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The Case of Andhra Pradesh in India

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Abstract

Many women in Andhra Pradesh marry early, have two or three children and accept voluntary sterilization at very early ages. The state has recently succeeded in reducing fertility to near replacement levels. Data from the second round of the National Family Health Survey are used to examine the duration between first marriage and sterility by distinguishing different marriage cohorts of the 4,032 ever-married women aged 15-49 years. Life table and hazard models are used to understand the cohort effects on the time spend in the effective reproductive span. The cohort effects remain highly significant when controlling for other demographic, social and reproductive attitude characteristics. Sterilization acceptance among younger women explains the compression trends in reproductive spans. Women's position as mothers is undergoing transition in Andhra Pradesh and they seem to make familial decisions much faster than the older generations did.

$\mathbf{A}$ reproductive health approach envisaged in the 1994 Cairo International Conference on Population and Development (ICPD) introduced a paradigm shift to understand demographic behavior especially at the individual level. The conference proceedings acknowledged the dire need to focus more on the individual reproductive rights, needs and behavior of women and couples rather than targeting on macro level demographic goals[1]. A follow-up meeting, ICPD+5 convened in The Hague during 1999, appraised the key actions of the 1994 conference and reiterated the importance of an individual level approach[2]. The choices and decisions on the number, timing, spacing and limiting of births are made at the individual level within the reproductive career by a woman or a couple. A significant issue that arises in this context is the time at which a woman enters reproduction or sexual relationship, the duration of exposure in reproduction and the time at which she stops reproduction, either voluntarily or involuntarily. In other words, the entry into and exit from reproduction assume crucial importance in understanding not only the fertility levels of a society but also a woman's reproductive planning, her choices to allocate the time for childbearing and her decisions to limit reproduction. This paper analyses the time that women spend in their reproductive spans, the changes over time and the associated factors that determine the length of the reproductive spans.

A woman's reproductive life is constituted by a sequence of events, which commences with the onset of menarche and ends up with the onset of sterility or menopause. Biologically, a woman is exposed to the risk of reproduction with the onset of menarche and she stays on average between 30 and 35 years in her reproductive career before reaching menopause[3]. In the prime reproductive years, adolescent sterility may occur, mostly between the ages 13 and 18, because of irregular menstrual cycles. Fecundity is usually much lower during the stages of adolescent sterility and menopausal ages[4]. Discounting for a certain degree of adolescent sterility or sub fertility and the lower chances of reproduction at menopausal ages above 40

years, a woman could spend on average about 20 to 25 years in effective reproduction. This reproductive span gets further compressed if the marriage is postponed to higher ages and sexual relationship is initiated only after marriage, birth intervals are kept shorter and in the case of early acceptance of voluntary sterilization. In many Asian and Latin American countries, women experience births mostly within the marital unions, have closely spaced births and have sterilization during early ages thereby spending little time in their reproductive spans[5]. The limiting or stopping behavior is mainly determined by the couple's desired family size, the number of surviving children and other motivating and inhibiting factors such as costs, demand, opportunities and individual choices[6].

Three types of reproductive spans are distinguished - conditional on the absence of mortality in the reproductive ages: potential or biological reproductive span, effective or behavioral reproductive span and social reproductive span. The potential reproductive span is the interval between menarche and sterility, either voluntary or involuntary. The effective reproductive span is the interval between the onset of marriage or consummation and sterility, either voluntary or involuntary. The social reproductive span is the interval between the onset of marriage or consummation and the cessation of sexual activity either because of separation, divorce or widowhood. Throughout this paper, we focus the discussion on the effective reproductive span.

Reproductive decisions are socially and culturally influenced. The entry into reproduction differs considerably across societies. In many less developed societies, sexual relationships initiate only after the consummation of marriage and childbearing out of wedlock is socially forbidden. In India, for example, the social value systems rule that reproduction should take place within the bounds of marriage. Once a marriage is consummated, couples are expected to have their children soon, especially the first child. The timing of marriages in the

past usually coincided with the timing of menarche. Consequently, Indian women were exposed to stay longer in their marital unions within the effective reproductive spans bearing an average of six to seven children[7]. A shift towards a declining fertility, as a result of gradual but little increase in the age at first marriage, was observed especially after the implementation of the Child Marriage Restraint act of 1978[8]. This legal initiative took steps to increase the minimum legal female age at marriage to 18 years from 15 years. Alternatively, the total fertility rates (TFR) in India declined considerably from 5.2 children during 1971 to 4.5 during 1981 and further declined to 3.3 children per woman during 1997; the reductions were found more accentuated in the southern states of India[9]. The TFR in the southern states varied between 1.8 children per woman in Kerala and 2.5 in Andhra Pradesh during 1997, compared with a TFR of more than 4 children in northern states such as Uttar Pradesh, Bihar, Rajasthan and Madhya Pradesh[10]. Among the southern states, Kerala and Tamil Nadu had already attained fertility below replacement levels during 1988 and 1993 respectively and Andhra Pradesh is almost close to the replacement levels[11†].

Much of the fertility decline especially in the southern states of India is attributed to a larger acceptance of sterilization, particularly female sterilization. Female sterilization is one of the most popular and dominant methods of contraception in India[12]. Many couples in India consider sterilization as the safest and effective method and it is often the sole method that couples use to control their family size. The first round of the National Family Health Survey (NFHS) conducted during 1992-93 reported that 27.3% of the currently married women had female sterilization, which increased to 34.2% during 1998-99 in the second round of NFHS[13]. Male sterilization, however, declined from 3.4% to 1.9% during the same periods. Another important observation is the falling median age of female sterilization; the median age decreased from 26.6 years during 1992-93 to 25.7 years during 1998-99. A gradual increase in

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* A below replacement fertility in India was first noticed in the western state Goa during the mid 1980s.

the female age at marriage and a decrease in the age at sterilization indicate the possibilities of narrowing reproductive spans among women in India. Few of the previous studies point out that reproductive span between age at marriage and that of last birth varied from 17-20 years in Uttar Pradesh to 9 years in Kerala[14]. These studies, however, did not focus on the analysis of reproductive spans per se and there exists very little documentation regarding studies on reproductive spans especially in the Indian context.

