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T.S. Syamala* and T. K. Roy**

Relationship Between Child Mortality and Fertility : A Few Empirical Evidences from Goa, India

THE intimate relationship of mortality, especially that of the infant and child mortality, with fertility is well documented in demographic literature (e.g., Rustein and Medica 1975; Scrimshaw 1978; Richter and Adlakha 1989), though the exact nature of this relationship is less evident empirically. The impact of child loss experience is often pronounced and the fertility of couple can be expected to be affected by such experiences to a great extent. A decline in the level of infant and child mortality therefore becomes a precondition for engineering a reduction in the level of fertility and also for the effective implementation of the population control programme.

The four possible mechanisms through which child mortality may operate to influence the level of fertility are linked with the biological, replacement, insurance and societal response effects (Preston 1978; Chaudhury 1982; El Deeb 1988). All these effects are positive and the implication is often that a decline in child mortality paves the way for a decline in fertility. The biological effect mainly operates through the abbreviated duration of lactation, leading to shortened postpartum amenorrhea and thereby reducing the birth interval. The replacement effect is operative with actual child loss experience and is manifested when the affected couples opt to have additional births as if to make up for the loss. With a decline in mortality, the need to replace children occurs less frequently, and in consequence the fertility levels would reduce.

Insurance effect is the response of fertility to the expected mortality of the offspring and it depends mainly on the couple's perception about the level of mortality in their community. The societal effect of fertility response is related to the volitional behaviour of women which evolves out of cultural norms, customs and taboos prevailing in the society (Singarimbun and Hull 1977). Theoretically, the insurance and societal effects are related to the individual's perception about the existing level of mortality, and can be present in every woman. However, these effects are hypothetical in nature and are rather difficult to visualise. The realization of the decline in the level of mortality is not always simultaneous with the occurrence of actual decline and specifying the threshold to which the level of mortality should drop to offset this lag is rather difficult. Fertility decline does not necessarily follow a decline in infant mortality and "fertility can be expected to remain high as long as

*Research Officer, International Institute for Population Sciences, Bombay-400088.

**Professor and Head, Department of Population Policies and Programmes, International Institute for Population Sciences, Bombay-400 088.

reproductive behaviour reflects a risk aversion strategy based on the fear of losing a critical resource in the form of children" (Handwerker 1986).

Efforts to unfold the relationship between child mortality and fertility have been relatively few in the Indian context (e.g., Das 1975; Subhadradevi 1977; Singh 1979; Reddy and Mahadevan 1984; Srivastava 1985; Singh 1990). The study of this relationship assumes further significance amidst the distressingly high levels of infant and child mortality that exists in the country. Moreover, the Indian family planning programme is yet to create a desirable impact on the level of fertility despite its inception forty years back. Evidences to suggest the existence of any intimate link between the infant and child mortality and fertility levels would naturally enable in determining more suitable parameters for the formulation of effective population policies capable of bringing about a desirable degree of impact in population control.

An attempt in this direction is being made in the present paper by making use of the information from a sample survey conducted in Goa, India. The effect of the traumatic experience of child loss to a woman on her subsequent fertility aspirations/behaviour as against a comparable group of women with no such experience has been addressed in this study as one of the key issues, the other related issues being the degree of manifestation of such differential according to the sex of the dead child as well as the time (parity) at which this traumatic event had occurred. The study is further extended to the domain of societal level effect through the examination of the impact of woman's perceptions concerning societal level mortality on her fertility options. Finally, a few aspects of family size control have been considered in relation to mortality perceptions and child loss experience.

Data and Methodology

The survey on levels of Fertility and Mortality in Goa was conducted by the International Institute for Population Sciences, Bombay, in 1984 (Roy *et al.* 1986). A two stage stratified sampling was employed to select a total of 2588 households. All the primary sampling units—villages in the rural and towns in the urban areas—were ranked according to the level of female literacy and the selection of the units was done with probability proportional to size sampling. From each unit selected at first stage, a uniform number of households were selected in the second stage using a systematic sampling procedure. This self weighting design provided estimates on fertility and on infant and child mortality for Goa and also for its rural and urban areas.

The survey elicited information concerning the entire pregnancy history and, inter alia, on survival status of each child born to a woman. Another information that also was sought in the survey pertained to the perception of women about the level of mortality in their region, as to whether the level of mortality had decreased, remained unchanged or increased since past two decades.

