

Levels and Trends in Post-partum Amenorrhoea, Breast-feeding and Birth Intervals in Matlab, Bangladesh: 1978-1989

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The adoption of modern contraceptive methods appears to have more than compensated for the sharp drop in the length of post-partum amenorrhoea

The duration of post-partum infecundability in Bangladesh is one of the longest documented in the world. The importance of post-partum infecundability for restraining fertility is especially pronounced in settings such as Bangladesh, where levels of contraceptive use have until recently remained relatively low.<sup>1/</sup> Chen and others (1974) found the median post-partum amenorrhoea duration to be around 17 months for a cohort of births 1969-1971. Huffman and others (1978a) reported a median length of post-partum amenorrhoea of 18-20 months for women following births in 1975-1976. The 1974 Bangladesh Fertility Survey reported a mean length of post-partum amenorrhoea of 14.6 months (Singh and Ferry, 1984). More recent research, however, has reported shorter lengths of post-partum amenorrhoea, with significant differentials evident by socio-economic status. The 1989 Bangladesh Fertility Survey found the overall median length of post-partum amenorrhoea to be 12 months, and just nine months for more educated women (5 + years of schooling) (Huq and Cleland, 1990). These findings suggest that the length of post-partum amenorrhoea has been falling in Bangladesh, with important potential consequences for fertility levels. Discrepancies in data quality and samples, and in methodologies used in different studies, however, make it difficult to confirm a downward trend, and it remains unclear whether such changes may be differentially concentrated among specific subgroups of women. This article examines changes in post-partum amenorrhoea in Matlab, Bangladesh over the period 1978 to 1990 and explores possible explanations for the trends observed.

#### Setting and data

In 1977, the Matlab Family Planning and Health Services Project was launched in order to test whether an intensive family planning programme could succeed in the absence of extensive socio-economic development. Matlab is a totally rural, riverain area largely inaccessible by modern transportation and communication, except river transport (Phillips and others, 1988). The social setting has also been relatively insulated from extensive change, with little economic, social or political improvements over the years that could influence demographic trends. Half the villages in the study area were designated as the treatment area and received intensive services, while the rest comprised the comparison area receiving only government services (Koenig and others, 1987). Young, married women were recruited and trained to visit households in the treatment area for the promotion and delivery of a wide range of maternal and child health and contraceptive services. A management support structure was also established to enhance worker credibility and reduce organizational barriers to field work.<sup>2/</sup> Service workers use field registers to record on a monthly basis information regarding the eligible women they visit and their children under five years of age. A longitudinal record of each woman's monthly reproductive, contraceptive and lactational status is available together with other health-related information and background data. These prospective records have been computerized and form a valuable database for the investigation of diverse health and family planning issues. At the same time, the registers assist workers in service delivery. Since the data collected are prospective in nature, they are largely free from the recall errors and biases which characterize most retrospectively collected data. Data from Matlab thus provide a unique opportunity to examine trends over time in a rural Bangladeshi population. In this article we examine changes in post-partum amenorrhoea, breast-feeding, contraceptive use and birth intervals over the 1978-1989 period.

#### Methodology

Data were analyzed on mothers following live births in two-year cohorts from 1978-1979 to 1988-1989,

with each cohort consisting of approximately 6,000 women.<sup>3/</sup> Women's reproductive and lactational records were followed for up to a maximum of 36 months, and birth intervals were calculated by following women from the date of birth of their child until the birth of their next child or to the end of the period of observation. For the 1988-1989 cohort, data were available for a somewhat more abbreviated period.<sup>4/</sup> Life-table methodology was employed to allow for the inclusion of periods of observation of censored as well as non-censored cases.<sup>5/</sup> Median lengths of post-partum amenorrhoea, as well as proportions still amenorrhoeic at various durations post-partum, were calculated. Similarly, median durations of breast-feeding and median birth intervals were calculated. Data on women's contraceptive use status were also analyzed to examine changes in post-partum adoption patterns.

## Results

### Post-partum amenorrhoea

Table 1: Median post-partum amenorrhoea (PPA), "full" and "any" breast-feeding (full plus partial), Matlab: 1978-1989

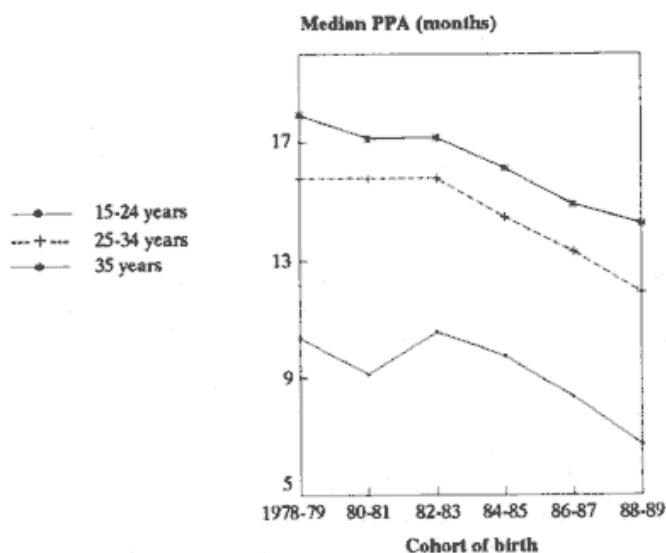
	(months)		
<b>Cohort of birth</b>	<b>PPA</b>	<b>Full breast-feeding</b>	<b>Any breast-feeding</b>
1978-1979	13.5	5.9	32.5
1980-1981	12.6	5.7	33.6
1982-1983	13.5	6.1	34.4
1984-1985	12.4	5.8	34.3
1986-1987	10.9	5.2	30.7
1988-1989	9.4	—	—

Note: Breast-feeding data not available for 1988-1989 cohort.

As shown in [table 1](#), the median duration of post-partum amenorrhoea fluctuated around 13 months for the cohorts of births during the 1978-1983 period. Thereafter, a sharp decline occurred, with the duration falling from 13.5 months for the 1982-1983 cohort to 9.4 months for the 1988-1989 cohort. When only women who gave birth in 1989 were considered, the duration of post-partum amenorrhoea was found to have fallen even more, i.e. to just 8.6 months, representing a decline of 36 per cent from 1982-1983 levels.

To determine whether this decline in post-partum amenorrhoea was widespread or instead confined to only certain population strata, trends in post-partum amenorrhoea by selected socio-demographic characteristics were also considered. Substantial reductions in post-partum amenorrhoea were apparent among almost all sub-groups. There was a consistent positive relationship between age and duration of post-partum amenorrhoea over time ([figure 1](#)). The large difference between older women (35 years or more) and younger women (15-24 years) was also noted in the 1974 Bangladesh Fertility Survey (Singh and Ferry, 1984), and suggests that age has an important direct effect on post-partum amenorrhoea, as well as an indirect effect mediated by breast-feeding, as has been found elsewhere (Jain and others, 1970). It is also apparent from figure 1 that all age groups of women experienced a steady decline in median duration of post-partum amenorrhoea over the study period.

Figure 1: Median post-partum amenorrhoea (PPA) by age, Matlab: 1978-1989



Women with fewer living children (1-2) experienced much shorter durations of post-partum amenorrhoea than those with three or more living children, across all the cohorts. A declining trend in post-partum amenorrhoea was once again apparent for all groups.

Higher levels of maternal education were associated with shorter durations of post-partum amenorrhoea across all cohorts. However, a generally downward trend was evident for all educational groups over time. In the 1988-1989 cohort, women with six or more years of education had a median duration of post-partum amenorrhoea of only a little over six months. Similar trends were observed with respect to household area, another indicator of socio-economic status.

#### Determinants of post-partum amenorrhoea

The observed sharp decline in post-partum amenorrhoea leads us to examine changes in the underlying determinants of post-partum amenorrhoea.

#### Breast-feeding

The positive relationship between the duration of breast-feeding and the duration of post-partum amenorrhoea across populations is now well-established (Huffman and others, 1978a). The declining post-partum amenorrhoea in Matlab suggests that important changes in the duration of breast-feeding occurred in the population, particularly from 1982-1983 onwards. Information is available for 1978 to 1987 on the monthly lactational status of women in Matlab, it being recorded as "full", "partial" or "no" breast-feeding.

Full describes those who gave no regular supplementation to the baby's diet in addition to breast-milk, whereas partial breast-feeding includes women who gave foods other than breast-milk on a regular basis.<sup>6/</sup>

[Table 1](#) shows the trend in the duration of breast-feeding over the period. The duration of any breast-feeding, that is, "full" plus "partial" breast-feeding, rose slightly over the first half of the period. It then fell from 34.3 months in 1984-1985 to 30.7 months in 1986-1987. Models of breast-feeding and post-partum amenorrhoea that have been developed on the basis of data from diverse populations (Bongaarts and Potter, 1983; Lesthaeghe and Page, 1980) were found to predict declines of a similar magnitude to that found here.

An earlier decline in the duration of any breast-feeding might have been expected, however, since the duration of post-partum amenorrhoea can be seen to have fallen steadily from 1982-1983 onwards.

Most models relating breast-feeding and post-partum amenorrhoea durations have considered only the total duration of any breast-feeding, rather than looking at full and partial breast-feeding separately. Data from Matlab on full breast-feeding were examined. The pattern of full breast-feeding duration was similar to that of post-partum amenorrhoea, with fluctuation around six months for the cohorts 1978-1979 to 1982-1983, followed by a decline to 5.2 months in 1986-1987 ([table 1](#)). Data for the 1988-1989 cohort, when available, may indicate further declines in breast-feeding, as was shown to be the case for post-partum amenorrhoea.

Breast-feeding duration was also examined by maternal characteristics. Higher education was found to be

associated with shorter durations of full and any breast-feeding over all cohorts. A downward trend was apparent in full breast-feeding from 1982-1983 onwards, and in any breast-feeding from 1984-1985, among uneducated and less educated women (1-5 years). Among women with more than five years of education, the duration of full breast-feeding remained at around just four months, and the duration of any breast-feeding was also fairly constant over the period. Patterns of breast-feeding with age of the mother were not consistent. Full breast-feeding was found to be shortest among the oldest group of women, i.e. those aged 35 years and over, whereas the duration of any breast-feeding increased with age of the mother. A downward trend was observed for each age-group of women in recent cohorts.

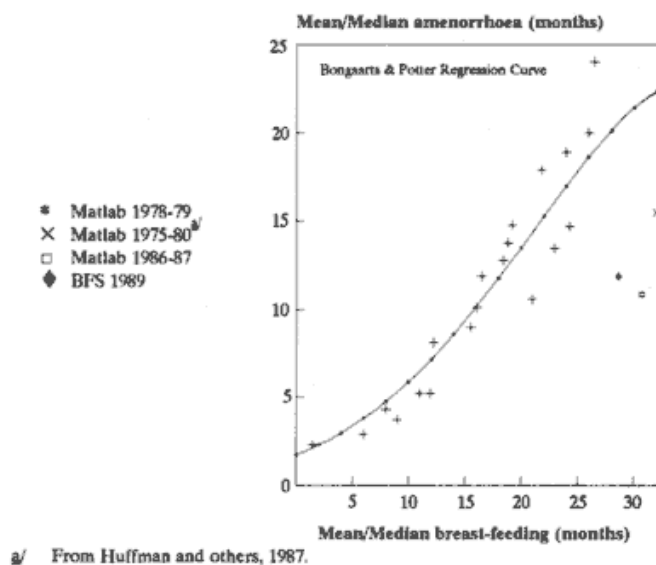
Breast-feeding data were analyzed by the number of living children in order to investigate whether declining durations of breast-feeding among low parity, younger women were being masked in the overall population. This may be the case since in Matlab fertility has been falling and, over the cohorts, an increasing number of women will be feeding their last child and thus may continue to breast-feed for extended periods (Dankert and others, 1991). Breast-feeding durations were found to increase with the number of living children. However, a similar trend, showing initially increasing durations, followed by a decline in the duration of any breast-feeding, was observed irrespective of the number of living children.

The duration of full breast-feeding also fell for all subgroups of women in the recent cohorts.

On the whole, the breast-feeding data were consistent with the downward trend in post-partum amenorrhoea, with falling durations of "full" and "any" breast-feeding apparent for most subgroups of women in recent years. However, the decline in the duration of any breast-feeding lagged unexpectedly behind that of post-partum amenorrhoea, suggesting that full breast-feeding duration may be more important in determining the lengths of post-partum amenorrhoea. Changes in other elements of breast-feeding, such as the frequency or intensity of suckling, may also be contributing to shortening post-partum amenorrhoea duration.

Compared with other populations, Matlab's breast-feeding and post-partum amenorrhoea durations appeared to be unusual. Data from Bongaarts and Potter (1983) showing mean or median durations of post-partum amenorrhoea by mean or median durations of breast-feeding for several populations are presented in [figure 2](#).<sup>7/</sup> The regression line fitted to these data by Bongaarts and Potter (1983) is plotted. Matlab data for the cohorts 1978-1979 and 1986-1987 from the current analysis are shown, together with data from the analysis performed by Huffman and others (1987) on Matlab data for the period 1975-1980. It can be seen that all the points for Matlab lie far below the regression line, indicating much shorter durations of post-partum amenorrhoea than would be expected in view of the durations of breast-feeding. This suggests that there is something special about the Matlab population, and leads us to explore the other determinants of post-partum amenorrhoea.

Figure 2: Duration of post-partum amenorrhoea by duration of breast-feeding



#### Maternal nutrition

It has been suggested by a number of researchers that nutritional status may have an influence on the length

of post-partum amenorrhoea, with better nourished women having shorter durations of post-partum amenorrhoea (Frisch and McArthur, 1974; Jelliffe and Jelliffe, 1972). However, current evidence indicates that any effect that does exist is likely to be small (Huffman and others, 1978a, 1978b; Bongaarts, 1982; Lewis and others, 1991). There is no evidence to suggest that the nutritional status of women in rural Bangladesh is better, on average, than that of other populations; indeed, it is likely to be worse than in most other settings. Similarly, there is no reason to believe that improvements have occurred in maternal nutritional status over the study period for the Matlab population. It is, therefore, unlikely that this factor is of importance in explaining either the unusually low level of post-partum amenorrhoea or the observed downward trend in post-partum amenorrhoea in the study population.

#### Contraceptive use

Over the period of observation, the most salient feature among the population of Matlab was the pronounced increase in the use of contraception. Between 1977 and 1984 contraceptive prevalence rose from 24 to 39 per cent (Koenig and others, 1987). The latter part of the study period, from 1984 to 1989, showed a further sharp increase, and by 1990 the overall prevalence rate was 57 per cent (Koenig and others, 1992). The most prevalent method in use throughout this period was the injectable contraceptive (Depo-Provera), followed by oral pills.

The possibility of an influence of contraceptive use on the duration of post-partum amenorrhoea was explored by examining the post-partum contraceptive records for the cohorts of women giving birth during 1978 to 1989.<sup>8/</sup> With rising contraceptive use, there has been an increase in the percentage of women who adopt a method of contraception while they are still in a state of post-partum amenorrhoea. In 1978-1979, 16.7 per cent of all women started to use a contraceptive method while amenorrhoeic, compared with 21.4 per cent in the 1984-1985 cohort and 27.4 per cent in the 1988-1989 cohort. Field workers report that women fear a *mura* pregnancy, that is a pregnancy following a birth without visible menses.

From the start of the study period (1978-1979), the level of contraceptive use in Matlab, and particularly the use of hormonal contraception, has probably been significantly higher than in the populations lying above the Bongaarts-Potter regression line, that is, among populations having longer than average duration of post-partum amenorrhoea for breast-feeding duration. It is also apparent that a significant minority of women in Matlab practise contraception while amenorrhoeic. Contraceptive use may thus contribute to the unusually short durations of post-partum amenorrhoea in Matlab, and changes in contraceptive use may, in part, account for declining post-partum amenorrhoea over time.

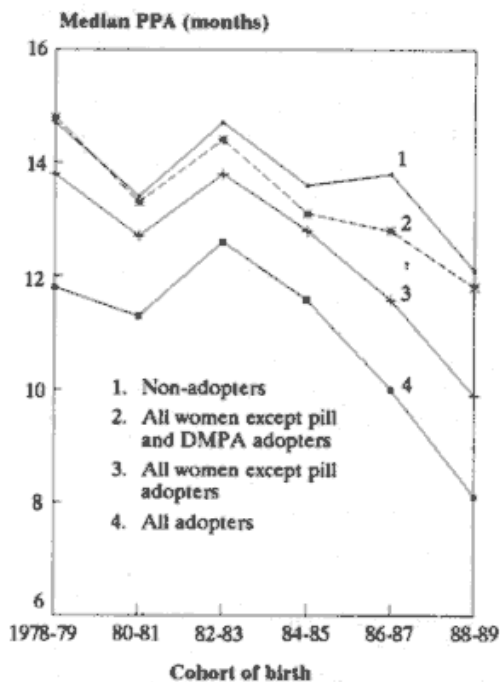
The use of particular methods of contraception during post-partum amenorrhoea may have a direct influence on the duration of post-partum amenorrhoea. The aforementioned injectable contraceptive may produce extended periods of amenorrhoea in users (Hatcher and others, 1989) and thus, if started during post-partum amenorrhoea, may lead to an abnormally long duration of post-partum amenorrhoea. An amenorrhoeic woman who adopts the oral pill is likely to experience bleeding which will be reported as menses, and thus she will have a shorter duration of post-partum amenorrhoea than if she had not adopted the pill (Bhatia and Kim, 1982, 1984). A large rise in the use of the oral pill during post-partum amenorrhoea could therefore be expected to produce a decline in post-partum amenorrhoea in a population. Conversely, a large rise in the use of the injectable contraceptive could cause an increase in post-partum amenorrhoea duration.