This paper aims to address two research questions. How long do women stay in the effective reproductive spans and how does it differ among different marriage cohorts? What are the effects of demographic, social and reproductive attitude characteristics in relation to the cohort changes observed in the effective reproductive spans? The analysis of this study has been carried out using the NFHS-2 data with a focus on Andhra Pradesh in India. The following are few justifications why we restricted the analysis to Andhra Pradesh and not other Indian states. The recent fertility rates in Andhra Pradesh indicate a convergence to replacement levels despite any substantial improvements in the female literacy rates and social development[15]. The median age at first marriage among females remained constant hovering around 15 years for more than a decade, which indicates that many women are still marrying outside the legal age stipulated by the government of India. Sterilization is widely accepted in this society and many women in this state undergo voluntary sterilization particularly at relatively very young ages.

DATA AND METHODS

Data

NFHS-2 is a nationally representative cross-sectional survey conducted during 1998-99 that collected individual level information on 90,303 ever-married women aged 15-49 years from

92,486 households. The survey covered 25 states from India and represents for more than 99% of the total population in India[16]. Data from Andhra Pradesh was collected between November 1998 and March 1999. In Andhra Pradesh, the survey covered 4,032 ever-married women from 3,872 households. The response rate from the households was 99.4% and women's response rate was 98.2%. The median age of women at the time of survey was 30 years. The survey recorded the date of marriage, births (a detailed birth history) and sterilization (husband/wife) in century month codes (CMC)[‡]. The survey, however, did not provide CMC information for the consummation of first marriage. Also, NFHS-2 did not collect information about the age at menarche or menopause. This information is usually difficult to collect since many women might not accurately remember the age at which they experienced menstruation or menopause. However, the survey did ask women whether they reached menopause at the time of survey. NFHS classified women as having had reached the menopausal state on the following basis; those who reported having had reached menopause or have had a hysterectomy at survey, those who reported currently neither pregnant nor amenorrhoeic at the time of survey and those who reported that their last menstrual period occurred six or more months preceding the survey[17]. Other background characteristics of women and household were also collected at the time of survey.

Variable measurement and operational definition

In this study, the effective reproductive span is measured as the duration between first marriage and sterility (voluntary/involuntary)[§]. If the woman or her spouse is voluntarily sterilized at a certain age, the effective reproductive span is the interval between the month of first marriage

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[‡] A century month code of 1 indicates January 1900.

[§] It has to be noted that a few non-sterilized and non-menopausal women expressed their intentions to stop childbearing at the time of survey. We consider these respondents as right censored with the assumption that they are still exposed to the risk of either sterilization or menopause anytime in the future.

and that of sterilization[**]. This study assumes that among those who reported having had reached menopause (as defined previously) but did not have a voluntary sterilization at the time of survey, the age at menopause was 44 years. This assumption is based on the review of a few available studies that indicated the average menopausal age of Indian women has been approximately 44 years[18]. Therefore, the effective reproductive span for a woman who reached menopause without having a voluntary sterilization is the time since her first marriage until she is 44 years. The NFHS-2 data from Andhra Pradesh show that 12.5% of women (N=4,032) have had reached menopause at the time of survey and among them, 65.7% of these women have already had a voluntary sterilization. This implies that roughly 175 women in the sample reported of having had reached menopause without having a prior voluntary sterilization. Furthermore, our data investigations indicate that about 72% of women who reported of having had reached menopause without sterilization were aged above 40 years at the time of survey.

Method

For the analysis, we used life table and Cox's proportional hazard methods. Life tables can easily handle the problem of censoring[19]. The completed episodes of the effective reproductive span were measured by the duration in months between first marriage and sterilization or until 44 years since first marriage if the women reached menopause without having sterilization. The censored episodes were measured by the duration in months between first marriage and date of survey. The life tables provide the estimation of the probability of sterility at various time periods after first marriage and the expected duration between first marriage and either voluntary or involuntary sterilization.

[**] This study assumes that a woman is not exposed to the risk of reproduction if the spouse is reported to have had undergone sterilization. Although we cannot rule out the possibilities of extramarital sexual relationship in India, there exists hardly any evidence of such issues in the Indian context. Furthermore the available statistics show lesser rates of divorce (less than 1%), separation and desertion in India (Source: IIPS, 2000, p.50).

In order to examine the effect of marital cohorts and other covariates on the risks of attaining sterility after first marriage, proportional hazard models were used. The proportional hazard models are easy to fit the data and require hardly any assumptions about the shape of the hazard rate since it varies according to the duration since marriage[20]. To measure the historical changes in the effective reproductive spans over time, we distinguish four different marriage cohorts. The effect of historical time can be plausibly captured by the coefficients for the year at which a woman is married[21]. The four marriage cohorts comprise women who were married in the time period between 1960-69 (11.7%), 1970-79 (26.7%), 1980-89 (34.1%) and 1990-96 (27.5%). NFHS-2 has the information of women married since 1961 until 1999 (survey). We did not purposefully consider those women who were married after 1996 (7%, N=4,032) in the analysis[††]. This is because of little exposure time left between, say a woman married after 1996 and the survey year, i.e., 1998-99. In other words, a woman married in 1997 is relatively less likely to complete her reproduction and have sterilization when compared with those married before 1996.

