An Analysis of Fertility Differentials Among Caste Groups in Andhra Pradesh, India

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Abstract: Though the South Indian state of Andhra Pradesh is experiencing transition to replacement level, notable fertility differentials persist between the caste groups. Fertility has been much higher among scheduled caste and scheduled tribes compared to other caste groups. This paper examines the fertility differentials among caste groups in the context of characteristics and interaction hypotheses, using the second Indian National Family Health Survey data. The results of multiple classification analysis on cumulative fertility and proportional hazard analysis on birth intervals show that differentials between caste groups persist even after controlling for the other socioeconomic and demographic variables. Further, the analysis of interaction effects show that the caste effect is not constant across the levels of other socioeconomic factors. In rural areas and at the lower levels of education and standard of living, fertility is relatively high and scheduled castes and tribes have higher fertility than 'other' caste. But this situation is reversed completely in urban areas and at the higher levels of socioeconomic status, where the level of fertility is not only low but also scheduled castes and tribes have lower fertility than 'other' castes. This indicates with the improvement of socioeconomic status, not only will fertility decline, but also the difference in fertility between caste groups will disappear.

Keywords: fertility transition, fertility differentials, scheduled castes and tribes, India.

1. INTRODUCTION

Now there is clear evidence that fertility transition is in progress in India. According to the direct estimates of total fertility rate (TFR) based on 1981 and 2001 Census, the TFR declined from 3.61 in 1981 to 2.52 in 2001, thus a decline in the fertility level of 1.09 children and the corresponding decline based on Sample Registration System (SRS) has been 1.42 during 1981–2001 periods (India, Registrar General, 2005). On the other hand, independent estimates of fertility from the three rounds of National Family Health Surveys (NFHS-1, 2 & 3) also indicate that India has been experiencing a rapid fertility decline in recent years (International Institute for Population Sciences [IIPS] 1995; IIPS and ORC Macro, 2000, 2006). Though the fertility has declined, the differentials are still present among the caste groups in India (Pallikadavath and Wilson, 2005; Gandotra, *et al.*, 1998). Fertility has been much higher among scheduled castes and tribes[1] (SC/ST groups) as compared to that of other caste (Non-SC/ST) groups. According to the National Family Health Survey-1 (NFHS-1), conducted in 1992–93, the TFR for the preceding three years was 3.9 for scheduled castes, 3.6 for scheduled tribes and 3.3 for non-SC/ST (IIPS, 1995). The second survey, NFHS-2 carried out in 1998–99, also showed lower fertility for all the caste groups, but the order is maintained though with narrower gaps (IIPS and ORC Macro, 2000: 91). Whether the caste differentials in fertility are caused by variations in the socioeconomic characteristics *or* whether caste *per se* is responsible[2] for the fertility differentials, needs further research. This calls for further analysis of the differentials among the caste groups and also it is necessary to do multivariate analysis to identify the net differentials, as the gross differentials may be attributable to other factors. This paper, therefore, examines the fertility differentials among the caste groups in the South Indian[3] state of Andhra Pradesh. On an average, women in Andhra Pradesh now give birth to only 2.2 children (in 2002, the latest year for which the SRS estimates are available) as compared to about 5 children in early 1970s. In spite of low fertility levels in the state, differentials are still discernible between the caste groups and the differentials tend to be considerably larger than fertility differentials by residence, education or religion (IIPS and ORC Macro, 2000a: 60). The TFR is 0.75 children higher among scheduled tribe women, 0.51 children higher among scheduled caste women, and 0.26 children higher among other backward class[4] women than among women in the 'other' caste category.

2. THE SETTING

Andhra Pradesh was the first state in independent India to be formed on a purely linguistic basis. It lies between 12°41' and 22°N latitude and 77° and 84°40'E longitude, and is bordered by Maharashtra, Chhattisgarh, Orissa in the north, the Bay of Bengal in the East, Tamil Nadu to the south, and Karnataka to the west. It is the fourth largest state in India by area and fifth largest by population. According to the 2001 Census, Andhra Pradesh had a population of 76.21 million, which accounts for 7.41 percent of India's population and covers 8.37 percent of the total land area. The scheduled castes and tribes together account for about a quarter of state's population, 16.19 percent were classified as scheduled castes and 6.59 percent as scheduled tribes (India, Registrar General, 2004). Nearly 80 percent of the scheduled castes and 90 percent of the scheduled tribes live in the rural areas. In recent years, the state of Andhra Pradesh has attracted the attention of population scientists due to lowest growth rate of population and rapid fertility decline during the last decade. The decade of 1991–2001 witnessed a dramatic decline in the growth rate and the third lowest growth rate of population among the major Indian states, higher than Kerala and Tamil Nadu. The average annual exponential growth rate has declined from its highest ever annual growth of 2.17 percent in 1981–91 to 1.36 percent during 1991–2001, while the slowdown in the population growth for the country as a whole was from 2.16 to 1.97 percent, respectively (Kumar and Sharma, 2006). This is largely due to the high pace of demographic transition (James and Subramanian, 2003).

Between 1971 and 1997, the fertility declined substantially in the state. The crude birth rate declined from 34.8 per 1,000 population in 1971 to 22.5 in 1997. The total fertility rate declined substantially, from 4.6 children per woman in 1971 to 2.5 children per woman in 1997. Of the two-child decline in a span of 26 years (1971–97), more than one child decline is accounted in the last one decade from 1987–97 (Ramachandran and Ramesh, 2005). Fertility continues to decline further in the state. According to the preliminary findings of the latest third round of National Family Health Survey (NFHS-3), 2005–06, the TFR for the three years preceding the survey was 1.79 (IIPS and ORC Macro, 2006), which is even lower than that of Kerala and Tamil Nadu. The total fertility rate is down from 2.25 children per woman at the time of NFHS-2, a decline of 20 per cent in approximately eight years. The decline in fertility in the state was largely attained through contraceptive use and particularly through female sterilization (James and Subramanian, 2003). According to the NFHS-2, the contraceptive prevalence rate is moderately high, with 60 percent of currently married women using some methods of contraception. Most of this, 57 points, or 96 percent of current contraceptive

prevalence is contribution of male or female sterilization. The median age at the time of sterilization was 23.5 years and about 64 percent of sterilized women undergoing sterilization before the age of 25. On the other hand, the median age at marriage in the state is 15.4 and most of women (76 percent) age 20–49 marry before the legal minimum age at marriage of 18 years (IIPS and ORC Macro, 2000a: 38, 92 & 96). Thus, sizable proportions of women in Andhra Pradesh marry before the legal age of 18, have a child soon after marriage, and complete family building and undergo sterilization before age 25. This indicates that the age patterns of childbearing in the state are restricted to very young ages of women, leading to a compression of reproductive spans and this has not been seen elsewhere in the world (Padmadas *et al.*, 2004; 2005). Son preference (women who have reached their desired number of sons are more likely than those who have not to adopt sterilization) and other cultural factors (individual identities in kinship and social networks) seem to play an important role in early sterilization in the state (Basu, 1999, Säävälä, 1999, Padmadas *et al.*, 2004).

2.1. Trends and Differentials of Fertility by Caste Groups

Estimates of different measures of fertility according to caste compiled from the two rounds of special surveys from the Sample Registration System (SRS 1978, 1984 Surveys) and National Family Health Surveys (NFHS-1 & 2) have been used to examine the differentials. The estimates of TFR rate and cumulative fertility (CF – computed as mean children ever born to women of age 40–49 at survey) given at different time points presented in Table 1 indicate that the scheduled castes and tribes had higher fertility compared to that of the non-SC & ST in all the surveys, but the differences are found to be very small in 1978 survey. The 1984 SRS survey estimates of TFR for scheduled castes and scheduled tribes show an excess fertility over Non-SC/ST by 13 and 23 percent, respectively. On the other hand, the NFHS-1&2 estimates also show SC and ST fertility is higher than that of Non-SC/ST fertility. The NFHS-2 estimates of TFR during 1996–98 show that the TFR of scheduled castes and scheduled tribes was higher than that of Non-SC/ST by 26 and 38 percent, respectively. Similarly, the mean number of children ever born for currently married women of age 15–49 for SC and ST is higher than that of Non-SC/ST by 20 and 36 percent, respectively.