In Matlab, the use of the injectable contraceptive rose from 15.5 per cent of all women in 1978 to 28.6 per cent in 1989, and the oral pill from 3.7 to 13.3 per cent over the same period. The percentage of women adopting these hormonal methods while amenorrhoeic also increased over the study period. In 1978-1979, 1.6 per cent of all women adopted the pill during amenorrhoea and 9.3 per cent, the injectable; in 1988-1989, these figures were 3.8 and 18.4 per cent, respectively. In order to examine the influence of the increasing use of hormonal methods of contraception, trends in post-partum amenorrhoea were examined by contraceptive status.<sup>9/</sup> It was found that, when pill users were excluded from the population, a downward trend in post-partum amenorrhoea was still observed, from 13.8 months in 1978-1979 to 9.9 months in 1988-1989. When both oral pill and injectable users were excluded, a decline of a similar magnitude was observed, from 14.8 months in the first cohort to 11.8 months in the last cohort (figure 3). Changes in post-partum use of hormonal contraception cannot, therefore, explain the decline in post-partum amenorrhoea. Nor does the high level of hormonal contraceptive use explain the short durations of post-partum amenorrhoea, since the predominance of injectable use would be expected to produce extended durations.

However, when only non-users were considered, the decline in post-partum amenorrhoea was much less sharp than among contraceptive adopters (figure 3). This suggests that contraceptive use may play some

part in the short, and declining, durations of post-partum amenorrhoea over the period. Contraceptive use during post-partum amenorrhoea may have an indirect effect on the duration of post-partum amenorrhoea by affecting qualitative elements of breast-feeding. It should be noted, however, that reverse causality cannot be ruled out: those groups of women who experienced the greatest declines in post-partum amenorrhoea may be more likely to adopt contraception. Alternatively, another independent factor may be influencing both post-partum amenorrhoea and contraceptive use.

Figure 3: Trend in post-partum amenorrhoea (PPA) by contraceptive use status



#### Implications for fertility

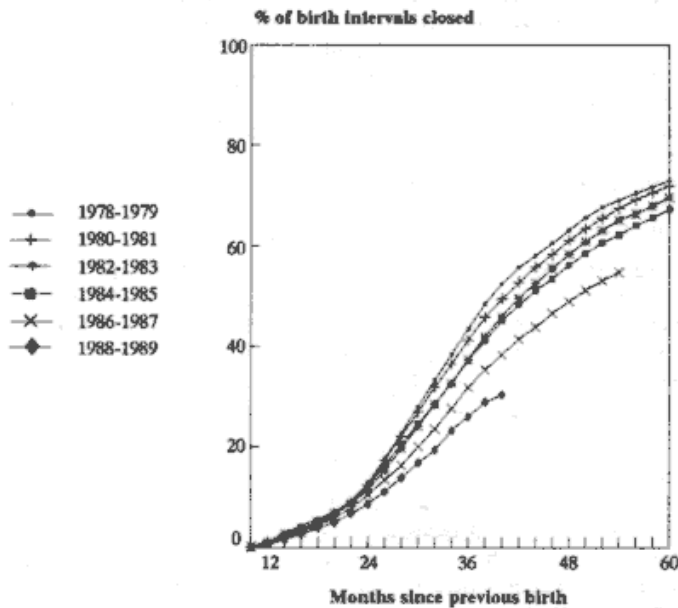
Given the backdrop of increasing contraceptive use, it becomes pertinent to ask what the implications of falling durations of post-partum amenorrhoea have been for fertility. In order to examine the net effect of changes in durations of post-partum amenorrhoea on fertility, median birth intervals were calculated for each of the cohorts from 1978-1979.

Table 2: Median birth interval, Matlab: 1978-1987

Cohort of birth	Median birth interval (months)
1978-1979	38.7
1980-1981	40.3
1982-1983	42.2
1984-1985	43.0
1986-1987	48.8

Table 2 shows that the median birth interval increased steadily over the 1978-1987 period from 38.7 to 48.8 months, with a sharper increase from 1984 onwards. The median birth interval could not be calculated for the 1988-1989 cohort owing to the limited period of follow-up and resulting large number of censored cases. However, figure 4 shows that at any time post-partum, fewer birth intervals have been closed by another birth among women in later cohorts than in earlier ones. Birth intervals have clearly lengthened over time.

Figure 4: Percentage of birth intervals closed by time since previous birth



The trend in birth intervals among different socio-demographic groups of women was also examined. The median birth interval was found to have increased among all educational groups, though a persistent differential was seen between groups, with better educated women having longer birth intervals.

Examining birth intervals by mother's age and number of living children provides an indication of whether the increasing median birth interval for the whole population is due to women ceasing childbearing, spacing births, or a combination of the two. This is because young women and those of low parity are likely to be between births, rather than at the end of their reproductive careers. Birth intervals were found to have lengthened among all age and parity groups. Among the youngest women (15-24 years), the median birth interval increased from 36 months in 1978-1979 to 43 months in 1986-1987. It was also found that women with no living sons had increasing birth intervals over the time period, though to a smaller extent than other sub-groups. It thus appears that the increase in median birth interval for the population as a whole is a result of increased spacing between births, as well as an increasing proportion of women curtailing their childbearing after fewer births.

For the majority of women in Matlab, the adoption of modern contraceptive methods appears to have more than compensated for the sharp drop in the length of post-partum amenorrhoea, resulting in a lengthening of the median birth interval over time.

## Discussion

### Breast-feeding data

Despite the fact that both post-partum amenorrhoea and the duration of breast-feeding fell over the period, the two trends did not mirror each other exactly. The fall in the duration of any breast-feeding lagged noticeably behind that of post-partum amenorrhoea. The shortening duration of full breast-feeding, that is, the earlier introduction of supplements, was more closely linked to the pattern of post-partum amenorrhoea, indicating its possible importance in declining post-partum amenorrhoea.

However, Bongaarts and Potter (1983) found that durations of post-partum amenorrhoea were influenced most by changes in breast-feeding behaviour during the 6-18-month period post-partum, that is, after the end of full breast-feeding for most populations. It is now generally recognized that characteristics of breast-feeding, such as the frequency and intensity of suckling, as well as the number of months an infant is fed, are important determinants of post-partum amenorrhoea (Labbok and Krasovec, 1990). Changes in these elements of breast-feeding may have occurred first in Matlab, only later leading to a reduction in breast-feeding duration. The breast-feeding patterns of women making up the "partial" group may, therefore, have been changing over a longer period of time, even though the actual duration of breast-feeding decreased only relatively recently.

The duration of post-partum amenorrhoea fell particularly sharply over the most recent years, and breast-feeding data for the 1988-1989 cohort may show a similar trend when available. Since 1987, there has been an emphasis on teaching correct supplementation in the Matlab programme (J. Chakraborty, personal



communication), and informal interviews with field-level workers in Matlab revealed that they felt there had been changes in the supplementation behaviour of women over the past few years. Data on the nutritional status of children aged 6-59 months have been analysed for the period June 1987 to November 1990; they indicate a downward trend in the prevalence of mid-upper-arm circumference of less than 110 mm (Andres de Fransisco, personal communication). This may suggest that weaning practices have improved and children are being given more substantial supplements from six months onwards than in the earlier cohorts.

Despite widespread concern about the deterioration of breast-feeding in Bangladesh among those involved in maternal and child health programmes, very little is known about the types of changes that have occurred in recent years. Concerns have been voiced regarding both supplementation too early in the infant's life and inappropriate and insufficient supplementation once the infant reaches six months of age (Huffman and others, 1987). The data presented here show shortening durations of breast-feeding in Matlab, but also suggest other changes, perhaps in intensity of suckling. To better understand changes in breast-feeding behaviour, more detailed information is needed.

#### Determinants of post-partum amenorrhoea

Since the inception of the project, the duration of post-partum amenorrhoea in Matlab has been far shorter than would be expected in view of the extended durations of breast-feeding. The possible influence of contraceptive use on post-partum amenorrhoea was explored. Direct influences of hormonal contraceptive use on post-partum amenorrhoea do not appear to explain adequately either the short post-partum amenorrhoea durations in the Matlab population or the decline over time. On the contrary, the very high level of injectable use might be expected to produce extended durations of post-partum amenorrhoea. However, it is worth noting that in a population with increasing contraceptive use, it may not be the case that all changes in post-partum amenorrhoea can be taken as indicative of changes in breast-feeding behaviour. It may be that contraceptive use itself, if initiated during the amenorrhoeic period, influences the duration of post-partum amenorrhoea. The influence of changes in contraceptive method choice and timing of adoption post-partum on durations of post-partum amenorrhoea has been given little attention and deserves further investigation.

A more pronounced decline in post-partum amenorrhoea was noted among contraceptive users than among non-users. This may reflect no more than the fact that the return of menses is an important trigger for contraceptive adoption, and that those groups of women with the most rapidly falling post-partum amenorrhoea durations are most inclined to use family planning methods. However, a large percentage of contraceptive acceptors in Matlab, around 50 per cent in each cohort, adopted a method while still amenorrhoeic, giving rise to the possibility of an indirect influence on post-partum amenorrhoea duration, via breast-feeding patterns. It does not appear to be the case that contraceptive use and breast-feeding are considered completely incompatible, since many women were found to practise both simultaneously. Women who adopt contraception may, however, change their breast-feeding practices in subtle ways. This could be because of real or perceived changes in milk production. Numerous studies have shown that the combined oral pill adversely affects the quantity of milk produced (Winikoff and others, 1988); other research in Bangladesh has reported that 60-70 per cent of pill users believed that a woman breast-feeding and using the pill will have less milk (Larson and Mitra, 1990). Women adopting other methods of contraception may also adjust their breast-feeding behaviour for a variety of reasons. Alternatively, it may be that women who adopt contraception are also more prone to adopt new patterns of feeding their children quite independent of their contraceptive use. It may also be that women who intend to introduce supplements to their children's diets, aware of the possibility of a return to fecundity, decide to adopt a method of contraception in order to avoid an unwanted pregnancy.

Contraceptive use during post-partum amenorrhoea may, in part, explain the unusually short durations of post-partum amenorrhoea in Matlab through its effect on breast-feeding patterns. Similarly, the increasing use of contraception during post-partum amenorrhoea may have led to shifts in breast-feeding behaviour that have contributed to the declining post-partum amenorrhoea over the study period. More detailed information on breast-feeding patterns and the use of more sophisticated analytical techniques will be needed to disentangle the various causal relationships among these variables in the post-partum period.

As noted above, estimates of the duration of post-partum amenorrhoea in Matlab for the early 1970s were much longer than those found in this study for the 1978-1979 cohort (Chen and others, 1974; Huffman and others, 1978). This suggests that post-partum amenorrhoea was in decline throughout the 1970s, which would preclude any causal role of contraception.

[Figure 2](#) also shows that national figures for Bangladesh, taken from the 1989 Bangladesh Fertility Survey (Huq and Cleland, 1990), lie far below the Bongaarts-Potter regression line. The contraceptive prevalence



rate at this time was just 31 per cent (23 per cent modern methods), and it is unlikely that the national population would have as large a proportion of women using contraception during post-partum amenorrhoea as in Matlab. This leads us to search for other explanations for Bangladesh's unusually short duration of post-partum amenorrhoea.

Supplementation of the infants' diet, irrespective of contraceptive use, may be more significant in Bangladesh than in other countries. Most observers, however, have suggested that supplementation is generally poor, with minimal amounts of calories being given (Huffman and others, 1987). It may be that supplementation comes earlier in the child's life in Bangladesh than in countries experiencing longer durations of amenorrhoea for similar overall durations of breast-feeding. The Matlab data presented here showed shortening durations of full breast-feeding which may have been important in declining post-partum amenorrhoea. Clearly, more detailed information is needed on patterns of breast-feeding in order to understand its relationship with post-partum amenorrhoea.

The possibility of data errors should also be considered. Although recall errors should occur far less often in Matlab than in retrospective surveys, the unique nature of intensive data collection coupled with service delivery over many years, may have an influence on the accuracy of the data collected. It is possible, for example, that field workers are reluctant to record a woman as "amenorrhoeic" who is using family planning, and thus record her reproductive status as "menstruating", leading to shorter reported durations of amenorrhoea among those who adopt contraception. The possibility of such biases within the Matlab data collection system deserves further attention. The BFS, however, should be prone to different types of errors from the longitudinal data collection of Matlab. Estimates of breast-feeding durations for Bangladesh from some sources have been shorter than those presented here (Shuaib and Islam, 1988; Rob, 1987; Ferry, 1981) but differences in methodology make comparisons difficult. The fact that levels estimated independently from the BFS and Matlab are similar gives support to their being reasonably accurate.

It should be noted that the data used to fit the Bongaarts and Potter regression line included few countries with lengths of breast-feeding as long as those in Bangladesh. It may be that durations of breast-feeding beyond a certain limit have very little impact on post-partum amenorrhoea, and that this would be reflected in the regression equation if more populations with long durations of breast-feeding were included. The points for Bangladesh may then lie closer to the overall regression line. Nevertheless, the data from Bangladesh clearly illustrate that the breast-feeding-post-partum amenorrhoea relationship has yet to be adequately explained.

#### Fertility effects

Despite the decline in post-partum amenorrhoea, the median birth interval in Matlab was shown to have increased over time among all demographic and socio-economic groups. Given the very large increase in contraceptive use in Matlab, however, larger decreases in fertility than have been observed might have been expected (Akbar and others, 1988). Employing the model suggested by Potter (1987) based on data from 74 populations, the Matlab total fertility rate for 1989, when the contraceptive prevalence rate stood at 57.1 per cent, should have been 3.3, compared with the actual figure of 3.7. The Matlab population is therefore an outlier, though not as extreme as has been suggested.

There are several factors that could account for this, including the underlying fecundity level, contraceptive method mix, use-effectiveness levels and marriage patterns. However, as noted above, there has been an increase in the percentage of women adopting contraception during the post-partum amenorrhoeic period and this overlap may be an important explanation. For example, in 1988-1989, 27.4 per cent of all women adopted a method of contraception during post-partum amenorrhoea, an increase of 10 percentage points since 1978-1979. As Bhatia and Kim (1982) note, the adoption of contraception during post-partum amenorrhoea, among populations where continuation rates are low, may lead to shorter birth intervals than if adoption is delayed until menses resumes. Further research is warranted on the issue of contraceptive use in the post-partum period and its relationship to breast-feeding and natural protection against pregnancy.

It is clear that important changes have occurred in the duration of post-partum amenorrhoea in Matlab over the past 10 years or so, and that the duration of post-partum amenorrhoea continues to be unusually short, in view of the extended period of breast-feeding observed in the population. A decline in the duration of "full" and "any" breast-feeding has been demonstrated, and it is likely that changes have also occurred in feeding patterns. Evidence from other sources points to the fact that declining post-partum amenorrhoea duration may be the trend throughout Bangladesh (Huq and Cleland, 1990).

Matlab has in many ways been a forerunner of important changes in the rest of the country. Current models of population growth, which assume that national durations of post-partum amenorrhoea will fall only very slightly over the coming years, should perhaps therefore be redefined. Further information will be needed

in order to understand more fully the reasons for the changes in the Matlab population and their implications for offsetting gains in fertility reduction resulting from increases in contraceptive use.

#### Footnotes

1. The period of post-partum infecundability cannot normally be measured in the field since it requires monitoring a woman's reproductive state and the detection of ovulation. In practice therefore the period of post-partum amenorrhoea is often taken as a proxy. Although a number of women will become pregnant without resuming regular menstruation, for most women the period of amenorrhoea is a reasonable indicator of the length of infecundability. Since the first few menstrual cycles are often anovulatory or have defective luteal phases, full fecundity may in fact return slightly after the return of menses for many women (McNeilly 1979; Howie and others, 1982).

2. The Matlab Family Planning-Health Services Project (FPHSP) is described in more detail in Bhatia and others (1980).

3. The cohort sizes were:

1978-1979	5,685
1980-1981	6,408
1982-1983	6,441
1984-1985	5,750
1986-1987	6,179
1988-1989	5,821

4. For the 1988-1989 cohort, reproductive status data were available up to May 1991. Lactation data were not available for this cohort.

5. The breast-feeding duration of mothers whose children subsequently died was considered as censored in the life-table analysis. It was felt that improvements in child survival over the period were not great enough to warrant adjustment of the data for this factor.

6. This information was gathered from Matlab field station notes and from conversations with field staff.

7. Bongaarts and Potter (1983) noted that means and medians could be presented together since there was little systematic difference between them apart from those at the shortest durations.

8. For this stage of the analysis all cohorts were given 17 months of contraceptive follow-up after the birth since this was the time available for the 1988-1989 cohort.

9. "Users" were defined as women who adopted a method of contraception in the birth interval under study and "non-users" as those who adopted no method during this time, although they may have used a method in previous intervals. Only the first method adopted subsequent to birth was considered.

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Ethnicity and Infant Mortality in Malaysia

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By enlisting the aid of the traditional authorities attending deliveries, important health messages for new mothers might be reinforced

In peninsular Malaysia, the Chinese have had lower infant mortality rates than either the Indians or Malays since the late 1940s ([table 1](#)). The infant mortality rate (IMR), which is the number of children dying in the first year of life as a proportion of 1,000 live births, is a particularly sensitive indicator of socio-economic development. It "reflects not simply per capita stocks of food, clean water, medical care, and so forth, but the actual availability of such amenities to all segments of a population" (Newland, 1981: 5). That this indicator of welfare varies so clearly with ethnicity in Malaysia poses some worthwhile questions for further investigation and offers some lessons for policy makers and programme administrators.

