estate*	*All*
15 — 19	.503	.474	.111	.450
20 — 24	.368	.370	.345	.467
25 — 29	.306	.318	.239	.305
30 — 34	.149	.234	.109	.206
35 — 39	.032	.124	.092	.106
40 — 44	.012	.069	.029	.057
45 — 49	.000	.015	.023	.014
Total Marital Fertility Rate	6.750	8.020	4.770	7.525

TABLE 4.

Mean and median duration of breastfeeding (in months) and proportions ever breastfed.

Statistic	*Place of Residence*			
	Urban	*Rural*	*Estate*	*All*
Mean duration	18.3	23.0	26.2	22.3
Median duration(*a*)	17.9	20.6	24.3	21.3
Proportion ever breastfed	0 97	0.98	0.97	0.97
Number of cases	894	3647	371	4912

(*a*) Medians are from 2 period moving averages.

TABLE 5.

Two estimates of the average duration of post-partum amenorrhoea

Estimates	*Place of Residence*			
	Urban	*Rural*	*Estate*	*All*
Median duration (Lesthaeghe and Page, 1981)	12·3	14.8	17.8	15.5
Mean duration (Bongaarts 1982)	12.0	16.1	18.8	15.5

TABLE 6

Index of lactational amenorrhoea. (C_{amen})

Index	*Place of Residence*			
	Urban	*Rural*	*Estate*	*All*
C_{amen}	.6557	.5780	.5362	.5882
$1 - C_{amen}$	.3443	.4220	.4638	.4118

TABLE 7

The Current contraceptive use rates (u), Contraceptive use-effectiveness (e) and Index of contraception (C_c)

Place of Residence	*e*	*u*	*s*	$C_c = (1 - seu)$
Urban	.882	.383	1.10	.628
Rural	.839	.302	1.10	.705
Estate	.963	.179	1.10	.810
All	.892	.317	1.10	.689

TABLE 8.

The combined effect of breastfeeding and contraception ($C_{amen} \times C_c$)

Index	*Place of Residence*			
	Urban	*Rural*	*Estate*	*All*
$C_{amen} \times C_c$	.412	.407	.434	.405

TABLE 9.

Age specific sterility rates.

Age Group	*Mean age at onset of sterility*	*Proportion sterile*
10 — 14	14.7	.014
15 — 19	18.5	.020
20 — 24	23.0	.033
25 — 29	27.9	.065
30 — 34	33.1	.128
35 — 39	38.2	.469
40 — 44	43.0	.685
45 — 49	48.0	1.000

TABLE 10.

Derivation of the total natural fertility rate (TNM) and the total marital fertility rate (TMR) implied by the total fecundity rate (TF), post-partum amenorrhoea (C_{amen}) and contraception (C_c).

Index	Place of Residence Urban	Rural	Estate	All
TF	16.7	16·7	16.7	16.7
TNM	10.95	9.65	8.95	9.82
TMR	6.88	6.80	7.25	6.77

TABLE 11.

Comparison of the implied total marital fertility rate (TMR) the observed total marital fertility rate (TMR) and the Duration Ratio (DRAT)

Estimate	Place of Residence Urban	Rural	Estate	All
TMR	6.88	6.80	7.25	6.77
TMR'	6.75	8.02	4.77	7.52
DRAT	0.71	0.74	0.63	0.72

TABLE 12·

Average early fecundability

Place of Residence Urban	Rural	Estate	All
.157	.124	.070	.124

TABLE 13.

Percentage childless among women married for five or more years.

Place of Residence Urban	Rural	Estate	All
2.6	3.1	4.7	3.1
(N=1002)	(N=3989)	(N=536)	(N=5528)

TABLE 14.

Probability that a woman of parity i will ever proceed to parity j.

Birth Order	*Place of Residence*			
	Urban	*Rural*	*Estate*	*All*
$i = 1$ $j = 2$	.908	.744	.454	.726
$i = 1$ $j = 5$	.290	.334	.257	.321

TABLE 15.

Percentage of never-users who did not intend to use contraception among currently married fecund women who did not want any more births.

Place of Residence	*Percentage*	*Number of Cases*
Urban	17.9	642
Rural	24.0	2342
Estate	37.6	279
Al	23.9	3263

Source : Department of Census and Statistics : Sri Lanka First Country Report (1978) Table 5.3.3C, Page 571.