Table 1
TRENDS AND DIFFERENTIALS OF FERTILITY BY CASTE GROUPS IN ANDHRA PRADESH, INDIA, 1978–1998

Year/ Indicator	Source	All	Caste/tribe			Ratio[2]	
			Scheduled castes	Scheduled tribes	Others[1]	Scheduled castes	Scheduled tribes
Total fertility rate[3]							
1978*	SRS	3.77	3.78	4.39	3.73	1.01	1.18
1984	SRS	4.10	4.40	4.80	3.90	1.13	1.23
1989–91	NFHS-1	2.59	2.61	3.74	2.52	1.04	1.48
1996–98	NFHS-2	2.25	2.51	2.75	2.00	1.26	1.38
Cumulative fertility[4]							
1989–91	NFHS-1	4.05	4.32	(4.07)	4.00	1.08	1.02
1996–98	NFHS-2	4.03	4.33	(4.95)	3.62	1.20	1.37
% Difference between the cumulative fertility and total fertility rate[5]							
1989–91	NFHS-1	36.05	39.58	8.11	37.00	NA	NA
1996–98	NFHS-2	44.17	42.03	44.44	44.75	NA	NA
Mean number of children ever born[6]							
1989–91	NFHS-1	2.72	2.94	2.95	2.67	1.10	1.10
1996–98	NFHS-2	2.72	2.93	3.32	2.44	1.20	1.36

Notes: [1]Others (Non-scheduled castes/tribes)
[2]Ratio: With values for 'others' as base
[3]Total fertility rates of NFHS-1&2 are for the three years preceding the survey to women age 15–49. Rates from SRS are for one calendar year.
[4]Cumulative fertility – Mean number of children ever born (MCEB) to ever-married women age 40–49 years
[5]Calculated as the difference between Cumulative fertility and total fertility rate, taken as a percentage of cumulative fertility.
[6]Age-standardized MCEB, computed from data files for currently married women of age 15–49 years
* Weighted averages are computed from 1978 Rural and Urban fertility estimates of RGI (1981)
( ) based on 25–49 cases; NA- Not applicable

Sources: 1978 SRS Survey: India, Registrar General (1981); 1984 SRS Survey: India, Registrar General (1989); NFHS-1: PRC and IIPS (1994:60 & 67); NFHS-2: IIPS and ORC Macro (2000a:60).

The mean number of children ever born to ever-married women of age 40–49 at the time of survey does not affect the interpretation of differentials. The pattern of differentials in the mean number of children ever born to women age 40–49, parallels the pattern of differentials in the TFR – suggesting that the pattern has prevailed over the past 20–30 years though the degree of difference has changed somewhat. Comparing the TFR and mean children ever born (period and cohort fertility) of NFHS-2, it was found that the extent of fertility decline was 44 percent for the state during the last three decades. By caste/tribe, fertility has declined faster among women of other castes (45 percent) followed by scheduled tribes (44 percent) but somewhat slowly among scheduled caste women (42 percent), indicating that fertility

has fallen considerably faster among scheduled tribe women than among the scheduled caste women. However, tribal fertility has almost never been lower than that of the SC people in Andhra Pradesh (Maharatna, 2005: 155). Thus, fertility among all the caste groups is much lower than the high fertility levels of the past and thus the process of fertility transition is in progress. On the other hand, use of contraception varies substantially across caste groups. Contraceptive use is lowest (49 percent) among women belonging to scheduled tribes and highest (64 percent) among 'other castes'. The median age at first cohabitation for women age 20–49, ranges from 14.7 for scheduled caste women to 16.7 for women in 'other' category (IIPS and ORC Macro, 2000a: 93 & 56).

Our examination of the above data on fertility differentials among caste groups in Andhra Pradesh suggests that fertility has been much higher among scheduled caste and scheduled tribes (SC/STs) as compared to that of other backward classes (OBC) and 'other' caste category (OC). For OCs, fertility is below the replacement level and for OBCs fertility is nearer to the replacement. It must be noted here that higher fertility among women belonging to a particular caste may not necessarily be attributable to the caste factor *per se*. There are differences in characteristics such as educational level, rural or urban residence, and occupational distribution, many of which have a bearing on fertility. Therefore, some or all of the caste differentials in fertility could be on account of differentials in one or more of these factors (the characteristics hypothesis). It is, therefore, necessary to examine the characteristics hypothesis and ascertain whether observed fertility differentials by caste in Andhra Pradesh are caused by variations in characteristics *or* are the effects of caste *per se*. In order to do so, the magnitudes of net differentials after controlling or adjusting for the effects of socioeconomic characteristics must be computed. This paper, therefore, assesses the net effects of caste factor on cumulative fertility and on family building process controlling for other variables. The paper would also attempt to examine whether the caste differentials in fertility exist at each stage of socioeconomic status and whether these are of the same order and direction using the NFHS-2 data.

3. DATA AND METHODS

3.1. Data

The analysis presented in this paper comes from the data of second Indian National Family Health Survey[5] (NFHS-2), a large-scale survey

in the state of Andhra Pradesh, carried out during 1998–99, along with other states of the country. The data collected includes the basic demographic and socioeconomic characteristics of each household as well as detailed reproductive history of ever-married women. In Andhra Pradesh, data were collected between 15 March 1999 and 23 June 1999, from a total of 3,872 households and 4,032 ever-married women aged 15–49 years. Out of 4,032 ever-married women interviewed, 3,695 were currently married. The household response rate was 99 percent and eligible women's response rate was 98 percent. The details of the study design as well as sampling frame and sample implementation are provided in the state NFHS report (IIPS and ORC Macro, 2000a). The NFHS-2 data provides information on caste/tribe and most of the women belonged to one of the four castes, namely, Scheduled caste (SC), Scheduled tribe (ST), Other backward class (OBC), and those who are neither SC nor ST nor OBC and are designated as 'others'. From this information, three categories of caste groups[6] are considered for the multivariate analysis. They are: Scheduled castes and tribes, other backward class and 'other' caste. Out of 3695 currently married women, 726 are SC and 177 are ST (thus, 903 belong to SC/ST), 1,628 belong to OBC, and 1,156 are OCs. The number of missing information on caste was quite small (out of 3,695 only 8). Therefore, these observations were not included in the analysis.

3.2. Methods of analysis

In order to estimate the magnitude of net differentials after controlling or adjusting for the effects of other socioeconomic characteristics, different multivariate analyses bave been carried out. First, the net effect of caste on cumulative fertility is estimated using the technique of multiple classification analysis (Andrews *et al.*, 1973), where the mean number of children ever born (cumulative fertility) is the dependent variable. In addition to the caste variable the following other socioeconomic variables were used as independent variables to test the characteristics hypothesis. They are the religion (Hindu, Muslim, or Christian), education (illiterate, literate but less than middle school, middle school and above), standard of living Index (low, medium, or high, as measured by the NFHS-2, IIPS and ORC Macro, 2000a: 27–29), work status of woman (working or non-working), place of residence (rural or urban), and region of residence[7] (Coastal Andhra, Telengana or Rayalaseema). The analysis has been restricted to currently married women and carried out in two stages. Wherein at first stage, only socioeconomic variables have been included and at the second stage besides socioeconomic variables, years of marital duration has been introduced as a covariate, since,

it plays a pivotal role in influencing the level of fertility. This is followed by analysis of birth intervals across the caste groups.