Table 1: Infant mortality rates in peninsular Malaysia

Years	Malays	Chinese	Indians
1950-1954	105.8	69.1	100.4
1955-1959	94.5	47.5	72.2
1960-1964	72.4	35.5	56.0
1965-1969	53.7	30.9	52.2
1970-1974	43.7	27.1	44.4
1975-1979	34.4	21.2	36.6
1980-1984	23.4	14.1	23.1

Sources:Kwok, 1980: 273; Tan and others, 1987: 13.

There is some potential imprecision in the Malaysian statistics which will be discussed below, but it is obvious that infant mortality rates are currently approaching those common to most developed countries, so the prospects for further reductions are neither so urgent nor easy as they were just a few years ago. Recently reported rates are now below those that were achieved in the United States in the late 1940s (Hirschman, 1980: 120). Nevertheless, the Malaysian experience with lowering infant mortality rates is worth exploring in some detail since it is one of the few cases where the development process has had such a clear differential impact on identifiable groups.

There are of course many reasons why some babies survive their first year of life and others do not. One possible reason why Chinese infant mortality rates are low is simply that a higher proportion of Chinese live in urban areas where they may have had better access to medical care (Jones and Tan, 1985: 267; and see [table 2](#)). Another is that Chinese are generally reproductively efficient and have relatively low infant mortality rates in any society (King, 1975: 509, 512). But the situation is not as simple as that.

Table 2: Infant mortality rates in peninsular Malaysia <sup>a</sup>

Year	Urban <sup>b</sup>	Rural	Total
1976	22.7	30.9	30.7
1977	22.0	33.5	31.8
1978	19.9	29.8	28.1
1979	19.1	29.2	27.0
1980	—	—	24.9
1981	—	—	21.0
1982	14.8	21.7	20.5
1983	16.0	22.9	20.3
1984	13.6	19.9	17.5
1985	—	—	20.2

Sources:United nations, 1987: 399, 407; 1988: 307, 310.

Notes:a Excludes live-born infants dying without the birth being registered.

b Gazetted area with a population of 10,000 or more.

Our initial and primary concern is with those factors related to the culture of infant care in the identified groups in Malaysia. The customs surrounding the care of infants are variable, learned behavioural patterns (cf. Raphael and

Davis, 1985), and these patterns vary by ethnicity: the literature unambiguously points to patterns of practices which are associated with Malays but not Chinese (such as "mother roasting") or with Indians but not Malays (such as restricting the new mother's food intake). If some of these practices can be shown to either be advantageous or disadvantageous for the infants of one group, then understanding the relationships between the statistics and actual behaviour should be enhanced. Similarly, if one group has learned new patterns of behaviour which have been advantageous for its infants, then discovering how and why the change occurred should enhance the potential for further improvements in infant survival.

### Chinese confinement

Many with experience in Malaysia know something of Chinese servants called "baby *amahs*". They are also known as *p'ei yué* (in Mandarin), *pui yue* (in Hokkien), or *p'ui yuet* (in Cantonese). *P'ei* means to accompany or to keep someone company; *yué* means moon or month. The term, then, refers to a person who keeps company with someone for a month. The month of confinement following the birth of the child is particularly important in Chinese societies. The woman should remain confined, literally, and follow a strict regime of diet and activity (Field and Baber, 1973: 40; Koh, 1981: 88; Ngin, 1985: 100). The demands of "sitting out" the month (*tso yueh-tzu*) are such that a helper is necessary (Pillsbury, 1978: 14). It is possible that such a person may be a contributing factor in lowering Chinese infant mortality.

The clearest statement of the ideal, normative rules for the confinement month comes, unfortunately, not from Malaysia but from Pillsbury's (1978) work in Taiwan Province of China. There is some risk in assuming that confinement customs in that province have anything to do with those among Chinese in Malaysia, but the practices that Pillsbury discusses are confirmed in the case of one Chinese community in Selangor by Ngin (1985).

With any ideology or set of rules, there is likely to be another set of rules for breaking the rules, so actual behaviour may have little resemblance to the ideal (cf. Laderman, 1983: 208), but Pillsbury's 12 normative rules are worth summarising, in her order of importance, because they appear to be the basis for most of what we know about Malaysian Chinese practices.

- (a) Do not wash the body or hair during the month, especially avoid contact with cold water. (This rule is usually relaxed after some days and water in which ginger has been boiled is acceptable.)
- (b) Do not go outside for the entire month (or at least wear a hat or use an umbrella and avoid wind).
- (c) Do not eat raw or "cooling" foods or foods cooked the previous day.
- (d) Eat chicken, especially chicken cooked in sesame oil; pork liver and kidney are also good; eat five or six meals daily and rinse the rice bowl with scalding water.
- (e) Avoid all wind, fans and air conditioning.
- (f) Avoid walking or moving about; the ideal is lying on the back in bed.
- (g) Do not go into another person's home.
- (h) Do not get sick.
- (i) Do not read or cry.
- (j) Do not have sex.
- (k) Do not eat with family members.
- (l) Do not burn incense or visit a temple or altar.

(Pillsbury, 1978: 13-14)

The basic reasons for these rules are apparently the need to protect the new mother from ill health and to protect the household from ritual pollution. Firstly, there is thought to be a need to restore the humoral balance of the mother who has been dangerously cooled by the delivery, hence the need to avoid cooling foods such as most fruits and vegetables and eat especially "heating" foods such as meat. (Anderson, 1980: 260, presents a detailed list of foods classified as heating, cooling and neutral by informants from Hong Kong and Taiwan Province of China; Wu, 1979, does the same for Singapore. Additional sources on the humoral classification of foods include Anderson and Anderson, 1972, 1977; Gould-Martin, 1978; Hart, 1969; and Harwood, 1971. References to the humoral theory of disease in general may be found in Logan, 1975). Also to restore the mother's humoral balance, bathing and draughts are to be avoided.

Secondly, the long-term health of the mother is considered at risk (Counsilman, 1990: 103; Johnson, 1975). Eye problems in later life are attributed to the failure to avoid reading and crying during the confinement month; aches and pains in old age are deemed to be a result of insufficient attention to the precautions of the post-partum month (Ngin, 1985: 100; Wolf, 1972: 56).



Thirdly, there is the need to avoid ritually polluting the household. The post-partum discharge, considered the same as menstrual fluid, is thought to be unclean, expelled waste and anyone contacting it not fit to burn incense or otherwise worship (Ahern, 1975: 194; Gould-Martin, 1978: 41; Johnson, 1975: 235).

Fourthly, yet another reason for Chinese confinement customs appears as a theme in the literature of rest and special food to reward the new mother (e.g., Wolf, 1972: 56).

One would expect that in Malaysia the confinement practices as described by Pillsbury (1978) and Wolf (1972) would be modified or would be different to begin with. In the first place, Chinese society in Malaysia was disrupted and altered by the migration experience. In the eighteenth and nineteenth centuries, Chinese society in Malaya was one of single male transients, with no family constraints or supports. Social life was not a "natural" one because of the shortage of women (Purcell, 1948: 88). The women who did begin arriving in greater numbers in the twentieth century were likely to have been poor, without children, and hardly the most reliable carriers of the "little traditions" of confinement practices, since they may have come from a family prevented by poverty from observing the ideal modes. On the other hand, the changes in Chinese communities that migration entailed may well have served to strengthen some aspects of confinement behaviour.

The data from Taiwan Province of China emphasize that the confinement practices are directed to the mother, not the child. Pillsbury says that the avoidance of fresh fruit and vegetables may help prevent diarrhoea in the nursing infant (1978: 17), but clearly neither Pillsbury nor her informants seemed primarily concerned with the child. Wolf says that the infant sleeps with its mother so that it may breast-feed at will (1972: 59) and that the protein-rich diet may improve the quantity and quality of breast milk, "but in this instance it is the mother's health that is considered at stake" (1972: 56).

In Malaysia, there may have been a shift in emphasis of the confinement practices towards the child. Dunn (1974: 8; 1975: 313) is clear that they are intended to protect the mother, the household and the child. Koh (1981: 88), too, mentions that avoidance of certain fruits and vegetables is believed to reduce the risk of diarrhoea in the infant and that the confinement diet may improve lactation. This change in emphasis may be merely reflecting the authors' interests, but it bears investigating.

Malaysian Chinese women show a decided preference for professional obstetrical care and hospital birth; even in rural areas, home birth is apparently rare (Dunn, 1975: 308). And in Malaysia the *p'ei yue* was transformed from a non-specialist - usually the mother-in-law - to, at least for some Chinese, a specialist professional. Wong (1964: 419) reports that in the early 1960s in Singapore a baby amah had become an "indispensable" and "all-important" substitute for the mother-in-law. Dunn (1975: 312; emphasis added) informs us that:

If the family can afford her, a specialist servant (*p'ue yue*) is employed for the first postpartum month. These servants are in considerable demand; they cook and care for the mother and child, thus freeing the family from polluting influences. The servant knows how to prepare and serve the traditional foods, and how to protect the mother and child from untoward influences.

Whether the professional baby *amah* is really a common institution in modern Malaysian Chinese society does not seem to be known. Some anecdotal evidence suggests that it is, especially among the reasonably well-to-do. On the other hand, Ngin (1985: 100) is clear that in the semi-rural, relatively poor Hokkien community she studied, "few women had help during the post-partum period" and that "most women admitted that poverty and lack of help prevented them from adhering to all the prescriptions and proscriptions of a traditional post-partum confinement".

It seems intuitively sound that giving a new mother rest, good food, some isolation and the advice and assistance of an experienced woman should create some of the conditions that might enhance an infant's survival chances, but whether Chinese confinement practices can help to explain the differential in infant mortality rates between Chinese and non-Chinese in Malaysia remains to be answered conclusively.

### Malay confinement

Without doubt the best sources on Malay customs surrounding childbirth and confinement are Laderman (1982a, 1983) and Manderson (1981a). And since those sources are readily available most of the material can be treated more superficially here.

One of the first things to note is that there appears to be both widespread regional variation in traditional childbirth customs and great variation in the degree to which the ideal traditional practices are observed. Kuah (1972: 81) comments on regional variations and notes that many of his informants did not know about customs and relied on elders. Manderson (1981a: 512-3) found no uniformity of practices and noted that some 10 per cent of her survey respondents chose to ignore traditional dietary restrictions. With respect to childbirth, a woman choosing a traditional midwife (*bidan*) to attend the birth was not much constrained by custom: "flexibility and accommodation" are the norm with the *bidan* advising and assisting as necessary but willing always to defer to the "star player", the new mother (Laderman, 1982a: 97).

Some traditional practices, for example avoiding "cooling" fruits and vegetables during confinement, have been under attack by medical practitioners for some time (Manderson, 1981a: 516). Chen (1975: 177) speaks about harmful dietary taboos (1973: 197) and complains that too many births (74 per cent in

Kelantan in 1970) were attended by what he called "untrained individuals, chiefly traditional birth attendants". These negative influences may account for some variation in the strength of traditional customs, but it should be noted that most Malaysians see the different medical systems as complementary instead of antagonistic (Chen, 1975: 178).

Keeping in mind the wide regional and historical variation in Malay childbirth customs, we propose to follow Pillsbury's lead (above) and enumerate a set of normative rules which seem to be accepted in the published sources.

***Childbirth is in the mother's natal home attended by a bidan.***

Though hospital births have become much more common for Malays since the Malaysian Government began a concerted effort to improve health services for rural Malays in the 1960s (Kwok, 1982: 285), Malays apparently still have a higher proportion of home births than other groups in the country. Traditionally, a woman went home for her confinement where she was attended by her mother and the still important *bidan kampung* (Djamour, 1959: 80; Laderman, 1982a: 83; Millis, 1958b: 139; Strange, 1981: 69).

The umbilical stump may be dusted with either wood ash (Kuah, 1972: 83) or a mixture of pepper, turmeric and ginger, a practice which could be the source of tetanus or other infection (Chen, 1974: 4), but Laderman (1983: 157) reports a bidan using an antiseptic on the stump.

***Mother and child are confined for either 40 or 44 days.***

During confinement, the mother is expected to perform only light household duties, indoors (Chen, 1973: 202; Wilson, 1973: 268). Time spent with the baby is important (Chen, 1973: 202). Meals are eaten alone (Djamour, 1959: 92). In contrast to Chinese belief, Laderman reports that the new mother is not considered as polluting to others (1983: 204). But Strange reports that she is considered ritually unclean and may not read the Koran or pray (1981: 73).

That two different lengths of the confinement are reported in the literature is curious. Several sources mention 44 days only (Chen, 1973: 200; Counsilman, 1990: 104; Kuah, 1972: 82; Manderson, 1980: 27; 1986: 139; Millis, 1958b: 141; Snodgrass, 1980: 261; Strange, 1981: 58, 73; Thomson, 1950: 340). But other sources mention only 40 days (Laderman, 1982a: 93; 1984: 550; Wilson, 1973: 267), and Laderman (1983: 182) notes that women are not slaves to the custom and in some cases cut the confinement short by four or five days.

Aside from providing a restful environment, confinement probably limits contact with possible carriers of infection (Manderson, 1981a: 516). But Laderman (1983: 204) reports that visiting the confined mother and child by neighbours is common.

The confinement period ends with the *bidan* performing a cleansing ceremony to mark the transformation of both mother and infant to a new status (Kuah, 1972: 83; Laderman, 1982a: 99; 1983: 204-7).

***During confinement a woman follows a special diet in which heating foods are encouraged and cooling foods proscribed to restore the humoral balance upset by the birth.***

From the literature it is difficult to determine how seriously the confinement diet is regarded, even in an ideal sense. Even the reason for following the diet may be primarily for the benefit of the mother (Laderman, 1983: 188; Manderson, 1981b: 962-3) or the baby by affecting milk quality (Wilson, 1973: 272). While some sources emphasize strictness and rigidity of food taboos (e.g. Chen, 1973: 197; Hart, 1969: 49; Wilson, 1973: 268), others found a good deal of flexibility in the practices. In the first place, Laderman (1982a: 99) says the word "taboo" is wrongly used in this sense, because the diet is not restricted owing to "supernatural strictures and entailing extra-natural penalties" and a woman who fails to follow the diet is not "a sinner, only a bit of a fool". Furthermore, those studies based on survey data note a minority of women who ignore the diet (e.g. Laderman, 1983: 189; Manderson, 1981a: 513; Millis, 1958b: 141), and women taking medication obtained from a hospital or clinic at least sometimes consider the traditional diet unnecessary because that medicine is considered sufficiently heating to restore the desired humoral balance (Manderson, 1981a: 513; McKay, 1971: 70; Wilson, 1973: 273).

The universally reported aspects of the diet are that the confined mother should avoid cooling foods and favour heating foods, just as in the case of Chinese. But for the Malays, there are more categories of food than simply heating and cooling foods. (Laderman (1983: 43-47) says there are three classes of food, Hart

(1969: 87-88) notes five and Manderson (1981: 951; 1986: 132) mentions six.) There seems to be a good deal of disagreement in Malay society as to which foods fit into which category.

In Manderson's study, 278 respondents were requested to classify specific foods. Admittedly 14 per cent of the respondents were Chinese, Tamils or Thais, but even so in only two cases did a majority of the respondents identify a food with the same class: 87.4 per cent said pineapple was "sharp"; 53.2 per cent identified prawns as "itchy" (Manderson, 1981b: 951). The salient point seems to be that foods are classified according to their effect on the individual. Different foods affect people in different ways. Also attributes such as method of cooking, texture, colour and spiciness alter a food's perceived effect. Thus, inconsistencies in classification of foods are not surprising (Manderson, 1986: 132).

Some of the inconsistencies are explicit. Eggs are preferred foods (Hart, 1969: 49; Laderman, 1983: 187; Strange, 1981: 73; Wilson, 1973: 268); eggs are avoided (Djamour, 1959: 92; Manderson, 1981a: 513). Tapioca or cassava is prescribed (Laderman, 1983: 187; Wilson, 1973: 268); cassava and tubers generally are proscribed (Chen, 1973: 200; 1974: 5; Manderson, 1981a: 513).

Laderman (1983: 212) makes the important point that the general, ideal pattern of avoiding cooling foods is insufficient to predict actual post-partum behaviour and that new mothers are normally encouraged to try many foods in small amounts, especially after the first delivery, to gain the experience which will influence subsequent confinement diets.

The consequences of these dietary rules for the health of the mother or the infant are not clear. Laderman's study of women's diets during pregnancy and confinement was accompanied by blood testing to judge the effect on nutrition; it found no evidence to suggest that a restricted diet reduced their nutritional status, though she admits that her sample was small and that it would be unwise based on her data to make generalizations about other parts of Malaysia (Laderman, 1984: 551-2). Manderson (1981a: 516) suggests that there may be advantages to increased levels of protein. Chen (1973: 197) says the diet is "harmful", Millis (1958b: 142) notes it "is inadequate in many respects". Snodgrass (1980: 261) calls it "injurious", and Wilson (1973: 273) says the diet is not "nutritionally prudent".

