Determinants of Fertility in the 1970s and 1990s in Nepal

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Introduction

Reductions in fertility are becoming a common feature of the demography of South Asia. Fertility began to decrease in parts of India in the 1960s (Preston and Mari Bhat, 1984; Rele, 1987). The onset of fertility decline in Bangladesh dates back to the end of the 1970s (Cleland et al., 1994). Some decline in fertility has commenced in Pakistan also (Jaurez and Sathar, forthcoming).

Recent evidence suggests that Nepal has also been experiencing a gradual decline in fertility over the last several years. Tuladhar's (1989) analysis based on the 1986 survey provides some early evidence of the onset of fertility decline in Nepal. Further evidence of the onset of decline in fertility in Nepal has been reported by Dangol et al. (1997) and Retherford and Thapa (1998). Collumbien at al. (1997) have argued that fertility decline in Nepal may have commenced as early as the 1970s.

It is well established that fertility varies by the socioeconomic status of the woman and her family. Some factors have less predictable effects than others. Having reviewed that fertility has started to decline in Nepal, from the policy and programmatic point of view, it is important to identify which factors have fertility-reducing effects. Moreover does the relative importance of these factors change as fertility changes? And to what extent can fertility decline be attributed to changes in the socio-

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economic composition of populations? This paper attempts to answer these questions using data from two national fertility surveys of Nepal conducted in mid-1976 and mid-1996 .

Materials and Method

The data used in this paper are from the 1976 Nepal Fertility Survey (NFS) and the 1996 Nepal Family Health Survey (NFHS). Both surveys were conducted under the overall coordination of the Ministry of Health.

The NFS was conducted as part of the World Fertility Survey (MOH, 1977). The aim of the sample design of the NFS was to interview approximately 5000 eligible women.. All ever-married women between 15 and 49 years of age, who were de-facto residents of sample households on the night prior to enumeration were defined eligible for the individual interviews. The design was framed in such a way that the expected sample sizes in the Terai, Hills and Mountains were proportionate to their population sizes. Multi-stage area sampling was applied in selecting districts, *panchayats* and wards successively from these regions. A total of 5,940 eligible women were successfully interviewed from 5,976 households yielding an individual response rate of 97.9 per cent. The NFS collected information under seven broad areas namely, respondent's background characteristics, maternity history, contraceptive knowledge and use, marriage history, fertility regulation, work history and current or last husband's background characteristics.

The NFHS was part of the worldwide Demographic and Health Survey (DHS) project. The NFHS was a nationally representative cross-sectional sample survey which successfully interviewed 8,429 ever-married women out of a total of 8,580 eligible women identified in 8,082 households (MOH, 1997). This survey also had a 98 percent individual response rate.

The NFHS sample was designed to provide estimates of population and health indicators including fertility and mortality rates for the country as a whole and for urban and rural areas separately. The survey provides information on a wide range of issues such as nuptiality, contraceptive knowledge and behavior, demand for contraception, other proximate determinants of fertility, family size preferences, utilization of antenatal services, breastfeeding and food supplementation practices, child nutrition and immunizations, and knowledge about AIDS.

The quality of the data collected in both the 1976 and 1996 surveys has been extensively evaluated (Goldman et al., 1979; MOH,

1997; Retherford and Thapa, 1998; Collumbien et al., 1997). Goldman's study concluded that omission and misdating of births have an increasingly serious effect on fertility estimates for five and more years before the NFS but found that recent events were reported fairly accurately. Overall, the evaluations concluded that omission of ever born children by older women was not serious in either the 1976 or the 1996 surveys.

In this study multiple regression analysis is used to evaluate the relative importance of selected socioeconomic and household variables on fertility. Total change in fertility is decomposed to assess the extent to which changes in fertility between the two survey periods were due to changes in the distribution of women in specific categories of some key variables (compositional effect) and the extent to which changes occurred net of the compositional effect.

The analytical framework in this analysis hypothesizes that fertility, the dependent variable, is affected by a set of socioeconomic and proximate factors. The analytical approach and specification of the variables are similar to those adapted in an earlier analysis (Thapa et al., 1997). The proximate factors considered in the analysis are age at marriage and ever use of contraception. Two related measures of fertility are used: recent fertility (defined as all births in the five years preceding the survey), and cumulative fertility (measured by the number of children ever born). In the analysis of recent fertility women who had less than five years marriage duration at the time of the survey are excluded since these women were not exposed to the full five years for childbearing. In both the surveys about 19 percent of the total ever married women reported having less than five years marriage duration.