In order to gain further insight into the differentials of fertility, birth spacing patterns are explored using life table analysis (Srinivasan, 1980; Rodriguez and Hobcraft, 1980) by combining the both open and closed intervals beginning during 1975–94 period[8]. The analysis has been restricted to currently married women and for the second, third, and fourth birth intervals[9]. Since, construction of life tables for the caste groups controlling for other variables becomes difficult, because the number of births in various sub-classes becomes small. Therefore, the proportional hazards model, which combines the features of life table and regression (Cox, 1972) has been adopted to estimate the net effect of the caste factor on the risk of the next birth, controlling for the effects of other variables. Apart from the above socioeconomic variables used in MCA on cumulative fertility, the following demographic variables are used as controls: age of the woman at the birth of the previous child (>20, 20–24, 25+ years), sex (male, female), and survival status of the previous child (survived >1 year, died as infant), and period or time period[10] (intervals beginning during 1975–79, 1980–84, 1985–89, and 1990–94). Intervals of width 0, caused due to twin births are dropped from the analysis.

Finally, the interaction effects of caste and socioeconomic factors on fertility were assessed using multiple classification analysis. As the emphasis is on caste factor, findings are discussed in detail on the net effect of caste factor on dependent variables. The other explanatory variables have been used only to substantiate the findings or to develop the model, and are not discussed in detail. Results are presented in three sections: the first section contains results of analysis on cumulative marital fertility, followed by analysis of birth intervals and finally in the third section, results from analysis of interaction effects on caste and fertility are presented.

4. RESULTS

4.1. Analysis on Cumulative Fertility: Net Effects of Caste on Children Ever Born

As discussed earlier, fertility differentials by caste could plausibly be due to differences in socioeconomic factors (the characteristics hypothesis). Therefore, to ascertain whether any observed fertility

differentials among the caste groups are caused by variations in characteristics *or* are the effects of caste *per se*, an analysis on cumulative marital fertility (children ever born) was carried out. Table 2 provides the unadjusted and adjusted relationship between caste and fertility along with other socioeconomic variables and covariate. The results of multiple classification analysis show that the unadjusted deviations by caste were large, the SC/STs showing fertility above the average (2.71) by 0.19 and the 'other' caste women below the average by 0.15. Results from Model 1 reveals that even after controlling for socioeconomic variables, the pattern of differentials in children ever born persisted, though the gap narrowed down. The adjusted mean number of children ever born for SC/STs continued to be above average and for OC and OBCs were below the average.

In Model 2, marital duration is used as the covariate[11] along with the socioeconomic variables used in Model 1. The results of Model 2 do not differ much from Model 1. In Model 2 also the SC/ST women had higher fertility than the average and the OC–OBC difference was much smaller in comparison to that of OC–SC/ST difference, even after adjustment. In other words, the unadjusted difference in mean children ever born between SC/ST and OC was 0.34 and the difference between OBC and OC was 0.16. When the effects of other factors and covariate are controlled (Model 2), the difference in adjusted mean children ever born between SC/ST and OC was 0.38 and the difference between OBC and OC was 0.16, that is, the difference between adjusted means was close to that in unadjusted means. This indicates that the observed (unadjusted) differences were not explained by the other socioeconomic factors used in the analysis. Thus, the characteristics hypothesis does not gain support as far as SC/ST–OC differentials are concerned, that is, higher than average fertility among scheduled castes/tribes was not explained by their relatively poorer socio-economic conditions. Among the other variables, religion, standard of living (both in Model 1 and Model 2, at different levels), education and region (Model 1 and Model 2, respectively) have shown significant effects on children ever born. Residence and work status did not show any significant effect on fertility.

Table 2
UNADJUSTED AND ADJUSTED MEAN NUMBER OF CHILDREN EVER BORN BY CASTE/TRIBE AND SOCIOECONOMIC VARIABLES, NFHS-2, 1998–99, ANDHRA PRADESH, INDIA

Variable/ Category	No. of cases (n)	Unadjusted MCEB	eta	Model 1 Adjusted MCEB	Model 1 beta	Model 2 Adjusted MCEB	Model 2 beta
Caste/tribe			0.067		0.047*		0.074***
Scheduled caste/tribe	899	2.90		2.86		2.93	
Other backward class	1622	2.72		2.69		2.71	
Other caste	1149	2.56		2.63		2.55	
Religion			0.093		0.107***		0.118***
Hindu	3214	2.67		2.67		2.67	
Muslim	247	3.36		3.46		3.52	
Christian	209	2.63		2.57		2.49	
Education			0.235		0.252***		0.22
Illiterate	2296	3.03		3.05		2.74	
Literate, <middle	771	2.42		2.42		2.64	
Middle and above	603	1.89		1.81		2.72	
Work status			0.101		0.028		0.008
Non-working	1569	2.49		2.65		2.73	
Working	2101	2.88		2.76		2.70	
Standard of living			0.072		0.058*		0.062***
Low	1300	2.84		2.60		2.80	
Medium	1731	2.71		2.72		2.74	
High	639	2.45		2.92		2.47	
Residence			0.043		0.015		0.018
Rural	2753	2.76		2.70		2.73	
Urban	917	2.58		2.76		2.66	
Regions			0.080		0.049		0.082***
Coastal Andhra	1598	2.55		2.62		2.54	
Rayalaseema	661	2.77		2.71		2.81	
Telengana	1412	2.87		2.82		2.86	
Grand mean				2.71		2.71	
Number of cases				3670		3670	
Multiple R				0.272		0.661	
Multiple R^2				0.074		0.437	

Notes: MCEB is the predicted mean number of children ever born based on the model.
For currently married women of age 15–49 only
Model 1: Adjusted for independents (for socioeconomic variables)
Model 2: Model 1 + Covariate (marital duration)
Level of significance: ***p≤0.001; **p≤0.01; *p≤0.05

In sum, the results of both Model 1 and 2 presented in Table 2 show that the SC/ST fertility was above the average and the differentials in cumulative fertility by caste persisted even after controlling for other socioeconomic variables and covariates. Clearly, the characteristics hypothesis (controlling the socioeconomic variables) alone does not explain differentials in cumulative marital fertility among caste groups in Andhra Pradesh. Besides the socioeconomic variables, specific factors such as, child mortality appears to be crucial in causing fertility differentials among the caste groups[12]. Since child mortality influences fertility desires and behavior, that is, high infant mortality induces to have more children in order to ensure survival of at least a few in to adulthood. Particularly, as the fertility level approaches replacement level fertility, the role of child mortality becomes increasingly important. Hence, it is desirable to include child mortality as an independent variable along with the socioeconomic variables in the analysis of cumulative marital fertility. However, this was not possible to include child mortality as an explanatory variable in the multiple classification analysis of children ever born because children ever born and child loss have a reciprocal effect (Alagarajan and Kulkarni, 1998). Therefore, this was recognized as a limitation and child loss was included in the following section on analysis of birth intervals, where this limitation did not arise.