Even if an extreme post-parturient diet is routinely followed by most Malay women, the impact is not certain. While it was once believed that a poor diet may reduce lactational performance and therefore reduce infants' survival chances (e.g. Hauck and others, 1956: 41; Millis, 1955: 161; Thomson, 1950: 340), it seems clear that this is not the case (Cruz and others, 1982: 272; Lawrence, 1985; Sundararaj and Pereira, 1973: 385; 1975: 193). The mothers' nutritional state is depleted if their diet is deficient, but "neither the volume nor composition of their milk is detrimentally affected" (Thapa and Williamson, 1990: 10). But, if the confinement diet is an extreme form of an already poor diet for some women, especially a diet deficient in vitamins and minerals because fruits and vegetables are already restricted (as is suggested by Millis, 1958b: 140, 142; Snodgrass, 1980: 261; and Thomson, 1950: 340), then the impact on future pregnancies cannot be good.

However, there does not seem to be much evidence that a restricted diet for 40 days with each child can have a serious impact on an otherwise healthy woman (Jelliffe, 1976), and there may be some valuable emotional comfort in believing that one is behaving in culturally endorsed ways. It must be recalled that the special, restricted diet is a confinement diet, not a lactation diet which, as we shall see in the case of Indians, continues to the next pregnancy (Laderman, 1983: 188). The mother's nutritional status at the onset of pregnancy is of far greater consequence to the infant than her nutrition during pregnancy or lactation (DaVanzo, Habicht and Butz, 1984: 402; Jelliffe, 1976: 133; Newland, 1981: 29; Widdowson, 1976: 103). Except indirectly, then, the Malay confinement diet probably does not "contribute to ... neonatal deaths" as suggested by Wilson (1973: 273). Moreover, there is evidence that the nutritional deficiencies detected in some Malay women are the result of poverty, not some traditional, restricted diet (Laderman, 1983: 201).

During confinement, the new mother should "roast" by lying above a fire or sitting with her back to a fire and she should warm her abdomen by applying a smooth, heated stone.

"Roasting" is a phenomenon widespread in South-East Asian societies and appears to be related to restoring the humoral balance (Cole, 1945; Hanks, 1963; Hart, Rajadhon and Coughlin, 1965; Johnson, 1975; Kimball, 1979; Manderson and Mathews, 1981; Morris, 1953; Mougne, 1978; Strange, 1981: 72; Wylde, 1957: 132).

Aside from the general need for the new mother to restore heat lost in childbirth, as evidenced by the need to dress warmly and the desirability of heating foods, roasting is specifically reputed to "dry out the womb" (Manderson, 1981a: 511, 512), to prevent illness, speed involution of the uterus and thus return a youthful figure (Chen, 1973: 201) or, as Laderman puts it, "to aid the mother in regaining her health and

tight vagina" (1982a: 98).

Infants should be breast-fed exclusively for the first few months.

Prolonged breast-feeding is reported as either an ideal or a norm among Malays in several sources (Chen, 1973: 197; 1974: 203; Djamour, 1959: 100; Manderson, 1984: 47, 52; Millis, 1958a: 145; Morris, 1953: 122; Strange, 1981: 58). In fact, the tenets of Islam urge mothers to breast-feed (Koran: chapter 2, verse 233; chapter 31, verse 14, as cited by Counsilman, 1990: 102). Nevertheless, Millis (1958a: 151) talks of supplemental feeding being introduced very early and Manderson (1984: 55) suggests that supplemental feeding may have been the norm in Malaya since the introduction of tinned milk early this century.

Both mother and child are bathed immediately after birth.

In contrast to Chinese practice, there is ample evidence that bathing continues throughout confinement in Malay communities. Water for bathing is heated and made more "heating" by adding herbs (Laderman, 1982a: 98; Manderson, 1981a: 512). Immediately after delivery, both mother and baby are bathed (Laderman, 1982a: 94-5; 1983: 175; Wilson, 1973: 270).

While sex is expressly prohibited during confinement, the woman's future sexuality is an underlying theme.

Islam forbids post-natal intercourse for forty days" (Djamour, 1959: 92). But one wonders, if the proscription is so clear, why some sources refer to a kinswoman or mother having to sleep with the new mother to keep the husband away or to the need for a woman to make herself unattractive to her husband during confinement (Djamour, 1959: 92; Kuah, 1972: 84). Laderman (1983: 204) notes that, in Trengganu at least, the rule that a wife disobeys her husband at her own risk can supersede the rule barring sexual relations during confinement.

### Indian confinement

The major sources of information about Indian birth and confinement practices in Malaysia are Colley (1978) and, to a lesser extent, Jain (1970). More detailed material coming from studies in southern India identify some beliefs and practices which may be current in Malaysia. The ancestors of most Malaysian Indians were Tamil "untouchables" who were the preferred estate labourers (Colley, 1978: 78). About 80 per cent of Malaysian Indians are Tamils (Sandhu, 1969: 257).

In terms of environmental conditions and the chance to learn mothering skills which might favour infant survival, there are suggestions that most Indians should have been relatively advantaged. Many estate workers had relatively good housing, creches and nurseries, maternity benefits and access to some, though often rudimentary, hospital facilities by the late 1930s (Arasaratnam, 1970: 69; Parmer, 1990: 185). Indians not on estates would have been mostly either town-dwelling, retail traders or government employees and so too could have been similarly advantaged. More recently, even on rural estates most Indian women give birth in hospital because it is a condition for obtaining a maternity allowance (Colley, 1978: 93; Jain, 1970: 137) and most estates have some company-financed medical facilities (Colley, 1978: 84).

From the late 1940s to the middle 1960s, Indian infant mortality rates were only marginally better than that of the Malays and since then they have been generally worse ([table 1](#)). In their analysis of data from the Malaysian Family Life Survey, DaVanzo, Habicht and Butz (1984: 400) found "a systematic worsening of Indians' income, birth-weight, birth-spacing and infant mortality over time, compared with the rest of the Malaysian population". While Kwok (1982: 274) suggests there may have been some problems with registration of Indian vital statistics in the 1970s, he also recognised some "puzzling trends". Among those trends are those of low birth-weight in the Indian population ([table 3](#)). "Low birth-weight is one of the most important correlates of infant mortality, especially during the first month of life" (DaVanzo, Butz and Habicht, 1983: 400).

Table 3: Birth-weight by ethnicity (kgs)

Year	Malays	Chinese	Indians
1977	3.10	3.10	2.90
1978	3.10	3.12	2.93
1979	3.10	3.12	2.93
1980	3.10	3.10	2.93
1981	3.10	3.13	2.93
1982	3.10	3.15	2.94
1983	3.10	3.15	2.94
1984	3.12	3.17	2.97

Source: Tan and others, 1987: 15.

Note: Known birth-weights vary from 90 per cent in Federal Territory and Negri Sembilan to 26 per cent in Kelantan.

Table 4: Pregnancy outcome by ethnicity and education (percentages)

	Live births	Stillbirths	Spontaneous abortion	Induced abortion	All wastage
Malays	92.5	1.1	5.7	0.6	7.5
Chinese	90.0	0.8	4.8	3.4	10.0
Indians	88.1	2.6	6.6	2.7	11.9
No school	90.9	1.7	5.9	1.5	9.1
Primary school	90.7	1.0	5.9	2.4	9.3
Lower secondary	90.0	0.5	6.6	2.9	10.0
Upper secondary	89.3	0.7	7.4	2.6	10.7

Source: Arshat, Tan and Tey, 1985: 118.

Note: 1982 data: 1,616 women, 6,992 pregnancies, in Johor and Perak.

It is also noteworthy that still-births and spontaneous abortion are more common among Indians than Chinese or Malays (table 4). The statistical relationships between birth-weight, infant mortality and characteristics of the mother are too complex to outline here; they are covered in DaVanzo, Habicht and Butz (1984). But the statistical relationships and other studies clearly imply a causal relationship between the mother's nutrition and the infant's survival chances (Belizan and others, 1981: 247). Further investigation into the customs surrounding childbirth and confinement in Indian communities in Malaysia seems warranted.

During the first week after delivery, the entire Indian family is considered ritually polluted and a ceremony may be held on the seventh day to remove the pollution (Colley, 1978: 94; Jain, 1970: 137). As in other societies pollution may be a basic reason for confinement, but the connection between the period of pollution and the time of confinement is vague in the Indian case. Colley (1978: 94) reports that "traditional" Indian families in Malaysia confine the mother and baby for 30 days. This is supported by one study from the Indian State of Tamil Nadu (Sundararaj and Pereira, 1975: 190, 193), but another says confinement lasts between 10 and 40 days (Katona-Apte, 1975: 47). A third study states that the common "pollution" period is 40 days (Eichinger Ferro-Luzzi, 1974: 14) and Counsilman (1990: 104) says the period of spiritual (and physical) danger is 28 days.

Whatever the period of confinement, a special and restricted diet with several common elements appears to be followed. In Malaysia, Wylde (1957: 133) reports that "the mother may eat nothing for three to seven days" after the birth; and, Colley (1978: 94) says the mother's confinement diet is restricted to warm liquids such as black coffee for the first three days. Then toast, with fried garlic and onions, is introduced to encourage lactation. "Cooling" foods are avoided, especially tomatoes, cucumbers, coconut milk and mutton. Foods considered good during confinement include very spicy curries, shark and sting-ray, chicken and salted fish. Colley (1978: 93) does not mention the amount or adequacy of the confinement diet, though in pregnancy women "should eat lots of fresh vegetables and . . . drink fruit juices and milk", which may suggest that some contemporary ideas about a good diet may have been accepted.

There is some risk, though, that Malaysian Indians are maintaining some dietary habits apparently common to their cohorts in southern India and which are likely to lessen infants' survival chances. With respect to the confinement diet, one Indian study of 1,200 women found that liquids only were given for the first few days followed by bread, milk, rice and soup. After the actual confinement, a diet which avoided meat, fish, eggs, buttermilk and curds, certain fruits, green vegetables, sweet potatoes and groundnuts was followed as long as lactation continued, ostensibly to protect the baby's health by ensuring good quality milk (Eichinger Ferro-Luzzi, 1974: 7). Three additional studies mention coffee and later bread as the initial confinement diet, but they also emphasize the basic inadequacies of the maternal diet, deficient in calories, protein, vitamins and minerals (Katona-Apte, 1975: 46; Sundararaj and Pereira, 1973: 385; 1975: 193). Because she is not working outside the home, the breast-feeding mother receives restricted amounts of food, because she is breast-feeding her baby, she receives a restricted range of food, because she is unclean she is barred from the kitchen and can only take what is prepared for her (Katona-Apte, 1975: 47). During pregnancy, a woman's diet is also restricted because too much good food is considered "harmful to the fetus" (Katona-Apte, 1975: 46) and, more specifically, high-protein foods are avoided to prevent the development of a large baby and a delivery that could thus be difficult (Eichinger Ferro-Luzzi, 1973: 259; Wylde, 1957: 133). A woman who follows a restricted lactation diet, who breast-feeds until her next pregnancy and who then follows a restricted pregnancy diet, is not eating well during her entire childbearing life.

If the Indian studies are valid (and they seem to be), and if Malaysian Indian women are conforming to a similar set of dietary practices (and, at least in the case of the immediate post-partum diet, they seem to be), some of the causes of the low birth-weight of Indian infants may be found. It is also clear that mothers under age 19 tend to have smaller babies and Indian women tend to marry and have children younger than Chinese (DaVanzo, 1984: 313; Jones and Tan, 1985: 270). Small women tend to have smaller babies and there is some suggestion that Indian women tend to be smaller than Malay or Chinese women (DaVanzo, Habicht and Butz, 1984: 398). The mother's nutrition in her own childhood and at the onset of pregnancy have a great effect on her child's birth-weight, and

therefore its chances for survival (DaVanso, Habicht and Butz, 1984: 402). An inadequate lactation diet, while not stunting the current baby's growth, will certainly lower the mother's nutritional status and therefore lessen the birth-weight of a subsequent child (DaVanso, Habicht and Butz, 1984: 399; Katona-Apte, 1975: 48).

#### Broader considerations

From the published materials on ethnic differences in childbirth and mothering referred to so far, it is difficult to conclude that one group has had a distinct advantage over another. But health workers and policy makers should be alert to the relationships between traditional beliefs and other ideas about health, as in the case of the diets of Indian mothers just mentioned. A sensitivity to traditional practices should complement our understanding of explanations of variations of infant mortality which are not based on ethnicity.

Before discussing some of those alternative explanations, two points about the published information used in this study need to be noted. The first point relates to the official statistics. Whereas the statistics on infant mortality in peninsular Malaysia are relatively straightforward, in Sabah and Sarawak the figures have not been categorized by ethnic groups so those two states are not included in this study. However, relatively low infant mortality figures for Sabah and Sarawak point to a problem with all the Malaysian infant mortality data: rather than reporting the number of *all* live-born infants dying in the first year of life, the Malaysian statistics exclude infants who die before the birth has been officially registered (United Nations, 1988: 307). Though the law requires births - even still-births - to be registered (Sidhu and Jones, 1981: 274), obviously some families are unlikely to register the birth of a child who dies within hours of birth, a factor which distorts the figures.

The second point relates to the nature of the literature consulted. Some of the sources consulted might be termed "medical" literature, and they tended to assume, implicitly or explicitly, that "modern", "Western", "scientific" obstetrical and paediatric care is the fountainhead of truth about practices which favour infant survival. Dunn (1975: 298) refers to this as "cosmopolitan medicine" and perhaps that term is less value-laden than words like "Western" or "modern," since such medicine incorporates many non-Western and very old ideas. Hospital births are assumed to be "better" than home births; a scientific diet is "better" than a traditional diet; a doctor is "better" than a midwife. Traditional practices are generally assumed to be ineffective or wrong until proven safe by cosmopolitan medicine's modes of analysis (cf. Simpson, 1957).

With respect to peninsular Malaysia, the general validity of this conventional wisdom is evidenced by the lowering of infant mortality rates over the past 50 years as cosmopolitan medicine has become increasingly available to Malaysian communities (cf. Leinbach, 1972) and as government policy continues its spread.

However, one should not allow the general situation to obscure the negative aspects of some cosmopolitan practices which have been coming under scrutiny. As has been pointed out, cosmopolitan medical attention at delivery does not automatically result in complete safety for either the infant or the mother; indeed, oversupply of medical attention, and the stress which may accompany it, may well be counterproductive in cases where there is no reason to suspect an abnormal delivery (Arms, 1975; Ehrenreich and English, 1979: 316; Oakley, 1979: 15-18). In both the Malaysian context and that of the wider third world, it has been amply demonstrated that the availability of the cures offered by cosmopolitan medicine does not automatically lead to preventative measures which lower infant mortality (DaVanso, 1984: 320; Jackson and Ugalde, 1985: ix-xvi).

Also, cosmopolitan medicine, as part of a wider cosmopolitan or "modernisation" trend in both the developed and the developing world, is identified by some observers with the crystallisation of gender-specific roles which in turn subordinate and marginalize women (Manderson, 1983: 13; Pearson and Manderson, 1987: 4-14).

Practices which may favour infant survival can be thought of as innovations to be adopted by families. Cosmopolitan medicine, through the agency of government policy, has tended to work from the theoretical perspective of rural sociology (e.g. Rogers, 1983), which focuses on the potential adopters of innovations and their personal attributes making them more or less resistant to new ideas. An alternative theoretical approach to innovation diffusion concentrates upon the *opportunity* to learn about and adopt new skills and focuses "upon the process by which innovations and the conditions for adoption are made available to individuals or households, that is, the *supply* aspect of diffusion" (Brown, 1981: 7). From this latter, geographical perspective, an assumption by some sources that some mothers have not been choosing to do the right thing by their babies becomes highly questionable (cf. Oakley, 1979: 165; Wylde, 1957). There are obvious implications for innovative, effective policy.

Our investigations of published materials have centred on the theme of mothering and learning the craft of



motherhood (cf. Raphael and Davis, 1985: 7). Frequently these materials derive from a social science tradition which tends to assume value and validity for most traditionally sanctioned practices. The references are few in number and are only rarely related to the central question of babies living or dying. So we are prepared to accept that future field and clinical studies may reveal that the ethnic differences in mothering are only remotely related to the differences in infant mortality. Other things may be more important, and it is to these broader considerations that the discussion now turns.

Seven very good, sophisticated, analytical studies of data related to infant mortality in peninsular Malaysia point to some items which should enhance our awareness of the complex interplay of factors influencing infant mortality. These studies are Butz, Habicht and DaVanso (1983; 1984); DaVanso (1984); DaVanso, Butz and Habicht (1983); DaVanso, Habicht and Butz (1984); and Habicht, DaVanso and Butz (1986; 1988). (There are some others, but they were unavailable at the time of writing.) They analyse the data from the 1976/77 Malaysian Family Life Survey of 1,262 mothers and involving 5,583 infants from 52 localities in peninsular Malaysia (DaVanso, Habicht and Butz, 1984: 388). There were too few infant deaths in the Malaysian Family Life Survey sample for these results to be totally reliable, and the survey relied on mothers' recall of their life histories (Butz, Habicht and DaVanso, 1984: 517-8). One should recall that the data are nearly a generation old (Haaga, 1988); in general, however, there seems to be little reason to doubt either the quality of the survey or the rigour of the analyses.

Like most studies of infant mortality, those stemming from the Malaysian Family Life Survey recognize that the immediate, "proximate" causes of infant death are readily determined. Babies die from infections, injuries, dehydration and so on, but the causes of these fatal biological factors are usually related to a series of other factors, which may be either biological (such as birth-weight) or social or behavioural (such as household income or mother's education), affecting mortality by indirect means (DaVanso, 1984: 310; DaVanso, Butz and Habicht, 1983: 381). The latter, indirect causes of infant mortality are very important because they are most amenable to planned change.