It has to be noted that, during the 1970s, the government of India took some legal measures to improve the health and family welfare of Indian women. The first step in this direction was to increase the female and male ages at marriage through the Child Marriage Restraint Act of 1978. Second, during the mid-1970s, family planning in India focused mostly on sterilization programs especially vasectomy or male sterilization[22]. The national emergency period during 1976-77, imposed by the then government of India under the leadership of the Prime Minister Mrs. Indira Gandhi, targeted for sterilization as the major method to be promoted for effective population control measures. This was made effective through the National Population Policy drafted during April 1976[22]. During this period, several mass sterilization camps were conducted throughout India thereby imposing sterilization on couples

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[††] In the survey, 3,751 women were married between 1960 and 1996. Among 3,751 women, 2 reported sterilization before their first marriage and they were not considered in the analysis.

who have at least three or more children. Monetary incentives and facilities were provided for those who accepted sterilization. Followed by the introduction of sterilization camps, male sterilization was highly prevalent in the mid-1970s but later it declined considerably to negligible levels. In the meanwhile, female sterilization took over and gained popularity as the most effective and reliable method of family planning in India. Later in April 1996, the Government of India adopted a 'target-free' approach to family planning enabling women or couples to make open and informed choices of methods[23]. By distinguishing these different marriage cohorts, we anticipate to capture the period effects of the program and policy factors on women's reproductive life.

The other important control variables considered are demographic and social characteristics and reproductive attitudes. The demographic characteristics are current age of women, number of children ever-born, ever-use of modern spacing methods, ever-experience of fetal loss (abortions or stillbirths)[‡‡] and infant and child losses, preceding birth interval for those having at least two children and gender composition of children[§§]. Social characteristics include education of women and their spouses, religion and place of residence of women and reproductive attitudes relates to couple's ideal and desire number of sons and inter-spousal communication of family planning. Reproductive attitudes are information collected at the time of survey and need not necessarily reflect the past or future individual reproductive behavior. Nonetheless, these proxy variables provide rough indications of women's attitudes and values regarding time allocation for childbearing and family planning. The selected independent characteristics were tested for multicollinearity problems through the correlation matrix of the independent variables and highly correlated variables were not considered in the same model.

[‡‡] We made no distinction between induced and spontaneous abortions because many women who reported of having had a spontaneous abortion probably had an induced abortion and were unwilling to report it as such.
[§§] The desire for a son is strongly rooted in many Indian societies and fertility changes are largely explained by the extent of couple's preference to have sons in the family (Source: Basu AM, Fertility decline and increasing gender imbalance in India, including a possible south Indian turnaround, *Development and Change*, 1999, 30(2): 237-263; Das Gupta M and Mari Bhat PN, Fertility decline and increased manifestation of sex bias in India, *Population Studies*, 1997, 51(3): 307-315).

RESULTS

Events determining the effective reproductive span

Table 1 provides an overview of the period differences in the median ages of first marriage and sterilization for women currently aged 25-49 years in India. Marriage is still relatively very early in India without any significant changes over time. Some states are exceptions, for example Punjab, Kerala, Goa and a few of the northeastern states, where median age at first marriage is around 20 years. An important observation is the median age at first marriage in Andhra Pradesh (15.1 years), which is almost identical to that in the high fertility states such as Rajasthan, Madhya Pradesh, Uttar Pradesh and Bihar. Furthermore, the median age did not change over the two periods in Andhra Pradesh. The NFHS-2 data also indicates that the gap between marriage and consummation has narrowed significantly in India, especially in the states that practiced child marriages[24]. Conversely, many Indian women underwent sterilization quite early below 30 years; the trend is particularly observed in Andhra Pradesh where the already low median age at sterilization declined from 24.5 to 23.6 years between 1992-93 and 1998-99. Many women in this state enter marriage relatively early; have their desired children and complete reproduction by accepting sterilization at young ages. This is clearly illustrated in Figure 1, which shows that fertility in Andhra Pradesh is increasingly getting concentrated among the 20-24 age groups, particularly in recent periods. For example, in 1996, more than three-fifth of births had occurred among women aged below 25 years. The recent fertility decline close to replacement levels is also noteworthy in Andhra Pradesh. We focus on this state for the detailed analysis of reproductive spans.

--- Table 1 and Figure 1 about here ---

A description of sequential events within the effective reproductive span in Andhra Pradesh is briefly summarized in Table 2. This is shown only for the recent NFHS-2 data. About 80% of women in Andhra Pradesh marry below 18 years and consummation is followed soon after marriage, especially among rural residents. First births also occur quite early and more than one half have first birth below 18 years. This indicates that marriage, consummation and first birth are closely confined to each other among young women in Andhra Pradesh. On the other hand, both female and male voluntary sterilization and last birth are closely spaced to each other irrespective of any differences in urban and rural areas. Although urban women marry relatively later than their rural counterparts they catch up with rural women by scheduling their last birth and sterilization at more or less same age. This suggests that urban women are more likely to complete childbearing and accept sterilization at a faster pace compared with their rural counterpart. Although only a few men are sterilized, they undergo sterilization when the wife is below 25 years. About 23% reported having had reached menopause at the time of survey. Women in rural areas are higher in proportion to report menopause.