The actual fertility of the women and their future fertility aspirations were taken into account while performing the fertility analyses. Two indices were obtained for the latter one based on the questions as to whether a woman wanted additional children and the second

based on the number of additional children desired by those wanting to have additional children. Thus the following three separate dependent variables

(i) CEB, representing total number of children ever born,

(ii) DCH, a categorical variable indicating the want for additional children and taking value 1 in case women wanted additional children and value zero otherwise, and

(iii) PFS, representing the preferred family si/e which is the sum of actual fertility (CEB) and the number of additional children desired

were considered in the analysis. It may be mentioned that for sterilized or menopausal women DCH is taken as zero and therefore, for these women PFS will be same as CEB.

The investigation to ascertain the mechanism of replacement on fertility has been carried out primarily by the comparison of the two groups: one group with child loss experience and the other without any child loss experience. There is one problem in ascribing the difference to be the effect of the mortality on fertility. A part of it might be an artifact arising from the effect of the latter on the former. It may be argued, that with some women, the higher fertility is not basically due to their child loss experience, rather it is their high fertility level that paves the way for child deaths. As an illustration, consider a woman having six children and experiencing only the loss of her youngest child. Clearly, the higher fertility, in this case, is not an outcome of the experience of child loss. To obviate this, the effect of child loss on fertility has been examined by considering the survival status according to the order of births. Such a comparison is fruitful otherwise also as it can enhance the understanding of the differences in the urge to replace a dead child according to variations in its birth order.

The variable, experience of child loss, is represented by seven dummy variables namely LOSSM1, LOSSF1, LOSSM 2, LOSSF2, LOSSM3, LOSSF3 and LOSS 4+ that represent loss of a woman's first child which is a male, loss of first child which is a female, loss of second child which is a male, loss of second child which is a female, loss of third child which is a male, loss of third child which is a female and loss of a child of order four and above respectively. For the reference category, consisting of women with no experience of child loss, all the seven variables assume the value zero. Both LOSSM 1 and LOSSF 1, for example, can provide insight into the effect due to the loss of first child, but separately for deaths of different sex. A comparison between the two can also facilitate the understanding of the impact of the sex of the dead child on the relationship.

The role of the insurance effect has been studied through the variable PERCEP which takes a value one for women who felt that mortality had declined in the region and zero for those women who felt it to be otherwise. The extent of the effect of PERCEP on fertility will suggest whether the insurance effect is debatable. The perception of a woman refers to her impression about the level of mortality at the time of the survey whereas her fertility history has been collected in retrospect as to reflect the past events chronologically and hence it is difficult to specify the extent to which the variable PERCEP will explain the essence of the insurance effect. However, it may be assumed that such perceptions are not easily amenable to change. Some evidence in support of this position has been presented later in

the discussions. Again, the effect of PERCEP on the other two dependent variables that reflects the future fertility intentions will further add to the understanding of the insurance effect.

The variables RELIGION and RESIDENCE are considered to be relevant for a better understanding of the linkage between fertility and child mortality. A value zero has been assigned for Roman Catholics and a value one for women from other religious groups. Values given to RESIDENCE are zero and one, with the latter standing for urban residence and the value zero denoting other residence. The Hindus and Roman Catholics are the two major religious groups in Goa and their representation in the present sample was 68.5 and 26.3 percents respectively. The remaining 5.2 percent of the sample was constituted mainly by the Muslims and Buddhists which for the purpose of analysis, was merged with the Hindus owing to their behavioural compatibility to the Hindus on aspects pertaining to family size.

The level of literacy of women has been represented by two dummy variables LIT 1 and LIT 2. LIT 1 takes a value one for illiterates, LIT 2 for those who were literates but with years of schooling less than five years. Women with years of schooling 5 or more formed the reference category and both the dummies in this case took a value zero. The useof family planning was represented by FPUSE, which look a value one if woman was using any method of family planning at the time of survey or zero otherwise.

Multiple and logistic regressions have been employed to examine the relationship of the set of independent variables witfi each of the dependent variables. Couples with at least one child were only considered throughout the study and this had reduced the total sample size to 2377 couples.

Results and Discussion

Differentials in Fertility Behaviour

To begin with, the fertility behaviour of women has been examined in terms of their child loss experience and also according to their perceptions about the existing level of mortality of the region (Tables 1-3). The incidence of child loss in the sample was 18 percent; the occurrence of child loss was more with the older cohorts suggesting thereby of an actual decline in the level of mortality in the region of Goa over the years. It is to be mentioned here (though not shown in tables) that the experience of child loss was much higher among the illiterates (25.1 percent) when compared to that of the literates (12.0 percent) and that the child loss was less among the Roman Catholics (13.3 percent) when compared to other religious groups (19.0 percent).