4.2. Analysis of Birth Intervals

In the previous sections, total fertility rate and cumulative fertility (children ever born) were used to examine the fertility changes and differentials among caste groups. Though the total fertility rate is a very useful indicator for monitoring the fertility change and to examine the differentials, this measure is not free from limitations. For example, the total fertility rates estimated from the NFHS-1 & 2 data referred to a reference period of three years prior to the date of survey and that might be affected by backward displacement of births, leading to overestimation of past fertility and underestimation of recent fertility. Moreover, it did not reveal whether the decline was due to change in the timing of start of reproduction, in the spacing of births and/or in the proportion of women reaching higher parities (Ni Bhrolchain, 1985; United Nations, 1997; Bongaarts and Feeney, 1998). Further, the timing of births or birth spacing may also be inversely related to completed or cumulative fertility. In these situations, examination of the family building patterns in determining the decline in fertility is more appropriate for a meaningful analysis. Family building process can be viewed as a series of stages through which women successively move, from marriage to first birth, first to second birth and so on, until they reach their completed

family size (Rodriguez and Hobcraft, 1980: 8). Such stages can be better judged by parity progression ratios and birth intervals, where the former indicate the proportion of women who move from one stage to another and the latter indicate the timing of births. Therefore, in this section, birth interval analysis was carried out to examine whether the family building process varies across the caste groups and also to examine the magnitude of the caste effect on the risk of the next birth net of the effects of other factors.

4.2.1. Gross Differentials of Birth Intervals

Table 3 provides information on two summary measures, median birth interval i.e., the date by which half of the women had the next birth (indicating the tempo of fertility); and the proportion who had the next birth within 60 months/5 years (indicating the parity transition or quantum aspect of fertility) for the second, third and the fourth birth intervals among caste groups for the period beginning during 1975–94. The results from the life table analysis of birth intervals shows that the Andhra Pradesh women took on an average 30 months for going from first to the second birth, 35 months from second to third birth and 46 months from third to fourth birth. Among caste groups, the second median birth interval did not show much variation. The median third and fourth birth intervals among SC/ST and OBC's were shorter than that of OCs (Table 3). This indicates a tendency of OC women to space their higher order births and not to achieve higher parity.

The tendency to go for a second birth was almost universal in the state and only after the second birth that the proportion having the next birth declined (i.e., 87 percent had a second child, 69 percent had a third birth and 56 percent had a fourth birth within 60 months). There was no difference in the transition probabilities at second birth within 60 months between the caste groups. This highlights the fact that most of the women in Andhra Pradesh, regardless of their caste, tended to go for the second birth. The difference in the timing of births between SC/ST and OC women was more noticeable at third and fourth births. However, there was not much difference in the transition probabilities between OBC and SC/STs at third birth. A large proportion of SC/ST (76 percent) and OBC (74 percent) women had their *third birth* within 60 months of the *second birth* compared to 57 percent of OC women. About two-thirds of SC/ST women (62 percent) had *fourth birth* within five years of the third compared to nearly half (49 percent) of OC women (Table 3).

Table 3
MEDIAN BIRTH INTERVALS AND PROPORTION HAVING SUBSEQUENT BIRTH WITHIN 60 MONTHS BY CASTE/TRIBE, 1975–94, NFHS-2, 1998–99, ANDHRA PRADESH, INDIA

Caste/tribe	Birth interval/Median (in months)			Proportion had next birth within 60 months		
	Second	Third	Fourth	Second	Third	Fourth
Scheduled caste/tribe	30.11	32.83	39.00	0.8617	0.7656	0.6223
Other backward class	30.50	34.19	47.00	0.8621	0.7429	0.5572
Other caste	28.93	41.50	62.43	0.8738	0.5707	0.4975
All	29.87	35.23	46.04	0.8656	0.6939	0.5581

Note: For currently married women of age 15–49 only. Before 1975 and after 1995 are not considered due to truncation bias.

4.2.2. Net Effects of Caste on Birth Intervals

The foregoing analysis i.e., life table approach on birth intervals assessed only the differentials among caste groups, without controlling for other variables. It is possible that the differentials by caste observed in the preceding analysis of birth intervals may, in part, be attributable to the fact that socioeconomic characteristics also vary by caste. Therefore, to estimate the caste effect net of other important socioeconomic and demographic variables and to analyze the moving and stopping behavior of women, the Cox's regression or proportional hazard model was adopted. The analysis was carried out among currently married women and for second, third and the fourth birth intervals beginning during 1975–94 period. The Cox regression estimates (beta values) for the effects of caste factor along with different categories of other variables on the risk of second, third and fourth births are shown in Table 4; exp (beta) gives the risk of the next birth for the category relative to the risk for the reference category.

The results of the Cox regression show that the caste effect was not significant for the second birth interval, that is, for the risk of the second birth, when other socioeconomic and demographic variables were controlled. Thus, caste as such did not seem to be an important determinant of the risk of having the second birth. However, there was a significant effect of caste factor on the chances of having the third and fourth births. For example, controlling for the other socioeconomic and demographic variables, the relative risks for the third birth was significantly higher for SC/ST and OBCs (Risk ratio [RR] = 1.50 and 1.37, respectively) than the OC women. The scheduled castes/tribes women had relatively greater chance (RR = 1.44) of having a birth after the third than OC women. The results for period variable show that there was a

declining period trend in the hazard rates for having third and fourth births between the time periods 1980–84 to 1985–89 (as compared to 1990–94). The risk of having third and fourth births were lowest during the period 1990–94 and the risk was highest during 1975–79 to 1980–84 periods. This clearly indicates that there has been a declining period trend of risks and the risk of having a third or fourth birth started to decline from 1975 and continued to the date of the survey, which is a further evidence of fertility decline in the state. Among the other variables included in the model, the age of the women at previous birth and survival status of the previous child had significant effect in all the three birth intervals. Residence and work status did not show any significant effects on the risk of subsequent births.

Table 4
ESTIMATED REGRESSION COEFFICIENTS AND RELATIVE RISKS FROM COX PROPORTIONAL HAZARDS MODEL, 1975–94, ANDHRA PRADESH, NFHS-2, 1998–99, INDIA

Birth interval/ Variable and Category	Values of β coefficients			Values of relative risk ratios		
	Second	Third	Fourth	Second	Third	Fourth
Caste[a]						
Other backward class	-0.0307	0.3155	0.1066	0.9698	1.3709***	1.1125
Scheduled caste/tribe	-0.0093	0.4079	0.3677	0.9908	1.5037***	1.4444**
Religion[b]						
Muslim	0.1840	0.5131	0.8604	1.2020@	1.6705***	2.3642***
Christian	0.0579	-0.1297	0.0104	1.0596	0.8784	1.0105
Education[c]						
Literate.<middle school	0.0963	-0.1650	-0.1980	1.1011@	0.8479*	0.8204
Middle and above	0.0326	-0.3698	-0.1582	1.0331	0.6909**	0.8537
Work status[d]						
Working	-0.0211	0.0828	0.0212	0.9791	1.0863	0.9790
Standard of living[e]						
Medium	0.1180	0.0597	-0.2106	1.1252*	0.9420	0.8101**
High	0.2217	-0.1064	-0.3619	1.2482**	0.8990	0.6963**
Age of the women at previous birth[f]						
Below 20	0.2443	0.2212	0.1586	1.2767***	1.2475***	1.1718@
25+	-0.5415	-0.3301	-0.1528	0.5819***	0.7189**	0.8583@

Continued

Continued Table 4

Birth interval/ Variable and Category	Values of β coefficients			Values of relative risk ratios		
	Second	Third	Fourth	Second	Third	Fourth
Sex of the previous child[c]						
Female	0.0531	0.0923	0.2703	1.0545	1.0967@	1.3103***
Survival status of the Previous child[h]						
Died as infant	0.4127	0.4759	0.5239	1.5110***	1.6094***	1.6885***
Time period[i]						
1975–79	0.0012	0.5452	0.9777	1.0012	1.7249***	2.6583***
1980–84	0.1038	0.3970	0.6051	1.1094	1.4873***	1.8315***
1985–89	0.0206	0.4011	0.4821	1.0208	1.4935***	1.6195***
Residence[j]						
Urban	-0.0432	0.1202	-0.0149	0.9578	1.1277@	0.9852
Regions[k]						
Rayalaseema	0.0748	0.1529	0.4801	1.0776	1.1652@	1.6162***
Telengana	0.0306	0.3380	0.5312	1.0311	1.4021***	1.7009***
Total no. of cases	2238	1973	1393			
No. of events	2092	1454	819			
No. of censored cases	146	519	574			
–2 Log Likelihood	28738.50	20162.16	10977.59			
Chi-square	116.438	319.237	259.51			
Degrees of freedom	19	19	19			