The observed median ages and proportions provide only a rough indication of the effective reproductive spans because of censoring problems. This is further elucidated in Table 3, which shows the observed mean and median duration of the effective reproductive spans. The open intervals that refer to the duration of effective reproductive span in the absence of sterility (voluntary/involuntary) are comparatively longer than the closed ones in the presence of sterility. The figures indicate a clear observation of narrowing reproductive spans over the marriage cohorts, irrespective of whether it is closed or open. For example, the closed interval shows that the effective reproductive span reduced from 17 years among women married during the 1960s to 7 years among those married during the 1980s. Similar trends were observed also for the open intervals with rural-urban differences. The interval is much shorter

among recent marriage cohorts, those married between 1990 and 1996, which is partially because of censoring at the time of survey. The censoring effects are captured in the life table analysis. The average number of children ever-born in open intervals is quite smaller than those in the closed intervals, particularly for the 1980-89 marriage cohort.

--- Table 2 and 3 about here ---

Life table analysis

Results from the life table analysis show a considerable change in the effective reproductive spans over the marriage cohorts. Table 4 shows the life table results of ever-married women completing their effective reproductive spans at various time periods classified by marriage cohorts and place of residence. There has been a considerable reduction in the time spent in the effective reproductive span among women in Andhra Pradesh. The analysis shows that 76 per 1000 women married during the 1960s spent 7 years in the effective reproductive span, which increased significantly to 211 per 1000 married during the 1970s, 403 per 1000 married during the 1980s and to 564 per 1000 among those married recently. The changes are highly accentuated among those married between 1970-79, during which the government of India introduced mass sterilization camps across the Indian states. Similarly, a considerable number of women married after 1980 spent only 5 years in reproduction since first marriage. The changes in reproductive spans over the marriage cohorts are particularly impressive among urban women. The probability that an urban woman, married between 1980 and 1989 remains non-sterilized for 5 years, will be sterilized before reaching the 7th year is about 21% and it is 19% for her rural counterpart[***]. The survival curves, as shown in Figure 2, demonstrate a significant declining trend among recently married cohorts in the time spent in reproductive

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[***] The probability is calculated as $(S_5-S_7)/S_5$; where S_x is the cumulative proportion of survivors who enter at the exact time x, which in this case is $[(1000-325)-(1000-468)]/(1000-325) = 0.212$ (or 21%).

spans. An important observation is the considerable distance in the distributions between those married between 1960-69 and later cohorts. This is because although sterilization was a key component of the official family planning program since the 1960s, the camp approach was not introduced until the country's fourth five year plan (1969-74) and hence sterilization was less common in the 1960s.

--- Table 4 and Figure 2 about here ---

Table 5 shows the average number of expected years that a married woman could spend in the effective reproductive span classified according to different marriage cohorts. We could refer the average number of expected years in reproduction as the average reproductive life expectancies in the effective reproductive spans. The results indicate that a woman married during the 1960s had spent on average about 22 years in the effective reproductive span, which declined further to 15 years for the 1970-79 marital cohorts and to merely 4.5 years for the recent cohort. An argument here is that it is certainly possible for a couple to have two children with a reasonable birth interval of 2 or 3 years and experience sterilization within a span of 4.5 years. A similar decline was observed especially among both urban and rural women. The results clearly suggest a significant change in the reproductive behavior among women in Andhra Pradesh.

--- Table 5 about here ---

Regression analysis

A multivariate hazard analysis is done to capture the cohort effects on the time spent in the effective reproductive spans with a control of other relevant demographic, social and reproductive attitude variables. The dependent variable of the hazard model is the duration

since first marriage until voluntary/involuntary sterility or until the time of survey. Among the independent variables, the current age of women and the total number of children ever-born were regarded as continuous variables. The results from two models are presented in Table 6. Model 1 includes demographic (except preceding birth interval) and social variables and the effect of preceding birth interval. The interaction effects are captured in model 2. Model 2 does not include women who were currently pregnant for the first time or have had only one child at survey. This is because of the inclusion of preceding birth interval as a covariate in the model. The gender composition variable which is birth order specific is also not included in model 2.

The results based on model 1 show that women married between 1980 and 1989 were almost 90% significantly more likely to stay shorter in the effective reproductive span than those married during the 1960s ($p<0.001$). Younger women and those who had a few children ever-born tend to have shorter reproductive spans when compared with their counterparts. Women who have had used a modern spacing method, who had ever-experienced any fetal loss and those who ever have had infant and child deaths were considerably more likely to stay longer in the effective reproductive span. Gender composition of children had significant impact on women's decision to stay either shorter or longer in the reproductive span. Women who have had borne either two boys or a boy/girl in the first and second birth orders were significantly more likely to stay shorter in the reproductive spans ($p<0.001$). This result might suggest a couple's inclination to continue reproduction until a male child is born. We decided to include the education of both the husband and wife in the same model as there was no significant correlation between the education of husband and wife. The results show that women with secondary level education were 64% significantly more likely than their illiterate counterparts to stay shorter in the reproductive spans; the effects are insignificant for those who had completed high school education and above. Our data investigations also revealed that women with secondary schooling are more likely than their counterparts to accept sterilization.

The reproductive spans of women tend to compress as the level of husband's education increases. Religious differentials indicate that non-Hindus were considerably more likely to stay longer in the reproductive spans than the Hindus, especially Muslims. Rural-urban differences were insignificant with regard to the time spent in reproductive spans. Women's desire on the number of boys in the family did not influence the time spent in the reproductive spans, however, those who were not sure or did not have a specific desire were likely to have spent more time in the reproductive spans. Inter-spousal communication did not influence the time spent in the effective reproductive span.