Nearly 75 percent of the women had held the opinion that mortality in the region had decreased. It could be observed that there existed no association between the perception of a woman about the decline in mortality and her actual experience of child loss (Table 1). A large portion of the women (74 percent) who had actually experienced child loss even felt that the level of mortality in this region had undergone a decline. A further analysis of the association by considering the level of literacy of the women revealed that there existed no association between the experience of child loss and perception of mortality level, even in

TABLE 1 : MEAN *(M)* AND STANDARD DEVIATION *(SD)* OF CHILDREN EVER BORN (CEB) TO MOTHERS BY THEIR AGE, PERCEPTION ABOUT LEVEL OF MORTALITY AND EXPERIENCE OF CHILD LOSS

Age of mother	*Perception of child mortality*	*Children Ever Horn*					
		No child loss			*Lost at least one child*		
		M	*SD*	*N*	*M*	*SD*	*N*
<30	Decreased	1.98	1.05	327	3.38	1.24	34
	Not decreased	2.09	1.14	111	4.17	0.90	6
30-39	Decreased	3.27	1.55	710	4.83	1.65	110
	Not decreased	3.49	1.62	214	5.28	2.01	46
40-49	Decreased	4.22	1.94	446	5.70	2.03	164
	Not decreased	4.69	2.04	153	6.45	2.12	56

TABLE 2 : PERCENTAGE OF WOMEN DESIRING ADDITIONAL CHILDREN BY NUMBER OF CHILDREN EVER BORN, THEIR PERCEPTION ABOUT LEVEL OF MORTALITY AND EXPERIENCE OF CHILD LOSS

Number of children ever born	*Perception of women about child mortality*	*Percentage desiring additional children*	
		No child loss	*Lost at least one child*
<2	Decreased	60.8	83.3
	Not decreased	57.9	@
3	Decreased	20.5	30.0
	Not decreased	23.5	@
4	Decreased	7.9	32.7
	Not decreased	9.5	@
5+	Decreased	5.2	7.1
	Not decreased	6.2	13.4

@ Not calculated because of very small sample size.

TABLE 3 : MEAN *(M)* AND STANDARD DEVIATION *(SD)* OF PREFERRED FAMILY SIZE (PFS) OF WOMEN BY THEIR PERCEPTION ABOUT LEVEL OF MORTALITY AND EXPERIENCE OF CHILD LOSS

Perception of women about child mortality	*Preferred family size*					
	No child loss			*Lost at least one child*		
	M	*SD*	*N*	*M*	*SD*	*N*
Decreased	3.65	1.58	1427	5.39	1.78	295
Not decreased	3.91	1.69	418	5.91	2.10	101

the case of illiterates. This could be expected in a region like Goa which had attained a low level of mortality nearly two decades ago. Many of those who had experienced child loss rationalized it as something of an accident and did not in fact tend to disapprove of the real decline in mortality. This lends support to the assumption made earlier that the perception is not something which changes too frequently.

Coming to the central issue of fertility differentials, it may be seen from Table 1 that the fertility level is higher for woman who had undergone the shock of child loss, and the impact is more prominent if the women had held the opinion that the mortality in the region had not declined. Women in the age group 40-49 with completed family size, who had experienced child loss and had held the view that mortality had not declined, were found to have 2 children more on an average as compared to a similar group of women who had not experienced child loss and who had held the view that mortality had declined in the region.

The replacement and insurance effects affect not only the actual fertility performance, but also are capable of inducing change in future fertility intentions (Table 2). This suggests that a woman with a given number of children is more disposed to opt for additional children if she has had child loss experience and/or holds the notion that the mortality in the region is still high. A similar observation can also be made about the replacement and the insurance effects and the preferred family size of the women (Table 3).

Treating CEB, DCH and PFS as the dependent variables, three separate regression analyses were carried out; in the case of DCH, a logistic regression was performed owing to dichotomy in the variable. Marital duration (MDUR) was taken as independent variable while analysing CEB and MDUR and male children ever born (MCEB) and female children ever born (FCEB) were used as independent variables while performing regression of DCH. Significant interaction effect was observed only between LOSSM 1 and PERCEP and this alone is retained in results of regression (Table 4).