The socioeconomic factors included in the analysis are: place of residence, religion, ethnicity, husband's education and occupation, and respondent's literacy and occupation. The choice of these independent variables was limited to those measured in a reasonably comparable manner in both surveys, and by additional consideration of sample distributions. The net effects of these factors on fertility are measured by controlling for the respondent's age, the main demographic variable. (The number of children dead is not considered an explanatory variable of cumulative fertility, since the number of dead children is one of the components of children ever born.)

Results

Trends in Fertility

The P/F ratio method (UN, 1983) is a useful tool for comparison of information on the age pattern of fertility derived from reports of recent births (F) with information on lifetime fertility (P). The age pattern of the P/F ratio enables us to detect if fertility has been changing and to assess the quality of data on lifetime and current fertility. If fertility has been constant, we can use information on the parities of women in their twenties to adjust the current fertility data for under reporting or over reporting of births in the last year. In the case of falling fertility these parities reflect higher fertility during the past few years and so such adjustments produce overestimates of current fertility (Collumbien et al., 1997).

Table 1 P/F ratios and estimates of total fertility rate (TFR) based on births in last year preceding survey date, Nepal, 1976 and 1996

Age Group	1976	1996
15-19	0.86	0.780
20-24	0.98	0.994
25-29	0.95	1.043
30-34	0.92	1.068
35-39	0.93	1.104
40-44	0.93	1.246
45-49	0.94	1.275
Unadjusted TFR	6.33	4.60
Adjusted TFR	6.21	4.70

The P/F ratios and unadjusted as well as adjusted fertility rates from the 1976 and 1996 surveys are presented in Table 1. Adjustment of fertility is based on the P/F ratio for women aged 20-24. The rise in the P/F ratio with age in the 1976 and 1996 survey data provides evidence of falling fertility. The data suggest that reporting of current fertility in the 1976, 1991 and 1996 surveys is fairly accurate.

Differentials in Fertility

In order to analyze changes in recent and cumulative fertility differentials in the two surveys mean number of births per 100 women in the five years preceding the survey and mean number of children ever-born (CEB) are calculated by categories of selected background variables

and the two proximate determinants of fertility. Moreover, statistical significance of gross association between the selected variables and the two measures of fertility are evaluated by the b coefficients estimated by means of simple regression lines. The results are shown in Table 2a and Table 2b.

The data indicate that in 1976 the two proximate variables, age at marriage and ever use of modern contraception, have statistically significant gross association with cumulative fertility but not with recent fertility (Table 2a). Except religion and husband's occupation all other socioeconomic and demographic variables have statistically significant associations with recent fertility in the expected directions. The weak gross effects of religion and husband's occupation on recent fertility in 1976 converted into strong effects by 1996. On the other hand, the strong gross effects of variables such as dead children and husband's education in 1976 changed into mild effects after two decades.

Age at marriage and ever use of contraception have strong significant associations with cumulative fertility. Ever users of contraceptives have, however, higher numbers of children ever born. In 1976 place of residence, region of residence, religion, ethnicity and respondent's occupation had weak associations with cumulative fertility (Table 2a), but after 20 years these variables (except region of residence and ethnicity) exerted significant gross effects on cumulative fertility (Table 2b).

Changes in Socioeconomic and Proximate Factors

Table 3 shows the percentage distribution of ever-married women, by socioeconomic variables and proximate factors, in the two surveys. The percentage of women residing in urban areas increased to 8.4 in 1996 from 2.2 in 1976. The percentage of husbands with schooling has gone up by two years, from 1.4 to 3.7 percent, about a three fold increase in two decades. Similarly a significant shift in husband's occupation has occurred between the two surveys. For instance, whereas 42 percent of respondents' husbands in 1996 were in nonagricultural occupation, it was only 23.3 percent in 1976. Similarly a progressive change in women's literacy is observed during these years. One in five women were reported to be literate in the 1996 survey compared to one in 20 in the 1976 survey. Another noticeable change in the distribution of women is in the ever use of modern contraceptives. Ever use of modern methods was as low as 3.8 percent in 1976 and increased to 34.3 percent in 1996.