Note: *See* Table 3.
Reference categories: (a). Other caste, (b). Hindu, (c). Illiterate, (d). Non-working, (e). Low household standard of living, (f). 20–24 years, (g). Male, (h). Survived, >1 year, (i). Intervals beginning during 1990–94, (j). Rural, (k). Coastal Andhra
Level of significance: ***p≤0.001; **p≤0.01; *p≤0.05; @≤0.1

In the preceding analyses, the effect of caste on cumulative fertility (children ever born) and birth intervals were examined after controlling the effects of other socioeconomic and demographic factors. It was found that differentials in cumulative fertility (children ever born) and birth intervals among the caste groups persisted even after controlling socioeconomic and demographic factors. Fertility among SC/STs was higher than that of OBC and 'other' caste women. The OC–OBC differences were small but the OC–SC/ST differences were large. Further, the life table analysis of spacing between births based on the fertility histories of women reveals that the SC/ST women showed considerably shorter birth intervals after the second than the OBC and other caste groups, clearly showing a greater tendency of SC/ST women to have higher order births early. Probabilities of progressions to third and fourth birth were also higher for SC/STs than for OBC and OC. The proportional hazard analysis also clearly show that differentials by caste persisted even after controlling for the other socioeconomic and demographic

variables for third and fourth birth intervals. The SC/ST and OBCs had higher propensity to progress to third and fourth births than OCs. Moreover, the differentials among caste groups were seen at various stages of the family building process (age at marriage and age at first birth), and family size desires and fertility regulation (Ramesh, 2002). Thus, the characteristics hypothesis does not seem to explain the fertility differentials among the caste groups in Andhra Pradesh. This calls for an examination of other hypothesis – *interaction hypothesis.* It is hypothesized here that the higher the socioeconomic status, the lower the fertility and the narrower the difference in fertility between scheduled caste/tribes (SC/ST) and 'other' caste (OC). The lower the socioeconomic status, the higher the fertility and the greater the difference in fertility between scheduled castes/tribes (SC/ST) and 'other' caste (OC).

4.3. Analysis of Interaction Effects

Though caste differences were seen in cumulative fertility and in timing of births, after controlling for the socioeconomic and demographic factors, this did not necessarily mean that there was a constant caste effect and the differentials persisted at each level of socioeconomic characteristics. It has been generally observed that fertility differentials emerge during the early phase of transition, since some sections of society begin to control fertility but become narrow during the late phase of transition as the fertility of various sections converges to a low level. For example, previous research on "religion and fertility" has observed the existence of interactions among religious groups and that the religious differences may not remain constant at various levels of socioeconomic factors. Convergence in differentials was noted with a rise in socioeconomic conditions. In Bangladesh, Chaudhury (1984) observed that fertility of Muslim women was higher than that of Hindu women at low level of education. However, at higher level of education, the order reversed, that is, fertility of Hindus was higher than that of Muslims. In India also, Iyer (2002) and Alagarajan (2003) have shown this to hold true in Karnataka and in Kerala, respectively. They argue that religion *per se* has no effect on fertility but the religious difference in fertility can be explained through the difference in socioeconomic factors and their differential (interaction) effects on the religious communities. In the case of Andhra Pradesh, which is experiencing a transition to replacement level fertility, it would be of interest to see if this is be the case among the caste groups. Therefore, the interaction effects of caste and socioeconomic variables were examined on cumulative fertility[13] (children ever born). For this purpose, the following reformulated explanatory variables representing combinations of

caste with other socioeconomic variables (education, level of standard of living, and residence) were used. They are:

Caste x Education (Categorized into 3 X 3 = 9) as: SC/ST–Illiterate, OBC–Illiterate, OC–Illiterate; SC/ST–Literate, <middle school, OBC–Literate, <middle school, OC–Literate, <middle school; SC/ST–Middle school or above, OBC–Middle school or above, OC–Middle school or above level of education

Caste x Standard of living (SOL) Index (Categorized in to 3 X 3 = 9) as: SC/ST–Low level of SOL, OBC–Low level of SOL, OC–Low level of SOL; SC/ST–Middle level of SOL, OBC–Middle level of SOL, OC–Middle level of SOL; SC/ST–High level of SOL, OBC–High level of SOL, OC–High level of SOL

Caste x Residence (Categorized into 3 X 2 = 6) as: SC/ST–Rural, OBC–Rural, OC– Rural; SC/ST–Urban, OBC–Urban, OC–Urban

4.3.1. Caste and Fertility by Socioeconomic Status

In order to assess the interaction effect and to see if any interaction terms are significant between caste and socioeconomic variables on cumulative fertility, first, analysis of variance (ANOVA) was carried out in two stages. The results of ANOVA showed that education, standard of living, residence, and regions had significant influence among the main effects but none of the two-way interactions involving caste had a significant effect on children ever born (table not shown). Further, when the marital duration introduced along with socioeconomic variables, caste, standard of living, and regions showed significant influence and among the two-way interactions, 'caste and residence' interaction is highly significant but none of the other two-way interactions involving caste had a significant effect on children ever born (Table 5).

The analysis of variance framework using sums of squares gives only whether an interaction effect is significant or not. In spite of this, to see the *direction* and *quantum of interaction effect,* it is desirable to estimate the effects for various combinations of categorized explanatory variables and to compare the effects of one variable at different levels of another. Therefore, the effect of these new interaction variables ('caste and education', 'caste and level of standard of living (Index)', and 'caste and residence') on cumulative fertility was assessed using multiple classification analysis. Since, caste and

socioeconomic variables are categorized, only one interaction is examined at a time[14]. Thus, three sets of analyses (caste and education interaction, caste and standard of living interaction, caste and residence interaction) were performed separately in two stages (Model 1: socioeconomic variables; Model 2: socioeconomic variables + marital duration as a covariate) and presented in Tables 6–8.

Table 5
ANALYSIS OF VARIANCE FOR CHILDREN EVER BORN

Source of variation	Sum of squares	df	Mean square	F	Significance of F
Covariate: Marital duration	5240.00	1	5240.00	2613.93	0.000
Main effects	232.56	10	23.26	11.60	0.000
Caste	20.67	2	10.33	5.16	0.006
Education	6.84	2	3.42	1.71	0.182
Work status	4.67	1	4.67	2.33	0.127
Standard of living (SOL)	38.21	2	19.10	9.53	0.000
Residence	0.05	1	0.05	0.02	0.877
Region	129.43	2	64.71	32.28	0.000
Two-way interactions	137.65	41	3.36	1.68	0.005
Caste x Education	5.26	4	1.32	0.66	0.622
Caste x Work status	3.68	2	1.84	0.92	0.399
Caste x Standard of living Index	15.51	4	3.88	1.94	0.102
Caste x Residence	19.33	2	9.67	4.82	0.008
Caste x Regions	10.13	4	2.53	1.26	0.282
Education x Work status	2.63	2	1.31	0.66	0.520
Education x SOL	10.96	4	2.74	1.37	0.243
Education x Residence	8.00	2	4.00	1.99	0.136
Education x Region	10.86	4	2.72	1.35	0.248
Work status x SOL	0.44	2	0.22	0.11	0.896
Work status x Residence	5.94	1	5.94	2.96	0.085
Work status x Regions	10.63	2	5.32	2.65	0.071
SOL x Residence	1.16	2	0.58	0.29	0.750
SOL x Regions	3.14	4	0.79	0.39	0.815
Residence x Regions	11.40	2	5.70	2.84	0.058
Explained	5610.21	52	107.89	53.819	0.000
Residual	7252.90	3618	2.01		
Total	12863.10	3670	3.51		

Note: For currently married women of age 15–49 only.
Adjusted for socioeconomic variables plus marital duration (covariate)

4.3.2. Caste and Fertility by Level of Education

Table 6 provides the unadjusted and adjusted relationship between the caste and fertility (children ever born) within different levels of education. The results of MCA show that even after controlling for other socioeconomic variables, a smaller difference (3.21 – 2.97 = 0.24) was found between SC/STs and OCs among illiterate women and negligible between OBCs and OCs. However, a reverse pattern was observed among literate women. It was found that SC/STs had 0.18 and 0.20 fewer children than OCs among women with less than middle school, and middle school or above levels of education, respectively (Model 1).