--- Table 6 about here ---

Model 2 included the length of preceding birth interval and accounted for the interaction effects between marital cohorts and place of residence with regard to time spent in the effective reproductive span. The interactions were tested mainly to capture the impact of sterilization programs and reproductive behavior among different marital cohorts especially in rural areas where the family planning program implementation had been more vigorous than that in urban areas. Longer birth intervals did influence women to stay longer in the reproductive spans. The inclusion of preceding birth interval in model 2 retained the statistical effects and identical directions of other variables in the model. The number of children ever born is not considered in this model due to multicollinearity reasons. The changes incorporated in model 2 mediated the influence of inter-spousal family planning communication suggesting that poorer communication efforts between couples influence women to stay much shorter in the reproductive spans ($p<0.05$). For testing the interaction effects between different marital cohorts and place of residence, the 1970-79 marriage cohorts from rural areas has been considered as the reference category. When compared with the rural 1970-79 marriage cohorts, women in urban areas and those married previously were likely to stay longer in the

reproductive spans. On the other hand, women married during the 1980s and later tend to stay shorter in their reproductive spans, especially among those residing in the urban areas. It has to be noted that sterilization camps in India were introduced in the mid 1970s, the acceptance rates of especially female sterilization increased thereafter particularly in urban areas.

CONCLUSIONS AND DISCUSSION

This study investigated the time spent by women in their effective reproductive spans and the changes over time among different marriage cohorts in Andhra Pradesh, where the fertility has recently reached close to replacement levels. The effective reproductive span was defined as the time between first marriage and sterility that has been undergone either voluntarily or involuntarily. Many women in Andhra Pradesh marry below 18 years, have a child soon after marriage, complete their desired family size and undergo sterilization at younger ages when the family size is completed. The study revealed a significant early compression of women's reproductive spans over time. A larger proportion of women undergoing female sterilization at relatively younger ages explain much of this compression.

Life table analysis pointed out that women married during the 1960s spent about 22 years on average in their effective reproductive spans that reduced considerably to approximately 10 years for those married during the 1980s, which further declined to merely less than 5 years for the recent marriage cohorts. The cohort effects on the time spent in reproductive spans were further captured in the hazard analysis with a statistical control of important demographic, social and reproductive attitude variables. Recent marriage cohorts were significantly at higher risk of staying shorter in their reproductive spans and the effects persisted with higher statistical significance when adjusted for important demographic, social and reproductive attitude variables. Most of the selected demographic, social and reproductive attitude variables showed significant associations with the time spent in effective reproductive

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spans. It has to be noted that the definition of menopause in this study is restricted to the information available in the NFHS-2. For a few women who reported of having had reached menopause without a sterilization we assumed the age at menopause as 44 years.

Nonetheless, this study demonstrated that there is an increasing trend among younger women in Andhra Pradesh to narrow their effective reproductive spans. This trend might be relevant also in other states of India particularly the southern states, where sterilization rates show an increasing trend over time ever since its introduction in the form of mass camps all over India. The coercion factor in family planning that prevailed in the target approach of the government of India coupled with poverty conditions had influenced many to accept an incentive-based sterilization[25]. The implementation of the target free approach seems to have exerted little influence on the sterilization acceptance rates, particularly in Andhra Pradesh where the recent acceptance rates show an ascending trend[26]. It might be the case that coercive practices are still followed, perhaps imperceptibly, in the state family planning program. In our data investigations, we found that of those who had sterilization (N=2,108), approximately 50% reported that it was either self-decision or none influenced them to use sterilization, 20% reported that their husbands suggested to use, 15% reported ANMs (Auxiliary Nurses and Midwives) and local health volunteers, 4% reported mother-in-laws, 2% reported friends and a majority of the rest represents other health workers, particularly from public health sectors. In addition, about 48% of respondents reported that they were not informed of other method options at the time when they had sterilization.

Other factors that influence the demand and supply of sterilization, such as improvements in infant and child survival, health care accessibility and the frequency of interaction with the antenatal care provider might also partly explain couples' decisions to

accept early sterilization[†††]. Only a very few currently married women in Andhra Pradesh use modern spacing methods (1.8%) and hardly any couples rely on traditional methods (0.5%)[26]. Moreover, many couples even have sterilization as the first contraceptive method especially in the same calendar month of the last birth[27]. Our analysis showed that a lack of inter-spousal family planning communication influence women to stay shorter in the reproductive span, which might also be a factor that explains low use of modern spacing methods. The influence of abortion/stillbirth in lengthening the reproductive spans is also revealed in this study. This finding is attributed to two plausible reasons. First, in the event of especially a fetal loss experience, it is likely that couples continue reproduction until their desired family size is achieved and hence a longer reproductive spans than those without any abortion/stillbirth experiences. Second, although it is beyond the scope of this study, it could be questioned whether young women prefer to have sterilization mainly to avert the burden of unwanted pregnancies?

The knowledge and use of sterilization have grown over time especially in southern India that is mainly attributed to the gains in female literacy and social development. This is, however, not true in the case of Andhra Pradesh. The acceptors are usually either illiterate couples or those with moderate schooling experiences. The preference of male children in the family was also found to be an influential factor determining early sterilization in the state. In addition, the cultural factors seem to play an important role. A qualitative study reported that young rural mothers in Andhra Pradesh accept sterilization mainly as a resource to advance their social goals and to attain a culturally defined prestige so as to retain their individual identities in the kinship and social networks[28].

[†††] We did not examine the role of health care factors in this analysis because the information was available only for births a few years preceding the survey and hence they cannot be related to the past events.