Table 2a Recent and cumulative fertility differentials by socioeconomic variables and proximate factors, Nepal, 1976

Variables	Recent Fertility		Cumulative Fertility	
	Births in 5 years[a]		CEB	
	Mean	b values	Mean	b values
Place of residence		-.036**		.008
Rural	115		3.3	
Urban	92		3.5	
Region of residence		.038**		-.006
Mountain and Hill	111		3.3	
Terai	119		3.3	
Religion		-.002		.028
Non-Hindu	115		3.0	
Hindu	114		3.3	
Ethnicity		.037**		.008
Non-Terai origin	113		3.3	
Terai origin	125		3.3	
Age[b]		-.374**		.678**
15-24	136		1.0	
25-34	149		3.4	
35+	70		5.4	
Dead children[b]		.062**	ni	na
<2	111			
2+	123			
Husband's education[b]		.047**		-.168**
<6 years	113		2.7	
6+ years	129		2.3	
Husband's occupation		-.014		-.068**
Agriculture	115		3.4	
Non agriculture	112		3.0	
Respondent's literacy		.031*		-.079**
Illiterate	114		3.3	
Literate	127		2.5	
Respondent's work		-.044**		.018
No work	121		3.2	
Some work	111		3.3	
Age at marriage[b]		.001		-.112**
<16 years	115		3.6	
16+ years	114		2.9	
Ever use of modern contraception		.022		.132**
No	114		3.2	
Yes	125		5.2	
All women	114		3.3	

Significant at ** p<.01; *p<.05.

a Mean number of births per 100 females in the five years preceding the survey.

b While estimating the b coefficients these variables were introduced as continuous.

ni = not included, na = not applicable.

Table 2b Recent and cumulative fertility differentials by socioeconomic variables and proximate factors, Nepal, 1996

Variables	Recent Fertility		Cumulative Fertility	
	Births in 5 years[a]		CEB	
	Mean	b values	Mean	b values
Place of residence		-.110**		-.074**
Rural	96		3.5	
Urban	64		2.9	
Region of residence		-.030**		-.004
Mountain and Hill	94		3.5	
Terai	89		3.4	
Religion		-.063**		-.027*
Non-Hindu	107		3.6	
Hindu	90		3.4	
Ethnicity		.024*		.017
Non-Terai origin	91		3.4	
Terai origin	96		3.5	
Age[b]		-.524**		.700**
15-24	154		1.2	
25-34	118		3.5	
35+	43		5.4	
Dead children[b]		.016	ni	na
<2	93			
2+	88			
Husband's education[b]		-.022		-.272**
<6 years	93		3.9	
6+ years	89		2.5	
Husband's occupation		-.043**		-.143**
Agriculture	95		3.8	
Nonagriculture	87		3.1	
Respondent's literacy		-.048**		-.252**
Illiterate	94		3.8	
Literate	82		2.2	
Respondent's work		.029*		.113**
No work	85		2.8	
Some work	93		3.6	
Age at marriage[b]		.042**		-.222**
<16 years	87		3.9	
16+ years	97		3.0	
Ever use of modern contraception		-.160**		.167**
No	104		3.2	
Yes	74		4.0	
All women	92		3.4	

Significant at ** p<.01; *p<.05.

a Mean number of births per 100 females in the five years preceding the survey.

b While estimating the b coefficients these variables were introduced as continuous.

ni = not included, na = not applicable.

Table 3 Percentage distribution of ever-married women by the household and individual characteristics, Nepal, 1976 and 1996

Variables	1976	1996	Difference (1996-1976)
Socioeconomic characteristics			
Mean year of education of household head	na	2.4	na
Household with toilet facility	na	22.4	na
Household with radio or TV	na	41.8	na
Urban residence	2.2	8.4	6.2
Residence in Terai region	41.7	50.5	8.8
Hindu religion	91.5	87.4	4.1
Ethnic groups of Terai origin	9.6	27.0	17.4
Mean age of the respondent	29.9	30.6	0.7
Mean number of dead children	0.9	0.6	0.3
Mean year of husband's education	1.4	3.7	2.3
Husband in nonagricultural occupation	23.3	42.0	18.7
Respondent literate	6.2	20.9	14.7
Respondent have some work	68.0	83.7	15.7
Proximate factors			
Median age at marriage	15.0	16.0	1.0
Ever used contraceptives	3.8	34.3	30.5
Total number of ever-married women	5,940	8,429	

na = not available.

The changes in education, occupation and use of modern contraceptives are most probably due to program efforts rather than to sampling. However, a substantial increase in the percentage of ever-married women in Terai originated ethnic groups during the two surveys (an increase from 9.6 to 27.0) is most likely due to definitional reasons rather than an increase in the proportion of such women in the national population.

Data indicate that the median age at marriage has increased by one year and the mean number of dead children has gone down by about 30 deaths per 100 women in the twenty years. A substantial proportion of women reported to have some work outside the home in 1996 (83.7 percent) compared to the proportion reported in 1976 (68 percent). The 1996 survey collected some household level information also. Data presented in Table 3 show that mean years of education of the household head is 2.4 years, about 22 percent of households have access to toilets, and about 42 percent have access to radio or TV.