With the exception of religion and place of residence, the effects of all other variables in the regression run were found to be significant in determining children ever born to a woman. The death of the first born child who happened to be a son tended to create greater urge among the women to have higher fertility. Further, such an experience was found to have significant interaction with the women's perception about the mortality level. For example, a woman with no experience of child loss and with favourable perception about the mortality had on an average of 3.4 children, keeping the other variables constant (at their mean values). On the other hand, women who held the view that mortality in the region had not decreased and whose first born was a son and had died, had on an average 5.6 children. Experience of male child loss at higher parities tended to have relatively less influence on fertility. However, as mentioned earlier, the effect of child loss at higher parities get vitiated by the reverse effect of fertility on mortality. Further, this post-loss effect at higher parities becomes less prominent owing mainly to the shortened span of reproductive time available to the mother to replace such child loss. The death of female child also tends to increase the fertility significantly, though the magnitude of this effect appears to be less than that due to male child loss.

Another point that emerges from the above analysis is that the difference in the level of fertility between the Roman Catholics and the Hindus disappeared completely once the

TABLE 4: REGRESSION ANALYSIS OF CHILDREN EVER BORN (CEB), WANT FOR ADDITIONAL CHILDREN (DCH) AND PREFERRED FAMILY SIZE (PFS)

Independent variables	*CEB*		*PFS*		*DCH* †	
	B	*SE of B*	*B*	*SE of B*	B	*SE of B*
LOSSM1	1.964*	0.350	2.272*	0.395	1.856*	0.855
LOSSF1	0.412*	0.173	0.738*	0.188	0.846*	0.403
LOSSM2	0.897*	0.207	0.945*	0.220	1.211*	0.448
LOSSF2	0.782*	0.250	1.041*	0.265	0.867	0.563
LOSSM3	1.231*	0.221 0.253	1.435*	0.244	1.319*	0.591
LOSSF3	1.158*		1.443*	0.282	0.437	0.744
LOSS 4+	1.721*	0.145	2.266*	0.155	1.304*	0.447
PERCEP	-0.185*	0.069	-0.173*	0.077	0.235	0.164
RELIGION	0.078 -	0.067	0.129 -	0.073	0.387*	0.151
RESIDENCE	0.106	0.060	0.195*	0.066	-0.569*	0.138
FPUSE	0.449*	0.060	0.230*	0.065	-1.684*	0.144
LOSSMlx PERCEP	-1.132*	0.391	-1.188*	0.440	-0.809	0.953
LIT1	0.801*	0.074	1.405*	0.076	0.972*	0.175
LIT2	0.624*	0.082	0.964*	0.088	0.359	0.190
MDUR	0.113*	0.004	—	—	-0.153*	0.012
MCEB	_	_	_	_	-1.009*	0.083
FCEB	-	-	-	-	-0.492*	0.066
Constant	1.102*	0.104	3.032*	0.107	3.316	0.266
R^2	0.507		0.306			

* Significant at 5 percent.
† Results of logistic regression.
— Not included in the analysis.

variation in the intervening independent variables were taken care of. In other words, the apparently lower fertility level of the Roman Catholics was mainly the impact of greater literacy and lesser child loss experience. Similarly, the fertility difference between urban and rural women in Goa would be negligible had the experience of child loss and distribution of women by the level of literacy were similar.

The results of the analysis of fertility behaviour of a woman in terms of her want for an additional child has also been presented in Table 4. In this case too, an experience of child loss, especially that due to loss of male child, was found to make a difference in a woman's desire for an additional child. The odds of wanting an additional child (the ratio of proportions wanting an additional child and those not wanting it) was found to be 6.4 times higher for those who suffered the loss of their first child which was a son, as compared to those who did not experience such a loss. An adverse opinion regarding the existing mortality level, however, did not seem to affect their fertility intentions. The desire to have an additional child was strongly associated with the number of male children ever borne by the

woman. An additional male child in the family reduces the odds of wanting an additional child by about 64 percent. The want for an additional child was significantly different with rural-urban residence of the women. The odds of wanting an additional child was about 1.8 times higher among the rural women than the urban women.

Observations from the analysis of fertility by preferred family size are similar to that made in the case of children ever born (Table 4). Women who experienced loss of son which was her first child, not only exhibited higher actual fertility and more chance to desire an additional child, but also had preference for larger family size in comparison to those who had not experienced such child loss. Noteworthy is the difference in the preferred family size of those who had experienced loss of their first born male child and held the opinion that mortality had not decreased; this difference was as high as 3.6 children as compared to the preference of those women who felt that mortality had declined and who has had no experience of child loss.