The factors identified as statistically significant in influencing "proximate biological" factors in Malaysia are as follows:

- (a) birth-weight;
- (b) mother's age at birth: <<18, 18-40, >>40;
- (c) short pregnancy intervals and prior reproductive loss;
- (d) sex of child;
- (e) birth order;
- (f) duration of breast-feeding, supplemented and un-supplemented, and type of supplemental or weaning food;
- (g) types of household water and sanitation;
- (h) persons per room in house;
- (i) year of child's birth;
- (j) mother's education;
- (k) household income;
- (l) household composition (e.g. grandparents present etc.);
- (m) institution of birth;
- (n) ethnicity; and
- (o) rurality.

(DaVanso, 1984: 311-312)

Of equal concern are those factors found NOT to have been significant in the analysis of infant mortality:

- (a) mother's hours of work in child's first year of life;
- (b) mother's occupation (other than that of housewife);
- (c) distance of mother's workplace from home;
- (d) presence of other children, or the presence of servants;
- (e) incidence of epidemics in child's first year of life;
- (f) type of health care preferred in village;
- (g) community's types of sanitation;
- (h) prices and availability of infant foods; and
- (i) access to various types of medical care.

(DaVanzo, 1984: 320)

The value of identifying particular factors such as these lies not so much in the answers given but in the questions raised. To take an example relevant to the previous discussion, does the fact that servants in the household have been found to be not significant mean that baby *amahs* are of no consequence to an infant's survival? Or is it simply that there were too few baby *amahs* to make their effect statistically significant in this survey? Or perhaps a baby *amah*, hired for one month, was not considered a servant? And, if grandparents in the household were found related to a lower rate of infant mortality, should not a baby *amah* performing a similar role in a Chinese household have the same effect? What, precisely, is the effect of the mother's education on the survival chances of an infant (cf. Newland, 1981: 27-9; Ware, 1984: 210; Whyte and Whyte, 1982: 113)?

The salient point we may learn from studies in the mode of the Malaysian Family Life Survey is that infant mortality is an extremely complex phenomenon with a great many interrelated facets. Further research and policy which concentrates on the simple aspects such as the biological causes of infant death in Malaysia are probably not worthwhile. We already know that a lot of infants in poor circumstances die of dehydration associated with diarrhoea, and we also know that critically ill infants can be effectively treated (cf. Feyisetan, 1985). But too few studies about how to make households safer for babies have been done.

For example, breast-feeding is clearly associated with fewer infant deaths in many societies (Clavano, 1982; Jelliffe, 1976; Jelliffe and Jelliffe, 1975, 1977; Knodel, 1977; Rohde, 1982; Victoria and others, 1987; but see also Milman, 1985; 1987). And specifically in the case of Malaysia, Holland's analysis (1987: 89) showed that infants who were never breast-fed were 12 times as likely to die as infants who were breast-fed at some time. But how and why breast-feeding is practised in the specific context of Malaysian communities has yet to attract the attention which would yield valuable information.

Again, the statistical studies from the Malaysian Family Life Survey provide a possible point of departure. As an infant grows older, the causes of death and factors influencing the cause of death change (DaVanzo, Butz and Habicht, 1983: 381; Spiegel, 1986, 167). This is because as infants grow older their resistance to fatal, especially enteric, pathogens increases, so despite increased exposure to infection, improvements to the environment in the later months of infancy prevent fewer deaths (Butz, Habicht and DaVanzo, 1984: 524). The first month, in the traditional confinement period for most Malaysians, looms as an especially critical time when babies should be protected from pathogens in the environment.

If it is true that during the first month of an infant's life breast-feeding is a particularly good way of reducing exposure to pathogens and of protecting the infant from the effects of pathogens (Habicht, DaVanzo and Butz, 1986; 1988; Howie and others, 1990), the choice of whether to breast-feed wholly or to feed supplementally needs to be understood better. Even where breast-feeding is the norm and supposedly total, in most societies infants are often given some additional food in the first month, if not the first few hours (Huffman and Lamphere, 1984: 95).

The avoidance of colostrum coupled with supplementary feeding in the first two or three days of an infant's life is apparently still very common (Chen, 1978: 122; Dixon, in press; Whyte, 1974: 115). Actually,

colostrum is extremely valuable. It is rich in gamma globulins which protect the infant against viral, fungal and bacterial infections and it prepares the intestinal tract for the proper milk (Clavano, 1982: 292; Fildes, 1986: 81; Lawrence, 1985: 117-38; Montagu, 1979: 189; Raphael and Davis, 1985: 42; Shah and Khanna, 1990: 26). Future detailed studies may reveal that Malaysian infants are normally given foods other than breast milk in the first few days. If so, they are being systematically denied valuable colostrum and are possibly being exposed to pathogens during the most vulnerable time (see also Khan, 1990).

#### Conclusion

Compared with factors not related necessarily with ethnicity, there does not seem to be enough in birth and confinement customs to explain adequately the differences in infant mortality rates in Malaysia. If anything, since Malay customs, at least in the ideal sense, appear to be directed more towards the infant and relatively less centred on the mother, they should be as likely to be of similar advantage to the baby as Chinese customs.

Because the statistics on infant mortality in peninsular Malaysia have been collected and reported within ethnic categories, Malaysia offers an interesting example for the study of infant mortality in other developing areas. It enables one to examine the possibility of ethnic causes in the variation of infant mortality rates. That the information available so far does not support a conclusion that the causes of variation are simply due to ethnic traditions of birth and confinement leads one to ask whether other divisions in society are interacting with ethnic differences. Other divisions, such as those based on upper class versus lower class, poor versus rich, illiterate versus literate, or rural versus urban, may be underlying causes of variation in infant mortality rates and may also be related to ethnicity (cf. Bromley, 1987). To carry the investigation to the next stage, the spatial or geographical components in the variation of the rates and variation in access to information and facilities which can lower those rates could be carefully examined.

Policy makers and administrators may be in a position to encourage continued investigation along these lines. And until some clearer answers emerge, continued attempts to develop policies to reduce infant mortality might profit from lessons this study suggests.

It is in the interaction between traditional values and cosmopolitan health systems that directed changes in health practices usually succeed or fail (Councilman, 1990: 105; Mosley, 1984: 19). Attempts to reduce further the infant mortality rates for specific communities in Malaysia and elsewhere could well exploit the existence of traditional confinement customs (Peng and others, 1972). By enlisting the aid of the traditional authorities, especially the Malay *bidan* and the Chinese baby *amah* or *p'ei yué*, important messages about such things as hand washing, breast-feeding and pure water might be reinforced and the vital emotional support a new mother gains from following the correct path as prescribed by the people she loves and respects might be preserved. In most cases, the new mother is likely to have longer and more persuasive contact with traditional authorities, and with older female members of her family, than with health professionals. Councilman's recent study (1990: 100) of breast-feeding among well-to-do mothers in Singapore found that statistically the most significant variable related to breast-feeding was the attitude of the mother-in-law.

Also, factors such as mother's education, rurality, mother's age and household income are unequivocally associated with infant survival (DaVanzo, 1984: 311-312). It seems logical to conclude, then, that programmes of assistance and education designed to reduce infant mortality are most efficiently directed to particular ethnic groups (e.g. the Indians) and to the illiterate, rural, young, and poor women of any ethnic group and, especially, to the older women in their households or communities who are still likely to be strongly influencing their behaviour.

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The Fertility Decline in China: The Contribution of Changes in Marital Status and Marital Fertility

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The policy prospects for retaining a low level of fertility must take into account the effects of socio-economic development on fertility

The dramatic decline in Chinese fertility during the past three decades is well known. The 1982 population census of China reveals that the total fertility rate fell from 5.93 in 1950 to 2.63 in 1981 (China Population Information Centre [CPIC], 1983).

The factors fostering the fertility transition in China are a matter of debate among demographers, both in China and abroad (Mauldin, 1982; Chen, 1983; Banister, 1984; P. Chen, 1984; Coale, 1984a; Tien, 1984; Bongaarts and Greenhalgh, 1985; Wolf, 1986; and Poston and Gu, 1987). The facts mentioned most frequently as underlying the decline include the changing roles and aspirations of women, postponement of marriage, and the impact of family planning and increasing use of reliable contraceptives in particular. These authors have not taken into account the distinction between the underlying variables (such as social norms about family, or economic conditions) and the intermediate variables (factors affecting exposure to intercourse and conception, and factors affecting gestation and successful parturition) through which the underlying variables affect fertility (Davis and Blake, 1956).

This article attempts to fill this void by examining the possible impacts of changes in nuptiality and marital fertility patterns on fertility in China. Its purpose is to quantify the components of the decline in annual fertility in China from 1953 to 1981 in such a way as to facilitate future research on the underlying and intermediate variables which are likely to affect fertility. For this special purpose, Coale's indirect standardization procedure, which distinguishes the impacts of women's marital status and fertility within marriage on overall fertility, is used.

This study analyzes the data primarily from China's 1982 One-per-Thousand Sample Fertility Survey conducted by the State Family Planning Commission. Retrospective histories of child-bearing and marriage of women aged 15-67 were obtained by this survey. The survey also included data on contraceptive practice, education, occupation, recent abortions and possession of a one-child certificate. Coale (1984) and several others, after scrutinizing the quality of the data, have concluded that the data are reasonably reliable and allow much more accurate and more detailed study than has been possible until now.

Following the introduction, a discussion is presented on the nationwide trends in nuptiality, including total female first-marriage rate, age at first marriage, and nuptiality pattern. The third part of the article examines the data related to declining marital fertility. In the fourth part, after a brief discussion of Coale's indirect indices (Coale, 1965, 1970), the article assesses the contribution of marital structure and marital fertility based on the measures of the relationship between overall fertility and its components: marital fertility and an index of the proportion currently married. The article concludes by discussing some research and policy implications of the findings. We hope that the results presented here will contribute to a better understanding of China's recent fertility trends.

#### Changes in nuptiality patterns

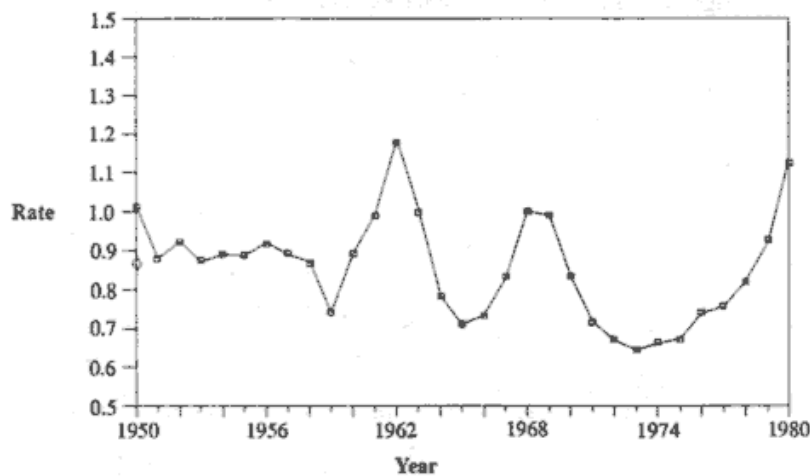
Sustained fertility decline is typically the outcome of changes in demographic behaviour that occurred earlier in time. This is also true of the impact of marital status of fertility in China. Whenever the age of marriage changes, some years pass before the change in number of newly married women moves through the initial ages of child-bearing and has its full impact.

#### Total female first-marriage rate (TFFMR)

TFFMR, obtained by summing age-specific female first-marriage rates and indicating the number of females who will ever marry per thousand females in a population, has differed from unity in most years, often substantially ([figure 1](#)). For example, it was at a high of 0.89 in 1954, fluctuated throughout the 1950s, reached a low of 0.74 in 1959 during the Great Leap Forward, rebounded to a high of 1.19 in 1962 as the economy and society recovered from that venture and the "bitter year" of 1960/61; TFFMR fell again to 0.71 and 0.73 in 1965 and 1966, respectively, at the beginning of the Cultural Revolution. It increased to unity in 1969. TFFMR dropped rapidly to a low point of 0.64 until 1973. In 1973, the TFFMR was at only 64 per cent of the 1968 level. It then gradually rose, reaching 1.1 in 1980. In 1980 and the first six months

of 1981, it rose in part due to the new marriage law of 1980, and in part to the large "baby-boom" cohorts of women born at the beginning of the 1960s. The marriage boom in turn caused increased births in 1981 and 1982 and exerted a continued upward pressure on births throughout the 1980s.

Figure 1: Total female first-marriage rate, China, 1950-1980



Source: China Population Information Centre, 1983, pp. 233-235.

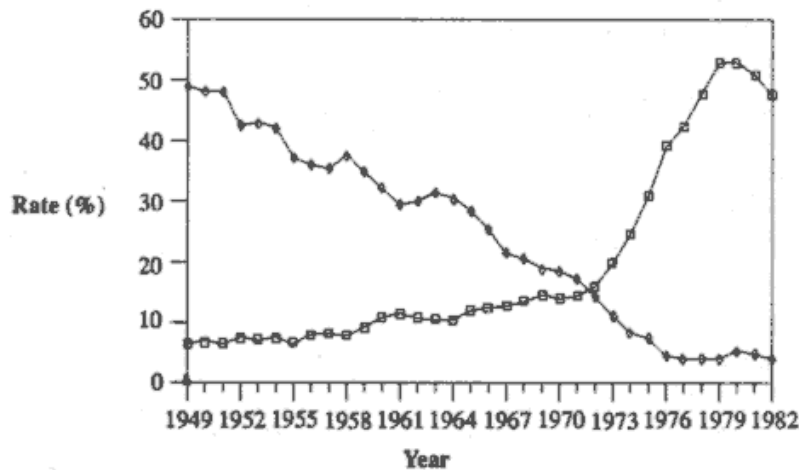
#### Age at first marriage (AFM)

AFM identifies the onset of exposure to the risk of socially sanctioned child-bearing, and as such, it is thus a principal determinant of the number of births a woman will have (Bongaarts, 1983).

Early and universal marriage was pervasive in traditional China. Data from before 1949 indicate that AFM was 17-18 years for women and 20-21 for men: 90 per cent of women married before age 20; few remained single after 25. AFM calculated for the 1940s is little different from that for 1950 (18.5 compared with 18.7). The increase in AFM was relatively gradual during the 1950s and the 1960s, and then became relatively rapid during the 1970s. Throughout the 1970s, the family planning programmes raised the age of marriage by controlling the issue of marriage permits. It became increasingly difficult to obtain permission to marry if the marrying couple did not meet the minimum age requirement: usually 23 years for women and 25 for men (Chen, 1985). By 1980 it had reached 23.1 years (25.2 for urban and 22.5 for rural areas) (Zhao and Yu, 1983).

The steady rise in AFM reflects the steady increase in the late marriage rate (LMR) and the early marriage rate for females (figure 2). In 1950, the LMR (defined as the percentage of women who marry after attaining 23 or more years of age) was 7 per cent for China as a whole. By 1971, LMR was 14 per cent. This rate had risen to 53 per cent up to 1981 (Wen and Wei, 1983). Obviously, without this change, the AFM could not have risen as it did.

Figure 2: Late and early marriage rate, China, 1949-1982



Source:Wen Zhifu and Wei Cen, 1983, pp. 126-129

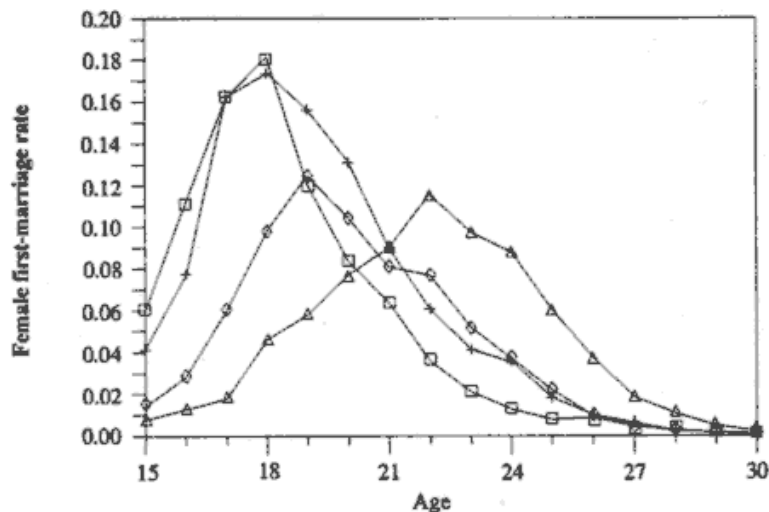
Notes: □ = Late marriage rate; ◇ = early marriage rate.

The early marriage rate (EMR) (defined as the percentage of women who marry at 18 years of age or earlier) also correlates with the steady rise in AFM. In 1949, EMR was 49 per cent for China as a whole. In 1960, this fraction had fallen to almost 32 per cent. Between 1949 and 1970, EMR was 34.7 per cent for the country as a whole. Since 1970, the proportion has fallen to about 4 per cent. During those 12 years, EMR was only 7 per cent for the whole country (Wen and Wei, 1983). That LMR and EMR were equal in the year 1972 suggests a surprising coincidence with the timing of the implementation of the population policy "later, longer, fewer" in 1971. This rapidly rising tendency to delay marriage obviously thinned out the actual number of marriages until the rise in mean age ceased as a result of the new marriage law which went into effect in 1980 (Coale, 1985).