Multiple Regression

Multivariate analysis of recent fertility (births during the five years preceding the survey) indicates that the age of the respondent, number of dead children, husband's occupation, respondent's work status and the two proximate variables had strong net association with fertility in 1976 (Table 4). The scenario is, however, slightly different for cumulative fertility. Six variables—religion, ethnicity, age of the respondent, husband's occupation, age at marriage and ever use of modern contraceptives—have strong effects on cumulative fertility. The notion that in high fertility communities demographic and proximate factors play dominant roles in fertility reduction is supported by the 1976 survey. This is further supported by the regression analysis of recent and cumulative fertility from the 1996 survey. In addition, other variables such as place of residence, religion, husband's education and respondent's literacy exert strong effects on recent as well as cumulative fertility in the 1990s.

The explanatory power (R^2) of the regression model of recent fertility almost doubles in 1996 from the level of 21.7 percent in 1976. This is another indication that socioeconomic variables have started to play an important role in fertility reduction in Nepal. However, the power of the model does not change during these years in the regression model of cumulative fertility. Further, in the regression models for recent and cumulative fertility in 1996 in which only socioeconomic variables were introduced the R^2 values were 2 percent and 10 percent, respectively. The major contribution to the increase in R^2 was the age of the respondent, which is not surprising.

In a society like Nepal household characteristics are also expected to play an important role in fertility differences. Women from households with better educated household heads may have more access to radio and TV. These women are likely to have different fertility behaviors than their counterparts. Access to toilet, and radio or TV could be taken as the proxy for economic status of the household. As previously mentioned, such information was not collected in the 1976 survey.

In order to analyze the effects of household factors on fertility, regression models (using 1996 survey data) were run by adding these variables to the previous models. The effects of household variables on the regression models were significant on recent fertility but only mild on cumulative fertility (results not shown). The addition of these variables did not, however, contribute to increasing the explanatory power of the models. Further because of lack of data in the earlier

Table 4 Effects[a] of socioeconomic variables and proximate factors on recent[b] and cumulative[b] fertility among females 15-49, Nepal, 1976 and 1996

Variables	Recent Fertility		Cumulative Fertility	
	1976	1996	1976	1996
Socioeconomic characteristics				
Urban residence[c]	-.022	-.057**	-.009	-.039**
Residence in Terai region[d]	-.023	-.053**	.001	-.009
Hindu religion[e]	-.017	-.053**	.028**	-.032**
Ethnic groups of Terai origin[f]	.018	-.001	.037**	.003
Current age of the respondent[g]	-.518**	-.624**	.693**	.655**
Number of dead children[g]	.253**	.192**		
Husband's education[g]	-.014	-.048**	-.014	-.053**
Husband in nonagricultural occupation[h]	-.037**	-.041**	-.023**	-.033**
Respondent literate[i]	.002	-.054**	-.002	-.046**
Respondent has some work[j]	-.048**	-.017	-.007	.016
Proximate factors				
Age at marriage[g]	.141**	.110**	-.216**	-.192**
Ever used contraceptives[k]	.048**	-.064**	.092**	.091**
R^2	21.7	35.5	50.7	55.2
F-ratio	106.08**	308.17**	520.12**	925.04**
Number of cases	4,617	6,734	5,582	8,284

Significant at **p<.01; *p<.05.

a Results are based on multiple regression analysis. In each model the dependent variable is continuous. b Recent fertility refers to births during five years preceding the survey and cumulative fertility refers to children ever born. c Coded as 0 = rural, 1 = urban. d Coded as 0 = Mountain and Hill, 1 = Terai. e Coded as 0 = Non-Hindu, 1 = Hindu. f Coded as 0 = other ethnic groups, 1 = ethnic group of Terai origin. g Continuous variable. h Coded as 0 = husband in other occupation, 1 = in nonagricultural occupation. i Coded as 0 = illiterate, 1 = literate. j Coded as 0 = no work, 1 = have some work. k Coded as 0 = never used, 1 = ever used modern contraceptive methods.

survey, we are not able to compare the effects of these variables with the 1970s period.

Overall, the results indicate that socioeconomic factors such as urban-rural residence, husband's occupation and women's literacy are emerging as significant predictors of both recent and cumulative fertility in the 1990s when fertility has declined slightly. Fertility is low among women living in urban areas, whose husbands have nonagricultural occupations and who are literate. How much of the change in the total fertility rate (TFR) between the two surveys is due to the change in the urban-rural composition of ever-married women, and how much change can be assigned to real change within the sub-groups?