These inter-linked factors clearly indicate that the position of women solely as mothers is undergoing a major transition in Andhra Pradesh, which might also be the case elsewhere in India. This argument is partly supported by the situation of lowering fertility levels in the state. The compression of reproductive spans particularly in the early phases of the reproductive career suggests that women could increasingly allocate time for their employment careers once their family size is completed. The time spent in the effective reproductive spans might also indicate the reproductive health status of women or couples and the extent to which women are exposed to gynecological, obstetrical and contraceptive health risks. Does the compression of reproductive spans among women in India adequately reflect changing life styles, empowerment and modernization? Do women or couples prefer to make choices for early sterilization or are they merely the victims of governmental population control measures? Do they make the decisions for sterilization by their own or through societal pressure? These questions need to be seriously considered and evaluated using in-depth studies in order to have a better understanding of couple's reproductive decisions on early sterilization, especially in the case of Andhra Pradesh.

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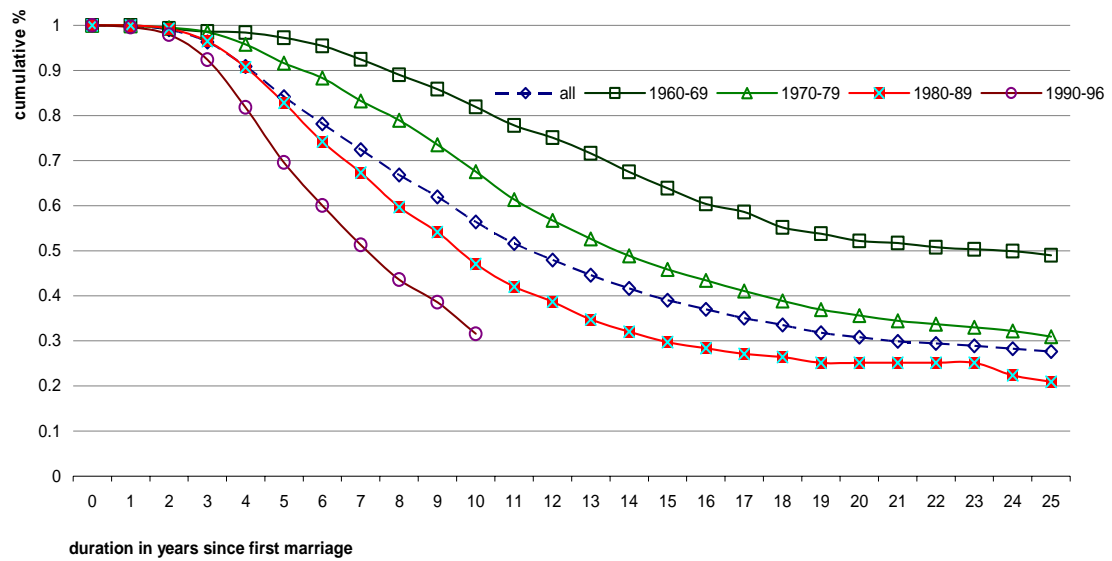
FIGURE 1. Age specific fertility rates, Andhra Pradesh, 1971-96
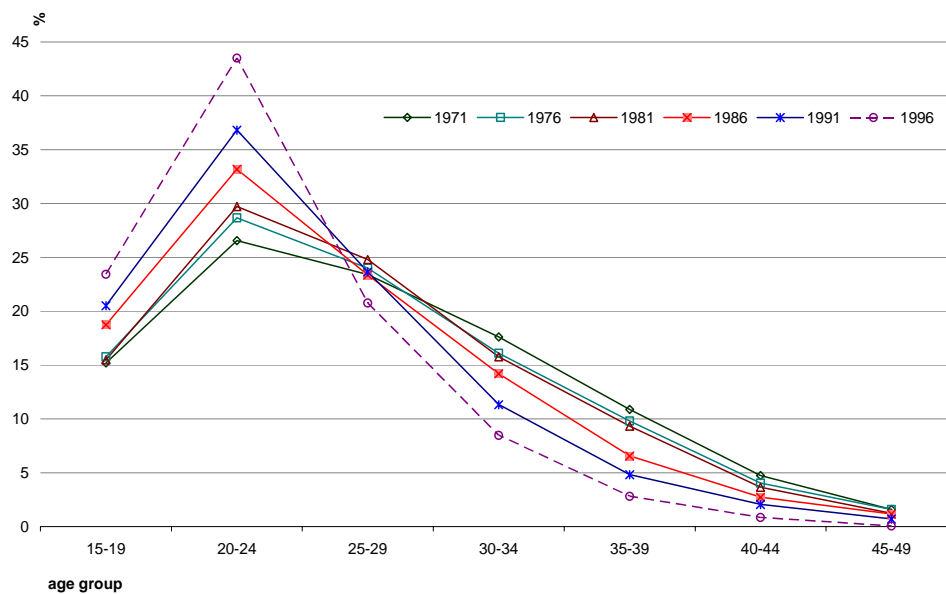
Source: Sample Registration System, various volumes, Registrar General of India, Government of India

FIGURE 2. Cumulative distributions of effective reproductive spans by marriage cohorts, Andhra Pradesh, 1998-99

TABLE 1. Median ages of first marriage and sterilization among women in India and states, 1992-93 and 1998-99