Differentials in Fertility Regulation

For women age 30 years and above, the family planning practice in terms of current use of all methods (including the natural methods) in terms of sterilization alone, has been studied according to their perception about the level of mortality and experience of child loss (Table 5).

TABLE 5 : PERCENTAGE OF CURRENT USE OF FAMILY PLANNING AND STERILIZATION OF WOMEN BY THEIR AGE, PERCEPTION ABOUT THE LEVEL OF MORTALITY AND EXPERIENCE OF CHILD LOSS

Age of women	*Perception about mortality*	*Experience of child loss*	*Percent current users*	*Percent sterilization users*	*No. of women*
	Decreased	No loss	56.1	32.1	710
30-39		Loss of one or more child	62.7	42.7	110
	Not decreased	No loss	49.5	29.4	214
		Loss of one or more child	54.3	32.6	46
	Decreased	No loss	50.1	32.0	447
40-49		Loss of one or more child	48.5	31.3	163
	Not decreased	No loss	41.2	26.1	153
		Loss of one or more child	26.8	17.9	56

Contrary to expectations, the experience of child loss did not seem to create any aversion to the practice of family planning or even to undergo sterilization. In the case of younger women with similar mortality perceptions, the extent of current practice and use of

sterilization were in fact more among those who had undergone child loss than those who had not. An unfavourable perception about the decline in mortality level, however, made significant deterrent effect on the acceptance of family planning.

Certain interesting differentials are available from Table 6 for the different subgroups of women regarding their age and the number of children they had when accepting sterilization. The child loss experience seems to differentiate the sterilization acceptors in terms of these maternal characteristics. On an average, the women who experienced a child loss accepted sterilization two years later than those who had not suffered child loss. Even the number of children born was higher by about 1-2 children in case of the former as compared to the latter.

TABLE 6: FAMILY PLANNING USE AND CHARACTERISTICS OF STERILIZATION ACCEPTORS ACCORDING TO CHILD MORTALITY EXPERIENCE

Family Planning Use Status	*Child mortality experience*	
	No child loss	*Lost at least one*
Percentage of Ever User	52.75	53.49
Percentage of Current User	46.38	48.92
Percentage of Sterilized	26.20	32.05
Average Age at the Time of Sterilization	30.03	31.86
Average CEB at the Time of Sterilization	4.31	5.65

Conclusion

The survey data examined for the present paper have provided a fair opportunity to understand the replacement and the insurance effects of child mortality on fertility. The study suggests that the fertility of women who experienced the death of their first child which was also male was significantly higher as compared to those who had not faced the trauma of child loss. The fertility of women was further affected if they viewed that mortality in the region continued to remain high. The net effect of the replacement and the insurance motivation was to the extent of having a higher fertility by about 2.2 children. In terms of preferred family size, namely the number of children ever born together with the number of additional children desired, this effect could bring about as high a difference as 3.6 children.

However the experience of child loss did not deter women from accepting even the terminal methods of family planning, though it apparently prompted them to go in for limiting their family size at older ages, after having replaced the dead children.

Though the replacement effect of mortality was found to be relatively stronger, the study did reveal the existence of a significant insurance effect. The women who were pessimistic about the decline in mortality in the region were found to have higher fertility and their urge to regulate fertility appeared to be less. The insurance effect could be present in all women irrespective of their actual child loss experience. As a result, the overall insurance effect in terms of increasing the level of fertility of the population, could be substantial despite its negligible effect per woman.

It is true that in Goa, where the level of infant mortality has attained a level of 30-50 per 1000 live births nearly two decades back, the proportion of women who experienced child loss or who do not hold optimistic opinion regarding decline in mortality will be less. However, this is not expected to be true in case of the larger states in the country, namely, Ultar Pradesh, Bihar and Madhya Pradcsh where the infant mortality still remain in the vicinity of 100 per 1000 live births and where the level of female literacy remains at a distressingly low level of around 20 percent. Assuming that the effect of infant and child mortality in these states would be more or less an exact replica of what was indicated for Goa, a decline in the level of infant and child mortality in these states would have enormous implications for engineering a reduction in the level of fertility in the country. This would point moreover to the twin needs of effective implementation of the maternal and child health programmes and also of an innovative campaign that awaken people to realize the recent decline in mortality whereby they shed "the fear of losing a critical resource in form of children".

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