Once, when the adjustment was made for the effect of other socioeconomic variables and the covariate (Model 2), it was found that SC/STs had 0.22 (2.92 – 2.70) more children than OCs at the lower level of education (illiterate) and this difference was reduced to 0.15 (2.71 – 2.56) children at the less than middle school level of education. At the middle school or above levels of education, there was virtually no difference in fertility between the caste groups. The OBC–OC difference was quite small at each level of education. Thus, the difference in fertility was wider at lower levels of education and the gap narrowed and converged at higher level of education. The findings of higher fertility for SC/ST than for OCs at lower levels of education and lower fertility for SC/ST than OCs, or the convergence in OC–SC/ST fertility at higher levels of education, points out that, with the improvement in educational levels, SC/STs will have as few children as OCs. These findings are in accordance with the hypothesized relationship between caste–education and fertility. Thus, the results showed the existence of interaction effect between caste and education. However, the analysis of variance (Table 5) showed this effect was insignificant.

Table 6
UNADJUSTED AND ADJUSTED MEAN NUMBER OF CHILDREN EVER BORN (MCEB) BY CASTE GROUPS: WITHIN DIFFERENT LEVELS OF EDUCATION, NFHS-2, ANDHRA PRADESH, 1998–99, INDIA

Variable + Category	n	Unadjusted MCEB	eta	*Model 1* Adjusted MCEB	*Model 1* beta	*Model 2* Adjusted MCEB	*Model 2* beta
Education x Caste			0.241		0.269***		0.057*
Illiterate							
Scheduled caste/tribe	698	3.14		3.21		2.92	
Other backward class	1112	3.00		3.02		2.69	
Other caste	486	2.94		2.97		2.70	
Literate, <middles school							
Scheduled caste/tribe	140	2.29		2.36		2.71	
Other backward class	308	2.31		2.31		2.64	
Other caste	323	2.57		2.54		2.56	
Middle school or above							
Scheduled caste/tribe	62	1.55		1.64		2.66	
Other backward class	202	1.81		1.68		2.64	
Other caste	341	2.00		1.84		2.63	
Grand mean				2.71		2.71	
Number of cases				3671		3671	
Multiple R				0.257		0.652	
Multiple R^2				0.066		0.426	

Notes: For currently married women of age 15–49 only.
Model 1: Adjusted for the effects of the following other socioeconomic independents: work status, standard of living, residence, and regions.
Model 2: Model 1 + Marital duration (covariate)
Level of significance: ***p≤0.001; **p≤0.01; *p≤0.05

4.3.3. Caste and Fertility by Level of Standard of Living

The results of interaction effect of caste and standard of living on cumulative fertility (Table 7) show that the unadjusted mean children ever born (CEB) was higher for SC/STs than the grand mean at lower and middle levels of standard of living. When adjustment was made for the effect of other socioeconomic variables, it may be observed that CEB tended to decline with the increase in the standard of living among SC/STs and this pattern was reversed for OBC and OCs. The difference in CEB between SC/ST and OCs was greater at the lower levels of standard of living, and this almost

converged at the middle level of standard of living. At the lower levels of standard of living, SC/STs have 0.25 more children than OCs and this difference was reduced to a negligible level to only 0.02 children at the middle level of standard of living. The picture was reversed completely at the higher level of standard of living and it was found that SC/STs have 0.37 fewer children than OCs (Model 1).

Once, when the adjustment was made for the effect of other socioeconomic variables and covariate (Model 2), fertility (children ever born) decreased as the level of standard of living increased among all the caste groups. Further, the difference in mean children ever born between SC/ST and OCs was negligible (2.95 – 2.87 = 0.08) at the lower level of standard of living and this difference increased to 0.23 (2.90 – 2.67) children at the middle level of standard of living. At the higher level of standard of living, the SC/ST–OC difference narrowed to 0.13 (2.49 – 2.36), showing some interaction. The OC–OBC difference was quite small at each level of standard of living. The pattern is not clear as in the 'caste x education' interaction and, the analysis of variance also did not show significant interaction effect between 'caste and standard of living' (Table 5).

Table 7
UNADJUSTED AND ADJUSTED MEAN NUMBER OF CHILDREN EVER BORN (MCEB) BY CASTE GROUPS: WITHIN DIFFERENT LEVELS OF STANDARD OF LIVING (INDEX), NFHS-2, ANDHRA PRADESH, 1998–99, INDIA

Variable and category	N	Unadjusted MCEB	eta	Model 1 Adjusted MCEB	Model 1 beta	Model 2 Adjusted MCEB	Model 2 beta
Standard of living x Caste			0.086		0.065		0.094***
Low standard of living							
Scheduled caste/tribe	543	2.97		2.76		2.95	
Other backward class	574	2.79		2.55		2.76	
Other caste	184	2.63		2.51		2.87	
Medium standard of living							
Scheduled caste/tribe	331	2.81		2.76		2.90	
Other backward class	835	2.74		2.67		2.69	
Other caste	567	2.61		2.74		2.67	

Continued

Continued Table 7

Variable and category	n	Unadjusted MCEB	eta	Model 1 Adjusted MCEB	beta	Model 2 Adjusted MCEB	beta
High standard of living							
Scheduled caste/tribe	26	2.33		2.59		2.49	
Other backward class	212	2.48		2.80		2.47	
Other caste	400	2.45		2.96		2.36	
Grand mean				2.71		2.71	
Number of cases				3671		3671	
Multiple R				0.256		0.652	
Multiple R^2				0.065		0.426	

Notes: For currently married women of age 15–49 only.
Model 1: Adjusted for the effects of the following other socioeconomic independents: education, work status, residence, and regions.
Model 2: Model 1 + Marital duration (covariate)
Level of significance: ***p≤0.001; **p≤0.01; *p≤0.05

4.3.4. Caste and Fertility by Residence

The results of interaction effects of caste and residence on cumulative fertility reveal that the effect of rural-urban residence on fertility being negative for SC/ST and positive for OC, that is, in urban areas SC/ST fertility was lower but for OC fertility was higher. The adjusted mean children ever born for SC/STs was higher than the average in both rural and urban areas but in urban areas, SC/STs had fewer children (0.26) than OCs (Model 1). When the adjustment was made for the effect of other independent variables and covariate, SC/STs had 0.32 more children than OCs in rural areas. But, this picture was reversed completely in urban areas and the SC/STs had fewer children (0.13) than OCs (Model 2). The results clearly show the existence of interaction effect for caste and residence. The difference was wider in rural areas and the gap narrowed and converged in urban areas. Thus, there is a strong caste and residence interaction effect. This is confirmed by the analysis of variance, which shows this interaction effect to be highly significant (Table 8).