	Median age					
	First marriage*			Sterilization†		
State	1992-93	1998-99	Ratio (1998/92)	1992-93	1998-99	Ratio (1998/92)
North						
Delhi	18.3	19.0	1.04	28.2	27.8	0.99
Haryana	16.0	16.9	1.06	27.3	26.5	0.97
Himachal Pradesh	17.7	18.6	1.05	26.9	26.2	0.97
Jammu & Kashmir	17.8	18.2	1.02	28.6	28.2	0.99
Punjab	19.0	20.0	1.05	27.9	27.1	0.97
Rajasthan	15.0	15.1	1.01	27.7	27.0	0.97
Central						
Madhya Pradesh	14.5	14.7	1.01	27.3	26.4	0.97
Uttar Pradesh	15.1	15.0	0.99	29.6	28.3	0.96
East						
Bihar	14.7	14.9	1.01	28.1	27.7	0.99
Orissa	16.6	17.5	1.05	26.8	26.3	0.98
West Bengal	16.0	16.8	1.05	26.0	25.1	0.97
Northeast						
Arunachal Pradesh	18.2	18.7	1.03	28.0	26.2	0.94
Assam	16.9	18.1	1.07	27.1	26.7	0.99
Manipur	20.8	21.7	1.04	29.7	30.5	1.03
Meghalaya	19.0	19.1	1.01	27.9	28.6	1.03
Mizoram	21.0	22.0	1.05	28.8	29.3	1.02
Nagaland	20.1	20.1	1.00	29.3	29.0	0.99
West						
Goa	21.7	23.2	1.07	28.5	28.5	1.00
Gujarat	17.9	17.6	0.98	27.5	26.5	0.96
Maharashtra	16.1	16.4	1.02	25.6	25.0	0.98
South						
Andhra Pradesh	15.1	15.1	1.00	24.5	23.6	0.96
Karnataka	16.6	16.8	1.01	25.2	24.2	0.96
Kerala	19.8	20.2	1.02	26.5	26.4	1.00
Tamil Nadu	18.1	18.7	1.03	26.2	25.3	0.97
India	16.1	16.4	1.02	26.6	25.7	0.97

*ever-married women aged 25-49 years. †currently married sterilized women and wives of sterilized men at the time of sterilization. *Note*: Age at menopause is not collected in the survey.

Source: IIPS (1995, p.81, 157) and IIPS (2000, p.57, 148).

TABLE 2. Description of sequential events determining the effective reproductive span of ever-married women aged 25-49 years by place of residence, Andhra Pradesh, 1998-99

Events	Descriptive statistics			
	Urban	Rural	Total	(N)
First marriage				
Median age (years)	16.0	15.0	15.0	(2,839)
% marrying below 18 years	63.8	85.3	79.3	(2,839)
First consummation				
Median age (years)	16.0	15.0	15.0	(2,839)
% consummating below 18 years	63.8	85.3	79.3	(2,839)
First birth*				
Median age (years)	18.0	17.0	17.0	(2,695)
% giving birth below 18 years	41.6	58.7	53.9	(2,695)
Last birth*				
Median age (years)	24.0	24.0	24.0	(2,686)
% giving last birth below 25 years	55.4	56.1	55.9	(2,686)
Female sterilization				
Median age (years)	24.0	24.0	24.0	(1,650)
% sterilizing below 25 years	56.1	58.7	58.0	(1,650)
Male sterilization				
Median age of women at the time of sterilization	25.0	25.0	25.0	(162)
% sterilizing below 25 years	48.9	43.5	45.1	(162)
Menopause / sterility†				
% reaching menopause	19.0	24.6	23.0	(2,033)

*only women with at least one birth are considered. †based on women currently aged 30-49 years. N refers to total number of women who experience various events, except for menopause that includes total number of women aged 30-49 years. *Note*: the analysis is restricted to ever-married women currently aged between 25-49 years in order to avoid problems of censoring.

TABLE 3. Observed mean and median duration of the effective reproductive spans and the mean number of children ever-born among ever-married women aged 25-49 years by marriage cohorts and place of residence, Andhra Pradesh, 1998-99

Marriage cohorts (year of marriage)	Duration in years							
	Open interval*			Mean IFS	Closed interval†			Mean CFS
	Mean	Median	N		Mean	Median	N	
All								
1960-69	31.2	32.0	134	4.0	17.0	15.0	303	4.6
1970-79	23.2	23.0	255	3.4	11.9	10.0	746	3.8
1980-89	13.4	13.0	362	2.2	7.4	7.0	806	3.1
1990-96	5.9	6.0	104	---	3.5	3.0	120	2.3
Total	18.3	17.0	855	2.1	10.4	9.0	1975	3.4
Urban								
1960-69	32.0	32.0	46	3.8	16.2	14.0	66	4.2
1970-79	22.9	22.0	63	3.4	11.3	10.0	185	3.8
1980-89	13.0	13.0	99	1.9	6.5	6.0	225	3.0
1990-96	5.9	6.0	49	---	3.6	3.5	54	2.2
Total	17.5	16.0	257	2.1	9.1	7.0	530	3.2
Rural								
1960-69	31.9	32.0	88	4.2	17.2	15.0	237	4.7
1970-79	23.3	23.0	192	3.4	12.2	10.0	561	3.8
1980-89	13.6	14.0	263	2.4	7.8	7.0	581	3.1
1990-96	5.9	6.0	55	---	3.4	3.0	66	2.3
Total	18.7	18.0	598	2.1	10.8	9.0	1445	3.4

*open interval refers to the duration of effective reproductive spans in the absence of sterility (voluntary/ involuntary).
†closed interval refers to the duration of effective reproductive span in the presence of sterility (voluntary/involuntary). IFS refer to Incomplete Family Size in the absence of sterility and CFS refers to Complete Family Size in the presence of sterility. *Note*: the analysis is restricted to ever-married women currently aged between 25-49 years in order to avoid problems of censoring. N refers to total number of women. --- not calculated due to censoring.