#### Age patterns

The cumulation of age-specific rates of entry into first marriage contributes to TFFMR. [Figure 3](#) delineates the age-specific female first marriage rates (ASFFMRs) for 1955, 1963, 1971 and 1977. During the 1950s and 1960s, ASFFMR plummeted after about age 18, a pattern characteristic of general resort to the legal minimum age at marriage (18 years for women, according to the marriage law of 1950), even though norms concerning age at marriage were already beginning to change. In contrast, by 1971 and 1977, the peak had been postponed and the fall after the peak had become more gradual, as changing marriage policies, especially the policy "later, longer, fewer" in 1971, and socio-economic factors began to cause women to delay marriage. This can be seen especially from the pattern for the year 1977.

Figure 3: Female first-marriage rate by age, China, 1955, 1963, 1971 and 1977





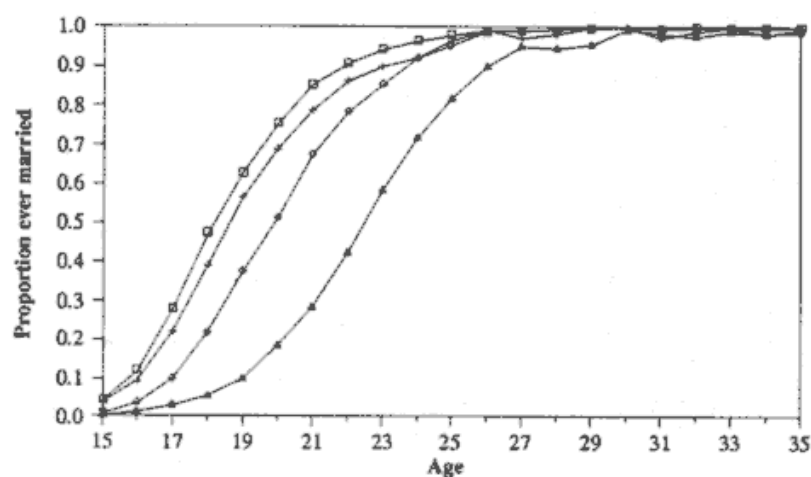
Source: China Population Information Centre, 1983, pp. 233-235.

□ = 1955;

Notes: + =

1963; ◇ = 1971; △ = 1977.

Figure 4: Proportion of ever-married women, China, 1956, 1963, 1970 and 1979



Source: Coale, A. J., 1984.

□ = 1956;

Notes: + =

= 1963; ◇ = 1970; △ = 1979.

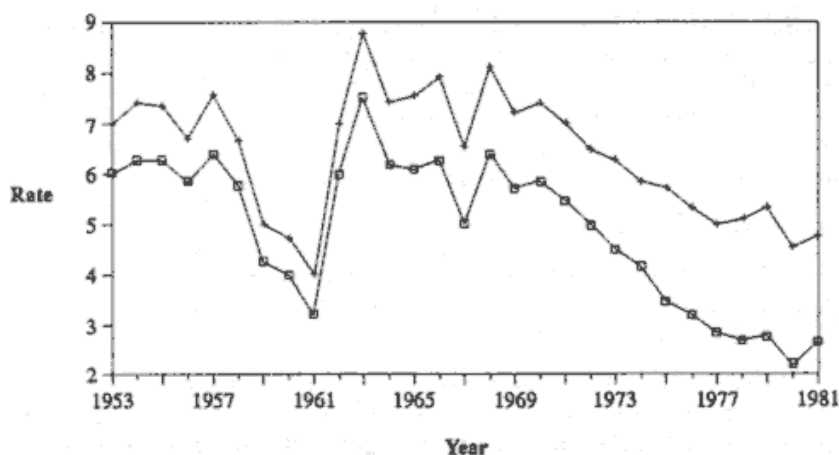
Like the general nuptiality model schedule (Coale, 1971), the age-specific proportions ever-married among females rose from the usual 0 for women aged under 15 to a plateau level that is reached in the late twenties or early thirties (figure 4). This figure depicts the age-specific ever-married proportions for 1956, 1963, 1970 and 1979. Several salient features can be ascertained from the figure. First, marriage remains "universal" for Chinese women. Actual cohorts of women in China achieve very close to 100 per cent entry into marriage (Coale, 1985). Second, the proportion ever-married decreased sharply throughout the decades across all age groups. Third, the ranges of largest and smallest proportions of ever-married women among the groups aged 15-49 become distant over time. The range, for instance, was 0.69 in 1955, and this value was 0.74 in 1963. In sharp contrast, the values of 1970 (prior to the policy "later, longer, fewer") and 1979 (the first year starting the "one child, one couple" campaign) were 0.84 and 0.95, respectively.

To sum up, the above discussion shows that the transformation from traditional to modern marriage patterns occurred in China during the past three decades. This transformation was especially conspicuous between the early 1970s and the 1980s.

#### Marital fertility patterns

##### Marital fertility level and trend

Figure 5: Total fertility and marital fertility, China, 1953-1981



Sources: TFRs were derived from China Population Information Centre, 1983, pp.244-246; TMFRs were computed from the data provided by Coale, A.J., 1984.

Notes: □ = Total fertility rate (TFR); + = Total marital fertility rate (TMFR).

As [figure 5](#) shows, total fertility rates (TFRs) and total marital fertility rates (TMFRs) by period exhibit remarkably persistent regularities. The two patterns seem to be repeated, with only differences in level. In the early 1950s, TFR fluctuated relative to TMFR from about 0.85, and it remained at this constant ratio until the mid-1960s. This suggests that nuptiality changes were having an impact on fertility.

Since the mid-1960s, TFR declined from 80 per cent of TMFR to about 50 per cent in the early 1980s. We note that during the period 1968-1981, TMFR fell less rapidly than TFR. This suggests that since the mid-1960s, the changes have taken place in either marriage structure or marital fertility or in both, although the nuptiality factor has had relatively less impact on the course of TFR compared with that of TMFR.

#### Age pattern of marital fertility

Table 1: Comparison between age-specific marital fertility and age-specific fertility: China, 1956, 1963, 1970 and 1979

Age group	1956		1963		1970		1979	
	MFR	FR	MFR	FR	MFR	FR	MFR	FR
15-19	0.2182	0.0786	0.2359	0.0788	0.2351	0.0444	0.2048	0.0118
20-24	0.3089	0.2690	0.4184	0.3478	0.3810	0.2832	0.3708	0.1610
25-29	0.2885	0.2842	0.3843	0.3742	0.3207	0.3122	0.2428	0.2194
30-34	0.2397	0.2380	0.3270	0.3260	0.2568	0.2530	0.0967	0.0954
35-39	0.1845	0.1840	0.2541	0.2536	0.1813	0.1782	0.0416	0.0414
40-44	0.1014	0.1012	0.1086	0.1138	0.0838	0.0824	0.0177	0.0176
45-49	0.0781	0.0156	0.0116	0.0116	0.0092	0.0090	0.0024	0.0024
Total	6.7812	5.8540	8.6781	7.5020	7.3392	5.8120	4.8839	2.7450

Sources: The age-specific marital fertility rates were calculated by the author from China Population Information Centre, 1983, pp. 244-246, and from Coale, A. J., 1984, pp. 76-85; the age-specific fertility rates also were derived from China Population Information Centre, 1983, pp. 244-246.

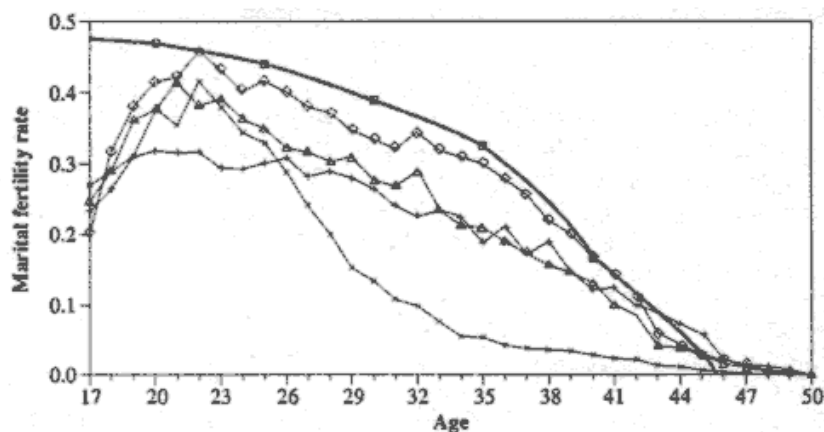
[Table 1](#) attempts to compare age-specific fertility rates (ASFRs) with age-specific marital fertility rates (ASMFRs) by employing the 1956, 1963, 1970 and 1979 data.

Relative to the ASMFRs over time, the ASFRs of younger women fell rapidly. The fertility rate of women in the 15-19 age group, for instance, was about 0.08 to 0.01 between 1956 and 1979, respectively, dropping by 85 per cent, while this was not the case for the marital fertility rate in the same age group during the same period. The rate increased from 0.22 in 1956 to 0.24 in 1970, and then decreased to 0.20 in 1979, a nearly constant pattern. This phenomenon suggests that the decline in the ASFR of those females aged 15-19 was not due to marital child-bearing itself, but rather the changes in marriage pattern.

The ASMRs of women aged 30 and above, on the other hand, have dropped considerably over time. This is a most striking characteristic in the change of the child-bearing pattern among ever-married women in China, indicating that those ever-married Chinese women, after passing through the prolific periods, have exercised deliberate control over the birth of babies. The fertility rates of the ever-married women aged 30 and above were surprisingly similar to those marital fertility rates in the same age group. The fertility level was thus affected only by the changes in child-bearing itself rather than by the marital level.

The patterns remained similar prior to the 1970s. It was not until the 1970s that a sharp change took place. The marital fertility rates in all the child-bearing age groups in 1979 were lower than those of 1956, 1963 and 1970 (figure 6).

Figure 6: Age-specific marital fertility and natural fertility, China, 1956, 1963, 1970 and 1979



Sources: Age-specific marital fertility was derived from Coale, A. J., 1984, and natural fertility from Lavelly, W.R., 1986.

Notes:  $\square$  = natural fertility; + = 1956;  $\diamond$  = 1963;  $\triangle$  = 1970; X = 1979.

Henry (1961) was the first to note that the age patterns of marital fertility were similar in different populations in which couples do not practise contraception or take other measures to reduce fertility before a certain family size is reached. He called such fertility "natural". The comparison with natural fertility provides indirect evidence of the extent to which marital fertility is affected by deliberate control through the use of contraception and abortion in China (see also figure 6). The convex shape of the natural fertility pattern different from the concave shapes that characterize Chinese society throughout the 1970s when deliberate parity-dependent birth control was exerted through the use of contraception and/or induced abortion.

In 1956, the ratio of marital fertility to natural fertility was 0.67. This ratio became 0.84 in 1963. The age structure of marital fertility in 1963 was very similar to that of 1956, each being a typical pattern of natural fertility, and suggesting slightly deliberate restriction in each case. The marital fertility schedule in 1979, however, departs far from that of the natural fertility curve which is high and wide. This is almost certainly the result of an increase in deliberate control.

#### Numerical analysis

##### Coale's indirect indices

Early discussion of the fertility decline in China often ignored the effects of nuptiality and marital fertility on overall fertility. Yet the fact is that the decline in birth rates was due in part to the limitation of births within marriage. It is widely accepted that the predominant mode of fertility control in China is control within marriage.

Coale (1965) developed an indirect standardization procedure for distinguishing the impact on period fertility of nuptiality, legitimate and illegitimate fertility (Wusch, 1978). At time  $t$ , the following symbols are defined:  $f_i$ , as the births per woman aged  $i$ ;  $g_i$  the legitimate births per married woman aged  $i$ ;  $m_i$  the number of married women aged  $i$ ; and  $F_i$  the standard fertility schedule. The following standardized indices can then be computed:

$$I_f = \frac{\sum f_i w_i}{\sum F_i w_i}$$

$I_f$ , the index of overall fertility, is the ratio of the number of births occurring in a population to the maximum number that might occur if women at each age experienced the highest rates of marital child-bearing on reliable record for a population.

$$I_g = \frac{\sum g_i m_i}{\sum F_i m_i}$$

$I_g$ , the index of marital fertility, is the ratio of the number of births occurring among married women to the maximum number that married women might have if subject to maximum fertility rates at each age.

$$I_m = \frac{\sum F_i m_i}{\sum F_i w_i}$$

$I_m$ , the index of proportion married, is a fertility-weighted index that measures the contribution of marital status to the attainment of maximal overall fertility in a population in which child-bearing occurs only among married women as is true in China.

The indices of fertility ( $I_f$  and  $I_g$ ) strictly lie from 0 to 1 - a value of 1 would imply attainment of maximum fertility, and 0 implies no births at all. The index of marriage ( $I_m$ ) falls within the same range: it is 1 if all women 15-49 are married, and 0 if all are single, widowed, or divorced.

When fertility among the non-married is negligible, the three indices are related by the identity:

$$I_f = I_g * I_m$$

In this case, the comparative index of general fertility is simply equal to the product of the comparative indices of legitimate fertility and of nuptiality (see Coale, 1965 and 1970, for a fuller definition of the indices).

Coale's indirect indices differ from the conventional measures by interacting between the weights (which always include the number of women or the number of married women at each age) and the function - the standard fertility schedule. The standard fertility schedule provides a natural upper limit with which the child-bearing of a population or population segment is compared. The fertility schedule considered as a maximum is the fertility schedule of married Hutterites during the period from 1921 to 1930. This maximum fertility schedule includes the following rates by five-year age intervals from ages 15-19 to 45-49: 0.550, 0.502, 0.447, 0.406, 0.222 and 0.061. Women marrying at age 15 and remaining married until age 50 would produce an average of 10.9 children if subjected to these rates.

Coale's indirect indices used in the case of China were designed here with three major considerations in mind. First, although the usefulness of Coale's indirect indices does not depend on the availability of absolutely precise estimates of the required measure, it is important to eliminate the effect of the difference in age structure if one is trying to compare two different populations or the same population but in different periods.

Second, it was essential to make explicit allowance for the effect of nuptiality on the overall fertility of the population. In China, child-bearing is almost wholly restricted to married couples. Coale's indirect indices can be quite useful in assessing the extent to which the index of marital fertility and the index proportional married inhibit fertility and how their contributions change over time.

Third, since detailed information about births such as age or duration of marriage in China is unavailable, it is necessary to employ Coale's indirect standardization if population structures (by age, sex and marital status) are known (Wunsch, 1978).

Measures of fertility for China, 1953-1981

Since the age-specific marital fertility rates and the number of married women by age were unavailable from China's data, they were first constructed by utilizing the One-per-Thousand Sample Fertility Survey of 1982. The author then had recourse to Coale's method by calculating  $I_f$ ,  $I_g$  and  $I_m$ ). [Table 2](#) shows the comparative indices.

Table 2: Measures and indices of fertility, China, 1953-1981

Year	TFR	TMFR	TMFR/TFR	$I_f$	$I_g$	$I_m$
1953	6.049	7.0270	1.1617	0.5169	0.5924	0.8726
1954	6.278	7.3590	1.1722	0.5033	0.5812	0.8660
1955	6.261	7.3283	1.1705	0.5067	0.5847	0.8666
1956	5.854	6.7812	1.1584	0.4698	0.5429	0.8654
1957	6.405	7.5495	1.2255	0.5436	0.6528	0.8686
1958	5.679	6.7089	1.1814	0.4713	0.5498	0.8572
1959	4.303	5.0382	1.1709	0.3308	0.3894	0.8496
1960	4.015	4.8042	1.1966	0.3181	0.3778	0.8420
1961	3.287	3.9841	1.2121	0.3059	0.3652	0.8377
1962	6.023	6.9939	1.1612	0.4784	0.5810	0.8234
1963	7.052	8.6781	1.2306	0.6001	0.7144	0.8399
1964	6.176	7.3712	1.1935	0.4922	0.5905	0.8336
1965	6.076	7.4237	1.2218	0.4799	0.5877	0.8166
1966	6.259	7.7956	1.2455	0.4920	0.6116	0.8044
1967	5.313	6.7784	1.2758	0.4149	0.5259	0.7890
1968	6.448	8.1186	1.2591	0.4915	0.6318	0.7779
1969	5.723	7.2280	1.2630	0.4408	0.5726	0.7698
1970	5.812	7.3392	1.2628	0.4464	0.5885	0.7585
1971	5.442	7.0224	1.2904	0.4184	0.5603	0.7467
1972	4.984	6.4707	1.2983	0.3833	0.5209	0.7358
1973	4.539	6.2120	1.3686	0.3521	0.4911	0.7169
1974	4.170	5.8746	1.4088	0.3310	0.4680	0.7073
1975	3.571	5.7705	1.6159	0.2913	0.4152	0.7016
1976	3.235	5.3547	1.6552	0.2711	0.3886	0.6976
1977	2.844	4.9831	1.7521	0.2506	0.3529	0.6987
1978	2.716	5.0948	1.8758	0.2345	0.3467	0.6764
1979	2.745	5.3339	1.9431	0.2373	0.3559	0.6667
1980	2.247	4.6443	2.0669	0.1959	0.2929	0.6688
1981	2.652	4.7710	1.7990	0.2259	0.3340	0.6764

Sources: Calculated by author from China Population Information Centre, 1983, pp. 152-154; and from Coale, 1984, pp. 76-85.

An interesting comparison enables us to observe that the fluctuations of the overall fertility rates ( $I_f$ ) show a remarkably consistent trend as TFR and TMFR change over time: wide fluctuations between 1949 and 1964; small downturn between 1965 and 1968; sharp drop during the 1970s; and modest upturn from the early 1980s. Fertility, for example, peaked in 1963 in all three indices, then declined to a common point in 1967, the year which marked the onset of the Cultural Revolution, when constraints on marriage and fertility were temporarily relaxed. The decline resuming in 1970 appears to conform to the deliberate family planning and "later, longer, fewer" population policy.