The pattern of relationship between the caste and fertility within different regions of the State (caste and regions) is not as clear as in other interactions (Ramesh, 2002). Thus, the effect of caste did not differ across regions and hence no 'caste and region' interaction was seen in fertility. Over all, it was only the 'caste and residence' and 'caste and education' interaction that appears to show some effect. In sum, the results show that in rural areas

and at the lower levels of socioeconomic status (education and standard of living), fertility was relatively high and SC/STs had higher fertility than OCs. But this situation was reversed completely in urban areas and at the higher levels of education and standard of living, where the level of fertility was low and SC/STs also had lower fertility than OCs. Thus, this indicates that in Andhra Pradesh, the caste effect on fertility was not constant across various levels of other socioeconomic factors.

Table 8
UNADJUSTED AND ADJUSTED MEAN NUMBER OF CHILDREN EVER BORN (MCEB) BY CASTE GROUPS AND RURAL-URBAN RESIDENCE, NFHS-2, ANDHRA PRADESH, 1998–99, INDIA

Variable and category	n	Unadjusted MCEB	eta	Model 1 Adjusted MCEB	Model 1 beta	Model 2 Adjusted MCEB	Model 2 beta
Residence x Caste			0.090		0.065***		0.064***
Rural							
Scheduled caste/tribe	786	2.93		2.80		2.88	
Other backward class	1233	2.80		2.65		2.71	
Other caste	735	2.50		2.60		2.56	
Urban							
Scheduled caste/tribe	114	2.64		2.74		2.70	
Other backward class	388	2.47		2.65		2.55	
Other caste	415	2.65		3.00		2.83	
Grand mean				2.71		2.71	
Number of cases				3671		3671	
Multiple R				0.258		0.654	
Multiple R^2				0.067		0.428	

Notes: Model 1: Adjusted for the effects of the following other socioeconomic independents: education, work status, standard of living and regions
Model 2: Model 1 + Marital duration (covariate)
Level of significance: ***p≤0.001; **p≤0.01; *p≤0.05

5. SUMMARY AND CONCLUSIONS

The South Indian State of Andhra Pradesh defies the conventional wisdom that socioeconomic development is necessary for rapid fertility decline. Despite the slow progress in socioeconomic development, the state has experienced fertility transition after Kerala and Tamil Nadu. A few

researchers have studied the Andhra Pradesh's scene in order to identify the causes of the fertility transition (Balasubramanian, 1999; James, 1999; Ramachandran *et al.*, 2000; James and Subramanian, 2003 among others). The explanations given that are: the family planning program in the state was well-organized and a much wider reach of mass media than in the rest of the country facilitated a speedier diffusion of innovative behavior; and high aspirations, caused probably by mass media and social reforms, contributed to demand for a higher quality of children leading to quality-quantity trade off.

Though the average level of fertility of the state of Andhra Pradesh is low, notable fertility differentials persist between the caste groups and the scheduled castes/tribes have exhibited higher fertility than others. This paper has examined the fertility differentials among caste groups in the context of characteristics and interaction hypotheses. Results of multiple classification analysis on cumulative marital fertility (children ever born) showed that differentials by caste persist even after controlling for the socioeconomic and demographic variables. The life table analysis on birth intervals showed that the scheduled caste and tribe women showed considerably shorter birth intervals after the second and higher probabilities of parity progression to the next birth. The hazard model also showed that the adjusted risk of birth was significantly higher for SC/STs as compared to other caste groups. Thus, the characteristics hypothesis, that is, socioeconomic differences contributing to fertility differences has been negated in this study.

Results from analysis of interaction effects showed a strong interaction between 'caste and residence' on the cumulative fertility. The interaction effects of 'caste and residence' on cumulative fertility reveal that the SC/STs fertility is lower in urban areas than in rural areas but for OCs fertility is higher in urban areas. In other words, the difference is wider in rural areas and the gap narrows and converges in urban areas. For caste and education, the interaction effect is mild, that is, there exist the SC/ST–OC difference at primary level of schooling and narrows at middle school and above levels of education. Thus, the analysis of interaction effects showed that the caste effect is not constant across the levels of other socioeconomic factors. The caste differentials are notable at lower level of socioeconomic status but at higher levels of socioeconomic status, the differentials are narrow. This indicates that there is no fixed caste effect and the fertility behavior of couples belonging to a caste is influenced by various factors. From these findings, one may tend to conclude that with the improvement of socioeconomic status, not only will fertility decline, but also the difference in fertility between caste groups will disappear. Overall, the results reflect the influence of "opportunity costs" than the "cultural" factors.

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Notes

1. Scheduled castes (SC) and scheduled tribes (ST) are castes and tribes that the Government of India officially recognizes as socially and economically backward and in need of special protection from injustice and exploitation.

2. It *is well documented in the literature that certain socioeconomic factors, such as education, income, occupation, rural-urban, and residence influence fertility. If such socioeconomic characteristics vary substantially across the caste groups, fertility level could also differ by caste. In that case, the gross fertility differentials among the caste groups could be totally or at least partially be attributed to variations in socioeconomic or demographic characteristics of the caste groups (the Characteristics Hypothesis.*

3. The South Indian region comprises four major states (Andhra Pradesh, Tamil Nadu, Karnataka and Kerala) of India. With a more than 200 million population, crossed replacement level in the mid-1990s and its demographic experience has attracted wide attention both at the national and the international levels. Among states, Kerala, Tamil Nadu, and Andhra Pradesh attained a below replacement fertility in 1988, 1993, and 2002 respectively (Guilmoto and Rajan, 2005).

4. Other backward classes (OBC) are castes and communities that have been designated by the Government of India as socially and educationally backward and in need of protection from social injustice.

5. The NFHS-2 is a demographic and health survey collected as part of the Demographic and Health Survey (DHS) program, which is funded primarily by

the United States Agency for International Development (USAID). The national survey covered a representative stratified random sample of about 95,000 women aged 15–49 years from the 26 states of India (IIPS and ORC Macro, 2000). Subsequent survey, the NFHS-3 carried out in 2005–06, for which data are yet to become available for India and for the state of Andhra Pradesh.

6. Though the religious differences persist among caste groups, the number of women belonging to non-Hindu religions is not sufficiently large (12.4 percent of women belong to non-Hindu religions) for further classification of caste groups by religion. Therefore, for a meaningful analysis, women are classified by caste rather than by religion. However, religion was included as a separate variable in the multivariate analyses. Further, the sample of individual categories of scheduled caste and scheduled tribes are very small for meaningful multivariate analysis. Therefore, both categories are combined.

7. Fertility differentials by caste could, at least in part, be attributable to spatial variation. Therefore, it becomes necessary to control the region effect. The state is distributed into three regions and these three regions differed considerably in terms of both socioeconomic and demographic indicators, with Telengana lagging behind the other two regions (Ramachandran and Ramesh, 2005).

8. Since, intervals beginning during the period prior to 1975 and after 1995 are not large and truncation bias (Trussell *et al.*, 1985) seriously affects these.

9. The NFHS-2 data do not allow an examination of the first birth interval. It was found that in 19 percent of cases, the date of first birth was within seven months of marriage (Ramesh, 2002). The number of fifth and higher order births, are too small for further analysis of differentials.

10. Investigation of period or time period will provide some evidence of the demand for subsequent births over a period of years and also helps to investigate the evidence of recent fertility decline in the state.

11. It may be noted that the inclusion of the covariate 'marital duration' in the second model has dramatically increased the value of multiple R^2 to 44 from 7 in case of the first model. This clearly shows the importance of marital duration incompatibility in explaining the fertility.