TABLE 4. Number of ever-married women (per 1000)* aged 15-49 years completing effective reproductive spans at various duration by marriage cohorts and place of residence, Andhra Pradesh, 1998-99

Year of marriage	Duration in years							
	3	5	7	9	11	13	15	N
All								
1960-69	14	27	76	142	222	284	362	437
1970-79	42	117	211	325	433	511	565	1001
1980-89	93	258	403	529	613	680	716	1279
1990-96	182	399	564	na	na	na	na	1032
Total	91	219	332	436	520	588	630	3749
Urban								
1960-69	18	36	80	152	223	286	339	112
1970-79	60	137	226	359	460	536	585	248
1980-89	108	325	468	596	669	712	730	342
1990-96	248	492	626	na	na	na	na	284
Total	122	277	383	490	564	617	650	986
Rural								
1960-69	12	25	74	138	221	288	369	325
1970-79	36	110	206	313	424	503	559	753
1980-89	87	234	380	505	592	667	710	937
1990-96	156	363	540	na	na	na	na	748
Total	80	198	314	417	505	577	622	2763

*based on life table analysis. N refers to total number of women in each category. na refers to not applicable because of censoring at the time of survey.

TABLE 5. Expected* duration in the effective reproductive spans for ever-married women aged 15-49 years by marriage cohorts and place of residence, Andhra Pradesh, 1998-99

Marriage cohorts (year of marriage)	Duration in years	N
All		
1960-69	21.5	437
1970-79	15.2	1001
1980-89	9.5	1279
1990-96	4.5	1032
Total	11.1	3749
Urban		
1960-69	22.3	112
1970-79	14.7	248
1980-89	8.8	342
1990-96	4.4	284
Total	10.5	986
Rural		
1960-69	21.2	325
1970-79	15.4	753
1980-89	9.8	937
1990-96	4.5	748
Total	11.2	2763

*based on life table analysis. N refers to total number of women.

TABLE 6. Hazard ratios (and 95% confidence intervals) showing the cohort effects on the time spend in the effective reproductive span, controlled for demographic, social and reproductive attitude variables, Andhra Pradesh, 1998-99

Characteristic	Model 1		Model 2	
Marriage cohorts				
1960-69	1.00		na	
1970-79	1.51***	(1.26 – 1.79)		
1980-89	1.89***	(1.45 – 2.46)		
1990-96	2.58***	(1.80 – 3.69)		
Demographic				
Current age of women (in years)	0.97***	(0.96 – 0.98)	0.96***	(0.95 – 0.98)
Number of children ever-born	1.10***	(1.07 – 1.13)	na	
Use of modern spacing methods				
No	1.00		1.00	
Yes	0.64***	(0.53 – 0.79)	0.58***	(0.47 – 0.71)
Ever-experience of infant or child deaths				
No	1.00		1.00	
Yes	0.80***	(0.72 – 0.90)	0.83**	(0.74 – 0.93)
Ever-experience of fetal loss				
No	1.00		1.00	
Yes	0.83**	(0.74 – 0.93)	0.73***	(0.66 – 0.80)
Preceding birth interval				
< 24 months	na		1.00	
≥ 24			0.64***	(0.59 – 0.70)
Gender composition of children				
Others	1.00		na	
First two are boys	1.61***	(1.37 – 1.88)		
First two are girls	1.07	(0.86 – 1.32)		
Either a boy or girl	1.54***	(1.36 – 1.74)		
Social				
Education of respondent				
None	1.00		1.00	
Primary completed	1.38***	(1.23 – 1.55)	1.40***	(1.25 – 1.57)
Secondary completed	1.64***	(1.42 – 1.89)	1.68***	(1.45 – 1.94)
High school completed and above	1.06	(0.79 – 1.42)	1.21	(0.89 – 1.64)
Education of respondent				
None	1.00		1.00	
Primary completed	1.27***	(1.16 – 1.48)	1.18**	(1.05 – 1.33)
Secondary completed	1.31***	(1.16 – 1.48)	1.23**	(1.09 – 1.39)
High school and above	1.38***	(1.16 – 1.65)	1.32**	(1.10 – 1.57)
Religion of respondent				
Hindu	1.00		1.00	
Muslim	0.52***	(0.43 – 0.64)	0.51***	(0.41 – 0.61)
Christian	0.82*	(0.68 – 0.98)	0.83*	(0.69 – 0.99)
Place of residence				
Urban	1.00		na	
Rural	0.97	(0.87 – 1.07)		

TABLE 6. Hazard ratios (and 95% confidence intervals) showing the cohort effects on the time spend in the effective reproductive span, controlled for demographic, social and reproductive attitude variables, Andhra Pradesh, 1998-99 (contd.)

Characteristic	Model 1		Model 2	
Reproductive attitudes				
Ideal and desired boys in the family				
None	1.00		1.00	
At least one	0.99	(0.88 – 1.13)	0.93	(0.82 – 1.06)
Two or more	0.95	(0.82 – 1.09)	0.83*	(0.72 – 0.96)
Don't know	0.85*	(0.74 – 0.98)	0.77***	(0.67 – 0.89)
Inter-spousal FP communication				
Yes	1.00		1.00	
No	1.07	(0.92 – 1.25)	1.18*	(1.01 – 1.38)
Interaction				
Marriage cohort*place of residence				
1970-79, rural	na		1.00	
1960-69, urban			0.53***	(0.39 – 0.71)
1960-69, rural			0.81*	(0.67 – 0.99)
1970-79, urban			0.99	(0.82 – 1.18)
1980-89, urban			1.33**	(1.08 – 1.63)
1980-89, rural			1.18	(0.99 – 1.39)
1990-96 urban			2.22***	(1.65 – 3.00)
1990-96, rural			1.97***	(1.50 – 2.57)
No. of events	2255		2182	
No. of censored events	1203		764	
Total no. of events	3458		2946	
-2log likelihood	32484.67		30723.21	
Model chi-square	807.40***		1058.53***	

*p<0.05. **p<0.01. ***p<0.001. na refers to not applicable
The analysis is restricted to women who had ever-married between 1960 and 1996.