Factoring  $I_f$  into its two components, marriage structure ( $I_m$ ) and marital fertility ( $I_g$ ) shows how the changes of  $I_f$  came about. Surprisingly, before the transition began,  $I_f$  was found to be much higher than the Hutterite standard suggested. Between 1953 and 1960, mean  $I_f$  was about 1.29 times as high as the Hutterite standard, and climbed slightly to 1.31 times between 1961 and 1970. Then, it declined rapidly, and its mean value was only about 82 per cent of the Hutterite standard.

The fluctuations in  $I_g$  parallel the curve of  $I_f$ , exhibiting its importance in affecting the fertility level and intimate relationships between the two indices. Between 1953 and 1981,  $I_f$  fell by 56.3 per cent. The reduction in the index of  $I_m$  was far less than the reduction in  $I_g$ : the former fell by 22.5 per cent, while the latter fell by 43.6 per cent. The decline in  $I_f$  was mainly due to changes in marital fertility rather than nuptiality. The relative importance of the fertility-inhibiting effect of each can be examined more clearly by taking (common) logarithms of the two indices:

$$\log(I_g * I_m) = (\log(I_f))$$

e.g.  $\log(0.51 * 0.79) = \log(0.40)$

i.e.  $(-0.29) + (-0.10) = (-0.39)$

The results show that 74.4 per cent (0.29/0.39) of the combined inhibiting effects on  $I_f$  is due to marital fertility between 1953 and 1981. In sharp contrast to the effect of marital fertility, the contribution made by the proportion married is much smaller, i.e. only 25.6 (0.10/0.39) per cent.

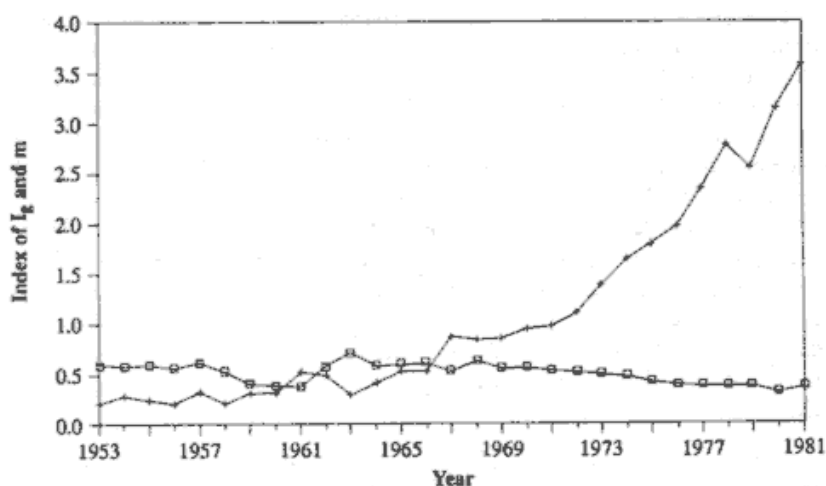
Table 3: Estimates of the contributions of  $I_g$  and  $I_m$  to  $I_f$

Period	$I_f$	$I_g$		$I_m$	
1953-1960	0.4576	0.5305	81.0 %	0.8610	19.0 %
1961-1970	0.4642	0.5769	71.7 %	0.8051	28.3 %
1971-1980	0.2901	0.4115	71.3 %	0.6994	28.7 %
1953-1981	0.4039	0.5063	74.2 %	0.7885	25.8 %

[Table 3](#) gives the relative importance of the fertility-inhibiting effect of each of the two factors responsible for the changes in  $I_f$  during the decades under observation. [Table 3](#) yields several interesting points. First, the changes in  $I_f$  between 1953 and 1980 were more striking than changes in  $I_g$ . Mean  $I_f$  fell from 0.46 to 0.29; and mean  $I_g$  fell from 0.53 to 0.41. Second, changes in marital fertility made a far greater contribution to the decline in overall fertility than did the proportions married during the decomposed periods, accounting for about 74 per cent of the decline in overall fertility. The contribution to lower fertility made by the assumed decrease in proportion married is of much smaller magnitude. Third, the proportion ever married was inhibiting potential fertility somewhat more between the 1960s and the 1970s than at the beginning, accounting for about 20 per cent during the period of 1953-1960, and about 30 per cent between 1961 and 1981, reflecting that before and since the intensification of the family planning programmes and the policy "later, longer, fewer" starting in 1971, steady changes in the marriage pattern had occurred.

Obviously, a rapid decline in  $I_g$  was due to family limitation, particularly between 1971 and 1981. Family limitation had been defined by Henry to mean that the timing of the cessation of child-bearing is conditional upon the couple's previous fertility history (Henry, 1961; Knodel, 1977). As a final comment on recent declining fertility in China, we note evidence of the effect of family limitation of marital fertility, revealed by Lavelly (1986) who, by using the same Chinese data as those in this study, calculated an index (m) of the degree of departure of the age structure of marital fertility from the pattern typical of a population in which there is no voluntary control of marital fertility. According to Coale and Trussell (1971, 1974, 1978), this index (m) is zero when marital fertility follows the typical pattern of "natural" fertility; it reaches values of 2.0 or more in populations in which the majority of couples use contraceptives or abortion to limit the total number of births to a very small number.

Figure 7: Marital fertility and family limitation, China, 1953-1981.



Sources: Marital fertility ( $I_g$ ) was calculated from data provided by Coal, A.J., 1984, and the China Population Information Centre, 1983, pp. 244-246, and family limitation ( $m$ ) from Lavelly, W.R., 1986.

Notes: □ = marital fertility ( $I_g$ ); + = family limitation ( $m$ ).

In [figure 7](#), the value of  $m$  is compared with our calculations of  $I_g$ . The shift from natural fertility to family limitation and the resulting decline in marital fertility reflected a radical change in the reproductive behaviour of couples and Chinese society. The time series in [figure 7](#) for the index of family limitation,  $m$ , and the index of marital fertility,  $I_g$ , are remarkably consistent. The value of  $m$  was 0.17 in 1953; it rose to 0.30 in 1960, 0.54 in 1965, 0.90 in 1970 and jumped to 3.10 in 1980. The index of  $I_g$ , on the other hand, was 0.59 in 1953 and declined to 0.38 in 1960 (note that this was a peculiar year because it was the first year of a natural disaster and the lagging effect of the Great Leap Forward starting in 1958); it rose to 0.59 in 1970. Since then, the index of  $I_g$  has uninterruptedly and precipitously declined, reaching 0.29 by 1980, clearly indicating a coincidence with an increasing degree of parity-related control. The intersection of the two indices took place in 1966, a lagging reflection of the family planning campaign in 1962. Both  $m$  and  $I_g$ , however, gained ground much slower until the early 1970s when family limitation began to have an increasing effect.

#### Discussion and conclusion

This study is concerned with assessing the degree to which marital structure and marital fertility variables are related to fertility levels. The results indicate that the reduction in fertility in China has been caused both by a dramatic fall in marital fertility and a change in the marital structure. The more important inhibitor of potential fertility was marital fertility, which has affected the fundamental transition from typical natural fertility to controlled fertility, especially since the 1970s. In contrast, changes in the marital structure have contributed moderately to the reduction in overall fertility owing to the relative stability of the marriage pattern during the past three decades, since the age at first marriage could not be raised infinitely. The importance of the latter, however, has gradually increased. Thus, research on the decline in fertility in China since the early 1950s should be focused on the underlying and intermediate variables affecting marital fertility.

Our study has pointed to evidence suggesting that the family planning programmes of "later, longer, fewer" from the beginning of the 1970s and the "one child, one couple" campaign launched in 1979 coincided with the timing of changes in both marital status and marital fertility. The urgency and importance of China's family planning programmes have been steadily and systematically reflected in the increasingly more stringent norms for child-bearing and their stricter enforcement.

At the same time, this coincidence reflects momentous changes in political and economic structures that have linked the central Government in the past three decades. Obviously, it is difficult to assess the family planning programmes' effects on fertility net of socio-economic and institutional factors that encourage people to accept and practise effective contraception (Tien, 1985). Since 1949, the Government has consistently and energetically pushed for greater development in education, employment opportunities, feminist campaigns and the rise in the status of women, health, medical, cultural and related services in the country as a whole and in the rural areas in particular. In addition, changes in the costs and benefits of

children, changes in the family and marriage system, the repeated rustication campaigns, housing shortages in urban China and land shortages in rural China, and so on - all those forces lying behind the fertility transition in China demonstrate that the Chinese family planning programmes operate within the context of a socialized society. Institutional developments, as a natural process, have greatly weakened the motivation for large families. This is especially true in urban China.

Future prospects for retaining a low level of fertility are unclear. This study at least indicates certain future research needs and policy implications. First, since marriage is almost universal in China, with only a negligible proportion remaining single throughout the reproductive age span, and since marital dissolutions as well as remarriages are uncommon, it would be unrealistic to expect further lowering in the index of  $I_m$  given the fact that the current age at marriage is relatively high except perhaps in some special local circumstances.

Second, the most important demographic determinant responsible for the decline in Chinese fertility has been marital fertility since levels of marital fertility can vary substantially with the adoption of family limitation (Watkins, 1986). The practice of contraception has become pervasive during the last decade. Public policy should ensure the rapid spread of knowledge about access to contraception as a means to assure birth control and especially as an alternative means to obtain the desired spacing between births.

Third, levels of marital fertility can vary substantially in the absence of deliberate marital fertility control. The relative weight of factors affecting marital fertility (including behavioural factors such as coital frequency, sexual taboos and duration of breast-feeding, as well as physiological factors such as fecundability, intra-uterine mortality, total or partial sterility) should be taken into account. Unfortunately, these factors have so far received little explicit attention partly because the data are meager.

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Continuation and Effectiveness of Programme and Non-programme Methods of Family Planning in Sri Lanka \* (Demographers' Notebook)

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The clinical efficacy of various contraceptive methods is well known. However, relatively little is known about their use-effectiveness (which refers to both technical failure of a method and the failure to use a method properly in actual life conditions, especially in developing countries). Use-effectiveness data for programme as well as non-programme methods are necessary for assessing the impact of contraceptive use on fertility (Bongaarts and Potter, 1983).

The objective of this paper is to examine continuation and effectiveness of contraception based on a 1986 survey of more than 3,200 women in rural Sri Lanka. Data on both programme and non-programme methods of contraception are analyzed. Programme methods are defined as including all those methods that are provided through the public or private family planning programmes (namely, oral pills, IUDs, injectables, condoms, female barrier methods and sterilization). Non-programme methods refer to those that are not provided through any structured programme; these methods include calendar rhythm (commonly referred to as "safe period" in Sri Lanka), withdrawal, abstinence and other traditional methods.

The use of non-programme methods was investigated in detail in the survey because, despite a "strong" family planning programme (Mauldin and Lapham, 1985), the use of non-programme methods of family planning is high in Sri Lanka (for details, see Caldwell and others, 1987). Of the currently married Sri Lankan women using contraception, the proportion using non-programme methods was 45 per cent in 1982 and 34 per cent in 1987 (table 1). As shown in table 1, the prevalence of safe period has remained stable during the period 1975-1987; much of the decline in the prevalence of non-programme methods reported in 1987 is confined to other traditional methods.

Table 1: Prevalence of programme and non-programme methods of contraception among currently married women aged 15-49, Sri Lanka: 1975, 1982 and 1987

Method	Per cent of:					
	Currently married women			Those currently using		
	1975	1982	1987	1975	1982	1987
<b>Programme</b>						
Female sterilization	9.9	18.0	24.7	28.8	31.1	40.0
Male sterilization	0.7	3.9	5.1	2.0	6.7	8.3
Pill	1.7	2.7	4.1	4.9	4.7	6.6
IUD	5.2	2.9	2.1	15.1	5.0	3.4
Condom	2.3	3.3	1.9	6.7	5.7	3.1
Injectable and barrier methods	0.4	1.0	2.7	1.2	1.7	4.4
<b>Non-programme</b>						
Rhythm/safe period	8.9	14.2	14.9	25.9	24.6	24.1
Withdrawal	1.6	5.1	3.4	4.7	8.8	5.5
Other traditional	3.7	6.7	2.8	10.8	11.6	4.5
All methods	34.4	57.8	61.7	100.1	99.9	99.9
Programme	20.2	31.8	40.6	58.7	54.9	65.8
Non-programme	14.2	26.0	21.1	41.3	45.1	34.2

Source: Adopted from DCS (1988: 58).

Note: Owing to civil disturbances in the country, the 1987 survey excluded northern and eastern provinces. Data from these provinces have been excluded from the 1975 and 1982 surveys in order to make these surveys comparable with the geographic areas covered by the 1987 survey. Some percentages may not add to 100 because of rounding. For a discussion on the lower prevalence of non-programme methods in the 1975 survey, see Caldwell and others (1987).

## Data and methodology

The data analyzed are from the Sri Lanka Rural Family Planning (RFP) Survey. This survey was conducted between August 1985 and February 1986. A two-stage stratified sample design with probability-proportionate-to-size techniques was used. Eligible respondents were defined as currently married women of reproductive age (<44 years) at the time of the survey. A total of 3,253 interviews of women randomly selected from 30 villages were successfully completed.

The sample is not completely of rural Sri Lanka. Owing to political disturbances, some districts in the north-eastern part of the country were excluded. Further, the survey was limited to the Sinhalese population, which constitutes three-fourths of the total population in Sri Lanka. Nevertheless, the survey covered three of the six socio-economic and ecological zones and 17 of the 24 total districts in Sri Lanka.

Data on recent contraceptive practice were obtained from a "calendar" of monthly data on contraceptive practices, pregnancy status and reasons for non-use covering approximately three years preceding the survey. The calendar module proposed by Laing (1985) was employed for data collection. This approach allows collection of detailed contraceptive use history in a 36-month "window" of reproductive behaviour in the manner described below. This approach to the collection of contraceptive use data has been in use, with some variation, since the mid-1970s within national surveys in the United States of America.

First, pregnancies based on the pregnancy record form were recorded in the window of observation in addition to months of gestation for each pregnancy (including current pregnancy, if applicable). For each conception during the period covered by the calendar, the respondent was asked whether conception had occurred while she or her husband was using contraception and, if so, what method was being used. For each pregnancy, a further question was asked on whether it was a planned or unplanned pregnancy. The duration of post-partum amenorrhea for each pregnancy was recorded as well. Starting with the current month and working backward through time, the interviewer asked about contraceptive practice in each month and recorded the method(s). For each month of non-use (other than during gestation), respondents were further asked their reasons for non-use of family planning. The data obtained through the calendar module are used to estimate continuation rates, failure rates and contraceptive effectiveness.

## Continuation rates

The monthly continuation rate (MCR) refers to the ratio of the total number of contraceptive users in two adjacent months to the total number of users in the first month. These rates are calculated using all pairs of adjacent months in the calendar. Monthly continuation rates can be converted to annual continuation rates (ACR) by:  $ACR = 100 (MCR)^{12}$ .

## Failure rates and pregnancy rates

The monthly failure rate (MFR) for a given method is estimated by dividing the number of conceptions that occurred during a month while the method was in use by the total number of non-amenorrhic users of that method during that month plus the number of conceptions. The monthly failure rates are converted to Pearl pregnancy rates (PPR) by:  $PPR = 1,200 (MFR)$ . PPR indicates the number of failures occurring per 100 woman-years of use. Pearl pregnancy rates among non-users are calculated in the same manner as among users. The pregnancy rates among non-users are employed to estimate the fertility-reducing impact of contraception among the users.

## Contraceptive effectiveness

Contraceptive effectiveness (CE) is defined as "the percentage by which the probability of conception is reduced as a result of contraceptive practice" (Laing, 1985: 141). This is expressed as:  $CE = 100 * (1 - (PPR/EPR))$  where EPR (expected pregnancy rate) is an estimate of the Pearl pregnancy rate that might have been expected in the absence of contraceptive practice. We use the PPR for non-users as the expected

rate. The expected pregnancy rate is usually much higher than the Pearl rate among contraceptive users and may exceed 100. Since the Pearl rate is simply 12 times the monthly rate expressed as a percentage, a Pearl-type rate of 100 implies a monthly pregnancy rate of 8.3 per cent. Since estimates of natural fecundability range from 16 to 25 per cent (Bongaarts and Potter, 1983: 29), the theoretical upper limit of the expected pregnancy rate correspondingly ranges from 192 to 300. The methodology for data analysis is based on a "cross-sectional" approach, as distinct from a life-table-type methodology. Unlike the life-table methodology, the cross-sectional approach does not require data on duration of use following contraceptive acceptance. Most importantly, continuation and effectiveness data based on the cross-sectional approach rather than those obtained from the life-table methodology are recommended for assessing the demographic impact of contraceptive use (United Nations, 1988).

Continuation and pregnancy rates as well as contraceptive effectiveness by each contraceptive method used are estimated for the total sample. Additionally, variations by demographic and socio-economic characteristics are examined. The demographic variables included in the analysis are age, marital duration, parity and fertility preference. Socio-economic variables include education, occupation, wealth status and regional development level. The last two are composite variables. The index of wealth refers to the sum of several household amenities, where the presence of each of the following is counted as 1: availability of electricity, cement floor, tile/asbestos roof, brick or cement wall, permanent toilet, and tap water in the respondent's house. This index ranges from 0 to 7. Regional development index refers to the classification of the geographic zones, based on multiple socio-economic and ecological characteristics, as classified by the Sri Lanka Department of Census and Statistics (DCS, 1978: 17-54).