12. Child mortality varies among caste groups. The NFHS-2 estimates of infant mortality rate during 1988–98 were: 95 for SC, 104 for ST, 70 for OBC, and 47 for OC compared to the average of 71. Under-five mortality rate were: 122, 116, 90, and 65 for SC, ST, OBC and OC, respectively compared to the average of 91 (IIPS & ORC Macro, 2000a: 120).

13. In the case of birth intervals, the number of women in each category becomes very small for various parities. Therefore, the interaction variables could not be examined.

14. Inclusion of two interaction variables in a single analysis brings in multi-colinearity. For example, if 'caste x education' and 'caste x residence' are included in a single MCA, the matrix becomes singular and hence both cannot be examined in one analysis.

References

Alagarajan, Manoj. 2003. "An Analysis of Fertility Differentials by Religion in Kerala State: A Test of the Interaction Hypothesis". *Population Policy and Research Review*, 22(5–6):557–74.

Alagarajan, Manoj and Kulkarni, P. M. 1998. "Fertility Differentials by Religion in Kerala – A Period Parity Progression Ratio Analysis". *Demography India*, 27(1):213–28.

Andrews, Frank M. James, N. Morgan. John A. Sonquist and Laura Klem. 1973. *Multiple Classification Analysis*. Ann Arbor, Michigan: Institute for Social Science Research, University of Michigan.

Balasubramanian, K. 1999. "Pace of Fertility Decline and Prospects for Population Stabilization in Andhra Pradesh". *Demography India*, 28(1):38–39.

Basu, A.M. 1999. "Fertility decline and increasing gender imbalance in India: Including a possible South Indian turnaround", *Development and Change*, 30(2):237–263

Bongaarts, J. and G. Feeney. 1998. "On the Quantum and Tempo of Fertility". *Population and Development Review*, 24(2): 271–291.

Chaudhury, R.H. 1984. "Hindu-Muslim Differential Fertility: How Much Religious and How Much Socio?". *Social Action*, 34(3):251–273.

Cox, D.R. 1972. "Regression Models and Life Tables". *Journal of the Royal Statistical Society*, 34(2), Series B: 187–220.

Gandotra, M.M. Robert D. Retherford. Arvind Pandey. Norman Y. Luther. and Vinod K. Mishra. 1998. *Fertility in India*. National Family Health Survey Subject Report, 9, IIPS, Mumbai and East West Centre Programme on Population, Honolulu, Hawaii, U.S.A.

Guilmoto, Z, Christophe and Irudaya Rajan, S. 2005. *Fertility Transition in South India*. New Delhi: Sage Publications.

India, Registrar General. 1981. *Levels, Trends and Differential in Fertility, 1979*. New Delhi: Vital Statistics Division, Ministry of Home Affairs

India, Registrar General. 1989. *Fertility Differentials in India, 1984*. New Delhi: Vital Statistics Division, Ministry of Home Affairs.

India, Registrar General. 2004. *Census of India 2001, India, Primary Census Abstract-Total population, Table A-5, Series-1*. New Delhi: Controller of Publications.

India, Registrar General. 2005. *F Series Tables: 2001 Census*. New Delhi: Vital Statistics Division, Ministry of Home Affairs. [Accessed 10 May 2006]. http://www.censusindia.net/results/fseries_tables/data_highlights_F9_F10. pdf

International Institute for Population Sciences (IIPS). 1995. *National Family Health Survey, 1992–93 (MCH and Family Planning): India*. Bombay: International Institute for Population Sciences.

International Institute for Population Sciences (IIPS) and ORC Macro. 2000. *National Family Health Survey (NFHS-2), 1998–99: India*. Mumbai: IIPS.

International Institute for Population Sciences (IIPS) and ORC Macro. 2000a. *National Family Health Survey (NFHS-2), India, 1998–99: Andhra Pradesh*. Mumbai: IIPS.

International Institute for Population Sciences (IIPS) and Macro International. 2006. *National Family Health Survey (NFHS-3), 2005–06*, Fact Sheet, Andhra Pradesh (Provisional Data). Mumbai: IIPS. http://www.nfhsindia.org/factsheet.html [Accessed 19 November 2006].

Iyer, Sriya. 2002. *Demography and Religion in India*. New Delhi: Oxford University Press.

James, K. S. 1999. "Fertility Decline in Andhra Pradesh: A Search for Alternative Hypotheses". *Economic and Political Weekly*, 34 (8): 491–499.

James, K.S. and Subramanian, S.V. 2003. "Towards a Demographic Transition". *Economic and Political Weekly*, 38 (12 & 13):1219–1229.

Kumar, Sanjay. and Sharma, N.K. 2006, "Riddle of Population Growth – Deceleration in Andhra Pradesh during 1991–2001". *Economic and Political Weekly*, 41 (42): 4507–4512.

Maharatna, Arup. 2005. *Demographic Perspectives on India's Tribes*, New Delhi: Oxford University Press.

Ni Bhrolchain, Maire. 1985. "Period Parity Progression Ratios and Birth Intervals in England and Wales, 1941–1971: A Synthetic Life table analysis". *Population Studies*, 41(1):103–125.

Padmadas, Sabu, S. Bohua Li. James Auburn, and Guangzhou Wang. 2005. Birth planning and population prospects in China and India. Paper presented at the IUSSP XXV International Population Conference, Tours, France, July 18–23, 2005.
http://iussp2005.princeton.edu/abstractViewer.aspx?submissionId=50865

Padmadas, Sabu, Inge S. Hutter, and Frans Willekens. 2004. "Compression of Women's Reproductive Spans in Andhra Pradesh, India". *International Family Planning Perspectives*, 30, (1), 12–19.

Pallikadavath, S. and C. Wilson. 2005. "A Paradox within a Paradox: Scheduled Caste Fertility in Kerala". *Economic and Political Weekly*. 40(28): 3085–93.

Population Research Centre (PRC), Andhra University, and International Institute for Population Sciences (IIPS). 1994. *National Family Health Survey (MCH and Family Planning): Andhra Pradesh, 1992*. Bombay: IIPS.

Ramachandran, P., Ramesh, P and Jareena, S. 2000. *South India Fertility Transition – Andhra Pradesh Component*. Tirupati, India: Department of Population Studies, Sri Venkateswara University. (*Mimeo*)
http://www.demographie.net/sifp/Phase1/andhrapradesh%20ph1.zip

Ramesh, P. 2002. *Sex Combination of Children and Reproductive Behaviour: A Study of Scheduled Castes*. Unpublished Ph.D. Thesis. Tirupati, India: Department of Population Studies, Sri Venkateswara University.

Ramachandran, P., and P. Ramesh, 2005. "Fertility Trends and Differentials in Andhra Pradesh", In: *Fertility Transition in South India*. Guilmoto, C.Z and S. Irudaya Rajan *(eds.)*, pp: 114–136, New Delhi: Sage Publications.

Rodriguez, Z. and John Hobcraft. 1980. *Illustrative Analysis: Life Table Analysis of Birth Interval in Colambia*. WFS Scientific Reports Series, 16, Voorburg, Netherlands: International Statistical Institute.

Säävälä, Minna.1999. "Understanding the prevalence of female sterilization in rural South India". *Studies in Family Planning*, 30(4):288–301.

Srinivasan, K. 1980. *Birth Interval Analysis in Fertility Surveys*. WFS, Scientific Reports, No. 7, London: World Fertility Survey.

Trussell, J. Martin, L.G. Feldman, R. Palmore, J.A. Conception, M. and Bakar, D.N.A. 1985. "Determinants of Birth-Interval Length in the Philippines, Malaysia, and Indonesia: A Hazard-Model Analysis". *Demography*, 22:145–168.

United Nations. 1997. *Family-building and Family Planning Evaluation*. New York: Department of Economic and Social Affairs. Population Division, United Nations, 112p.

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