Table 5 shows the decomposition of changes in the total fertility rate (TFR) between 1976 and 1996. The decomposition procedure applied here is similar to that of age standarization for crude birth and death rates (see for example, Shryock and Siegel, 1976: 284-288.) The urban population of ever-married women in the 1996 sample increased from 2.2 percent to 8.4 percent in the 1976 sample. The results show that only 21 percent of the decline in fertility between these two periods is due to this change in composition. About 79 percent of the decline in fertility is within the sub-groups. Fertility has declined considerably more in urban than in rural areas.

Table 5 Decomposition of the change in total fertility rate (TFR) between 1976 and 1996, Nepal

Variable	1976		1996		Change in TFR
	Women (%)	TFR[a]	Women (%)	TFR	(1976-1996)
Place of residence					
Rural	97.8	6.33	91.6	5.24	1.09
Urban	2.2	5.33	8.4	3.46	1.87
Change attributable to intra-class decline	79.0				
Change due to composition	21.0				
Husband's occupation					
Agriculture or other	76.7	6.41	58.0	5.31	1.11
Nonagriculture	23.3	5.84	42.0	4.41	1.43
Change attributable to intra-class decline	86.5				
Change due to composition	13.5				
Respondent's Literacy					
Illiterate	93.8	6.27	79.1	5.24	1.03
Literate	6.2	5.61	20.9	3.46	2.15
Change attributable to intra-class decline	84.4				
Change due to composition	15.6				
All	100	6.26	100	4.92	1.34
Number of women	5,940		8,429		

a TFR is calculated using the births in the five years preceding the survey. In 1976 the number of total women in 5 year age groups for sub-groups of the population are obtained by inflating the number of ever-married women (inflating factors are based on the total population).

Similarly, decomposition of the TFR by categories of husband's occupation and respondent's literacy shows that about 15 percent of the change in the TFR is attributable to the change in

population composition and the remaining 85 percent is the real change within the sub-groups. Hence, we may conclude that the observed decline in fertility between the two periods is not solely due to changes in the composition of population characteristics.

Discussion and Conclusion

Nepal is in the early phase of the fertility transition when decline in fertility is slow, from a TFR of 6.2 (adjusted) in 1976 to a TFR of 5.1 in 1996. Marriage is universal (Acharya, 1989 and 1993), and women try to become pregnant as soon as possible after marriage to establish their position within the household. For instance, by the age of 19, more than three-fourths enter motherhood, and by the age of 24 almost 96 percent of ever-married women enter motherhood, suggesting that timing of marriage is synonymous with initiation of childbearing (Thapa et al., 1997). In this context early marriage and early childbearing have strong positive effects on fertility. Conversely, late marriage and higher age at first birth have fertility-reducing effects.

Although the level of contraceptive use was low in the 1970s, it showed a statistically significant association with both recent and cumulative fertility. In the 1990s, ever use of contraception had a significant negative effect on recent fertility, but a significant positive effect on cumulative fertility. The positive association between contraception and cumulative fertility may be related to the use of particular contraceptive methods. Sterilization is the most commonly used contraceptive method in Nepal (Thapa and Pandey, 1994) . In both surveys, about 67 percent of current users (currently married nonpregnant women) reported use of sterilization. For most couples in rural Nepal family planning means termination of childbearing. In this context, contraceptive use is most likely to be the consequence of having had high fertility (Thapa et al., 1997). In other words contraceptive use is determined by previous fertility, rather than in determining fertility. In a previous analysis based on the 1996 survey, Thapa et al. (1997) found the direction of the relationship between contraceptive use and fertility becomes inverse around the age of 30, suggesting that the fertility-inhibiting effect of contraceptive use becomes pronounced only after age 30.

In conclusion, this analysis of the data from two good quality surveys taken 20 years apart shows that fertility has begun to decline in Nepal. Of the two proximate factors—age at marriage and contraceptive use—the former has a strong inverse association with

cumulative fertility in both the 1970s and 1990s. Contraceptive use has, however, a positive association with fertility. This is most likely due to the fact that contraception is used largely by those who have achieved their desired fertility. Thus, the family planning program appears to be gaining a strong foothold in giving couples the means to limit childbearing. Its other role—that of spacing births—appears minimal. This other role may be expected to be strong only when a significant proportion of Nepali couples begin to consider using contraception for spacing births. Aside from the role of the proximate factors, women's literacy, husbands' education and nonagricultural occupation have also emerged as important fertility-inhibiting social factors in the 1990s in Nepal. The results provide strong support for continued investment in the family planning program and other social development factors (e.g., improvements in educational attainment and higher age at marriage) that could contribute to greater reductions in fertility in the future.

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