In this note, we focus on discussing contraceptive method-specific continuation and use-effectiveness rates. Pearl pregnancy and expected pregnancy rates for socio-economic characteristics are not shown because, as Laing (1985: 153) has pointed out, "... contraceptive effectiveness is a more plausible indicator of relative effectiveness than Pearl rates and should be used in preference to Pearl rates for studying effectiveness differentials".

#### Data quality

Data collected retrospectively are usually prone to reporting errors. Errors may come from failure to report the use of a method at all, or from the misplacement of events. For example, incorrect reporting of the use of contraception at the time of conception, an important piece of information required to estimate the contraceptive failure rates, may not be uncommon. In his study in the Philippines, Laing (1985) found that although the reporting of contraceptive use tended to be less reliable for the recent past at the individual level, it was reliable at the aggregate level. For the data collection methodology employed here, "the reliability of information for any given month is not very important, as long as the information on number of months of use and on contraceptive status at the time of conception are reasonably accurate" (Laing, 1985: 139). Laing also points out that the reliability of duration of use and use status at the time of conception are equally important for life-table analysis. Hence, the retrospective data collected for the calendar approach are not more likely to be subject to greater errors than estimates based on the application of life-table techniques. Recently, one study in Peru compared the quality of contraceptive use data collected through the calendar approach with data collected through the standard "tabular" approach and found the quality of the detailed contraceptive history data to be superior (Goldman, Moreno and Westoff, 1989).

As a check on data quality, we estimated contraceptive prevalence at three points in time using the 1986 RFP survey data and compared these estimates with those from the 1982 Sri Lanka Contraceptive Prevalence Survey (CPS) for the rural Sinhalese population. We found prevalence at the aggregate level, particularly for modern methods, to be consistent over time ([table 2](#)). For example, from 1982 to 1985 prevalence of IUD and the pill was 3-4 per cent, and withdrawal about 7 per cent. Apparent changes in prevalence for condom and safe period between 1982 and later dates are most probably due to the addition of the combination categories. It is likely that many women who said they were practising "safe period" or "other traditional" methods alone in 1982 were practising safe period combined with withdrawal (such combination methods were not ascertained in the CPS or earlier surveys) and indicated so in the 1986 survey. Similarly, the apparent drop in condom prevalence from 1982 to 1983 may be explained by the additional proportion of women using condoms combined with safe period in 1983 and later. The proportions of female and male sterilizations in 1983 appear to be low compared with the 1982 CPS data. This could be due largely to the fact that the 1982 CPS data are based on a period measure of contraceptive use, whereas estimates from 1983-1985 are based on cohort measures of contraceptive use. Overall, the prevalence data are fairly consistent. This indirect quality check lead us to conclude that these retrospectively collected data for Sri Lanka do not suffer from any substantial magnitude of underreporting or misreporting, at least at the aggregate level.

Table 2: Proportion of currently married, exposed ( not pregnant ) women using contraception, 1982-1985: rural Sinhalese women

Method	CPS		RFPS	
	1982 (March)	1983 (Feb.)	1984 (June)	1985 (Oct.)
Programme				
Female sterilization	19.9	20.6	27.2	31.3
Male sterilization	3.0	2.4	3.8	5.0
IUD	3.8	4.1	4.1	4.1
Pill	2.7	3.3	4.0	3.9
Condom	3.5	1.6	1.4	1.9
Other modern <sup>a/</sup>	1.0	0.6	0.8	1.2
Non-programme				
Safe period	15.2	9.9	8.9	9.3
Withdrawal	6.3	7.2	7.0	6.8
Other traditional	6.2	2.3	2.7	2.9
Combinations				
Safe period + withdrawal	n.a.	12.8	12.9	12.4
Safe period + condom	n.a.	1.6	1.7	1.6
Any method	61.6	66.4	74.5	80.3
No method	38.4	33.6	25.5	19.7

Notes: Data for 1982, based on the CPS, are restricted to Sinhalese women residing in those rural zones where the RFPS was conducted. Hence, the 1982 prevalence data represent approximately the same population as in the RFPS, which is the source for prevalence for 1983-1985 data shown in the table.

a/ Includes female barrier methods, injectables and induced abortion.

CPS = Contraceptive Prevalence Survey; RFPS = Rural Family Planning Survey;

n.a. = not available.

## Results

The results regarding continuation and effectiveness of programme and non-programme methods of family planning for the total sample are presented in [table 3](#). Besides sterilization, the highest annual continuation rates (ACR) were for the IUD. The lowest rates were for condoms, withdrawal, abstinence and other traditional methods. In general, modern methods had a wider range in ACRs (100 for female sterilization to 32 for condoms) than traditional methods (50 for safe period to 38 for withdrawal). Users of safe period in combination with condoms had ACRs approximately equal to those who used safe period alone but much higher than users of condoms only. Women who used safe period combined with withdrawal had higher ACRs than women who used safe period alone and substantially higher ACRs than users of withdrawal alone. In fact, combined safe period-plus-withdrawal users' continuation rates were nearly as high as or higher than continuation rates for three modern methods including injectables and the pill.

Table 3: Annual continuation rates, Pearl pregnancy rates (PPR), expected Pearl-type pregnancy rate (EPR), and contraceptive effectiveness (CE) by contraceptive method: rural Sri Lanka

Method	Continuation rate (woman-months)	Annual continuation rate	Pearl pregnancy rate	Expected pregnancy rate	Contraceptive effectiveness
Programme					
Female sterilization	25,573	100	<1	74	100
Male sterilization	3,632	98	1	80	97
IUD	3,977	83	2	83	98
Pill	3,519	54	8	104	93
Condom	1,384	32	13	91	86

Injectables	803	59	5	108	96
Non-programme					
Safe period	8,949	50	32	85	62
Withdrawal	6,729	38	34	92	63
Abstinence	842	41	0	60	100
Other	1,718	43	20	83	75
Combination					
Safe period + condom	1,477	49	8	82	90
Safe period + withdrawal	12,391	57	23	85	73
Any method	70,974	81	13	82	85

The pattern of contraceptive effectiveness estimates was roughly similar to the pattern of ACRs. Modern methods had the highest CEs, traditional methods the lowest, and safe period combination methods improved upon safe period used alone. When used alone, safe period had the lowest CE of any method. When used in combination, safe period CE increased from 62 to 73 with withdrawal and to 90 with condoms - a level nearly as high as most modern methods. Withdrawal CE increased from 63 to 73 when combined with safe period, and condom CE increased from 86 to 90 when combined with safe period - a level nearly as high as most modern methods.

#### Socio-demographic differentials

Table 4: Annual continuation rates (ACRs) and contraceptive effectiveness (CE) for all methods used by selected demographic and socio-economic characteristics: rural Sri Lanka

Variable	Continuation rate (woman-months)	Annual continuation rate		Contraceptive effectiveness	
		Including sterilization	Excluding sterilization	Including sterilization	Excluding sterilization
Age group at mid-survey period					
15-19	1,104	53	50	68	67
20-24	8,590	65	57	79	74
25-29	14,664	74	61	82	74
30-34	19,292	84	71	88	78
35-39	18,992	90	78	90	80
40-44	8,370	91	82	89	79
Marital duration (years)					
Fewer than 5	6,272	56	54	68	66
5-9	20,596	73	63	83	77
10-14	18,228	86	73	87	77
15-19	13,872	91	78	92	80
20 or more	12,044	94	85	90	77
Total number of living children					
0	355	(68)	(63)	(56)	(46)
1	6,768	74	72	86	86
2	16,660	75	68	88	84
3	18,312	81	67	88	79
4	12,988	85	68	91	80
5 or more	15,932	87	69	90	75
Women's education (years)					
None	5,542	85	71	86	73
1-5	24,096	83	67	87	75
6-9	23,076	79	66	86	77

10 or more	18,296	80	71	88	84
Woman's work status					
Income earning					
Regular salaried	7,107	83	72	89	83
Casual wage	7,466	89	77	90	79
Home-based/cottage	5,268	85	73	88	78
No direct earning					
Domestic/farm	51,176	79	66	86	78
Husband's education (years)					
None	2,686	83	66	81	61
1-5	22,972	82	66	85	72
6-9	27,364	82	69	88	80
10 or more	17,480	79	71	88	83
Husband's occupation					
Farmer	24,000	81	68	83	71
Agricultural labourer	5,021	84	62	92	78
Skilled non-agricultural labourer	13,192	81	69	90	83
Unskilled non-agricultural labourer	10,822	82	67	88	79
Teacher/office worker	8,282	81	74	89	86
Own business	5,113	78	65	87	80
Other	4,574	78	67	87	81
Couple's education (years)					
None	883	88	-	87	-
1-5	15,590	83	67	86	72
6-9	11,654	79	67	87	78
10 or more	10,962	79	71	88	84
Wife less than husband	17,004	82	70	88	80
Wife more than husband	14,408	81	68	87	78
Couple's occupation					
Domestic	16,644	78	65	82	71
Non-domestic	10,304	85	75	90	84
Wife domestic, husband non-domestic	31,676	79	67	88	81
Wife non-domestic, husband domestic	7,356	88	76	86	73
Couple's wealth status					
Low	27,096	80	64	85	74
Middle	37,560	82	70	88	80
High	6,357	81	73	89	84
Regional development level					
Low	19,980	79	67	83	75
Middle	28,396	84	67	87	73
High	22,636	80	71	89	84

Estimates of socio-economic and demographic differentials of contraceptive use and effectiveness (for all methods) are presented in [table 4](#). We have indicated relatively unreliable estimates based on fewer than 600 woman-months by putting them within parentheses; these estimates are based on a small number of cases (50 or fewer) or a short duration of observation. Therefore, they should be interpreted with caution. Since nearly 40 per cent of the total number of persons practising contraception in this study were users of sterilization, which has predictable effects on contraceptive continuation and effectiveness estimates, we repeated the socio-demographic and fertility preference analyses, excluding sterilization cases, to ascertain

how sterilization contributed to the results.

Continuation rates were positively associated with age and ranged from 53 for women under age 20 to 91 for women in their forties. This pattern may be due partly to more older women having been sterilized. Another reason could be that more older women are more motivated to use contraception diligently. As expected, the estimates of CE were low among women under age 20, moderate among women in their twenties, and relatively high among women over age 30.

ACR was also positively associated with marital duration. Women married for fewer than five years had an ACR of 56 while the ACR was 94 among women married 20 or more years. In terms of contraceptive effectiveness, marital duration discriminated between three groups of women: those married fewer than five years had low CE, those married 5-14 years had moderate CE, and those married 15 or more years had relatively high CE.

ACRs and CE were low among women with no living children and progressively higher among women with greater numbers of children. ACR increased monotonically with number of living children, reflecting the tendency for women with more children to use contraception more assiduously. Effectiveness rates, though less pronounced, reflected the same pattern.

The patterns of CE estimates by age, marital duration and number of living children were consistent and fairly strong. An interesting feature of the pattern was the apparent slight drop in CE among women in the terminal category of the three variables. This might be due to some older women thinking they are not fecund and therefore using less effective methods of contraception. At the same time, the results may also reflect selectivity. Older women who are especially concerned about stopping child-bearing often opt for sterilization, effectively shifting the rates for the upper age and marital duration categories towards those typical of sterilization. Higher educational attainment and work status are generally assumed to be associated with contraceptive adoption, continuation and efficacy (cf. Laing, 1985). In Sri Lanka, CE bore little relationship to these characteristics and ACRs showed weak and irregular patterns.

Contraceptive continuation was highest among women with no education. This finding is probably a reflection of the likelihood that women with no education tend to be older and higher parity and thus, more determined to stop or limit child-bearing. Continuation was also highest among casual wage labourers, though the differentials were not very great among income-earning women. Domestic/farm workers with no direct income had the lowest ACR. Effectiveness estimates among educational groups and work status groups did not vary greatly.

Few ACR and CE patterns emerged with respect to husbands' education and occupation. Wives of husbands with 10 or more years of education, like the women themselves, had the highest CE (88) but also had the lowest ACR (79). Effectiveness was positively associated with husbands' education. Husbands classified as agricultural labourers had the highest ACR and CE, whereas farmers had the lowest CE.

When taken jointly, husbands' and wives' education showed little relationship to contraceptive continuation and effectiveness. Couples in which both husband and wife had fewer than six years of education had the highest ACR (88). Conversely, couples in which both husband and wife had six or more years of education had the lowest ACR (79). Whether the husband or the wife had more education made no difference in continuation, and effectiveness did not vary with respect to the couples' education.

The finding that CE did not vary by couple's education while ACR did suggests that, although more poorly educated couples might have been more diligent in their contraceptive efforts, the results of their efforts were no better than the efforts of less diligent, highly educated couples.

Continuation was low among couples in which both husband and wife were domestic workers and among couples where the wife did domestic work and the husband was a non-domestic worker. On the other hand, the ACR was high among couples in which both partners were non-domestic workers and among couples where the wife had a non-domestic occupation and the husband did domestic work. On the whole, the ACR was relatively low if the wife had some kind of domestic occupation and was relatively high when the wife did non-domestic work. Couples in which both husband and wife were domestic workers had considerably lower CE (82) than when both husband and wife were non-domestic workers (CE=90).

To examine whether couples with better economic status or those living in relatively more advanced areas were more likely to adopt and continue to practise more effective contraception, we examined couples' wealth status and regional development levels. ACRs were lowest both among couples with low wealth status and where regional development was low, and highest among couples with moderate wealth status



and in places where regional development was moderate. However, the differences were not very great. Similarly, CE was positively associated with wealth status and regional development, though again, the differences were not great.

#### Fertility preference differentials

Table 5: Annual continuation rates (ACRs) and contraceptive effectiveness (CE) by fertility preference measures: rural Sri Lanka

Characteristic	Continuation rate (women-months)	Annual continuation rate	Contraceptive effectiveness
Whether desires more children <sup>a/</sup>			
Yes	15,512	69	76
No	21,880	76	84
Not decided	439	(66)	(88)
Intensity of desire for more children <sup>a/, b/</sup>			
Not very strong	8,800	70	87
Strong	4,506	67	73
Very strong	2,407	68	49
Number of additional children desired			
0	55,176	85	91
1	11,904	69	81
2	3,316	72	74
3 or more	455	(63)	(59)
Desired delay to next child (months)			
No more children	55,176	85	91
Less than 25	5,941	80	84
25-48	5,273	65	83
49 or more	4,625	60	63

Notes: a/ Excluding sterilized respondents.

b/ Excluding women who do not desire more children.

Fertility preferences were associated with contraceptive behaviour. Women who said they desired more children did not continue contraceptive practice, and they tended to be less efficacious when they did practise contraception (table 5). The intensity of the desire for more children showed a strong relationship with CE, but ACRs did not vary greatly. In essence, the prevailing pattern with respect to both desire and strength of desire for additional children was as expected, i.e., the stronger the desire for more children, the less effective was the woman's contraceptive practice.

As expected, the number of additional children desired correlated negatively with ACR and CE. The average ACR was very low (63) for women desiring three or more additional children and relatively high (85) among women desiring no more children. CE was inversely associated with the number of additional children desired, ranging from a high ACR of 91 among women desiring no more children to a low of 59 among women desiring three or more children. This pattern holds even when the unreliable estimate for women desiring three or more children is ignored.

The desired spacing between the last child and next child exhibited unexpected patterns with respect to ACR and CE. Women who desired the longest delay to the next child (more than 48 months) had the lowest ACR (60) and CE (63). Women who desired their next child within the next 25 months had the highest ACR and CE among women desiring more children. This finding may reflect a tendency among higher parity women (who desire fewer additional children as well as a longer delay to the next child) to be less efficacious at practising contraception.

The results in table 4 clearly show that the patterns of association which emerge for variables are in large part due to the pattern of sterilization effects. Absolute differences in ACR and CE between all respondents and non-sterilized respondents increase with woman's age, marital duration and number of living children and differences decrease as all three education variables increase. These findings indicate that sterilization acts to reduce fertility relatively more among older, less-educated, higher parity women, and almost

exclusively among women desiring no more children.

#### Summary and conclusions

This paper analyzed the continuation and effectiveness of programme and non-programme methods of contraception among rural women in Sri Lanka. The results with regard to contraceptive failure support the notion that real life condition failure rates, particularly for modern temporary methods, tend to be substantially higher than reported rates based on clinical studies. Estimates of ACR and CE were positively associated with demographic variables such as age, marital duration and number of living children.

However, relationships with socio-economic status indicators were generally weak. Furthermore, contraceptive continuation and effectiveness were higher for couples with lower levels of educational attainment. These patterns of findings appear basically consistent with those found for the Philippines (Laing, 1985). Overall, it was found that the use of safe period in conjunction with either withdrawal or condoms had considerably higher effectiveness than when practised alone. These results also showed that ACRs were much higher for condoms and withdrawal when used together with safe period than when used alone. These results and other findings (Laing, 1985) suggest that the impact of non-programme methods on fertility, in the long-run, may be more substantial than previously realized. The findings seem to support the thesis forwarded by Caldwell and others (1987) that the practice of non-programme methods of family planning has probably played a significant role in Sri Lanka's fertility transition. Since combined methods seem to have a remarkably high contraceptive effectiveness, family planning programmes may do well to promote the use of the safe period method in combination with condoms or withdrawal for those who do not want to use other spacing methods of contraception.

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