

DOES TYPE OF HOUSEHOLD AFFECT MATERNAL HEALTH? EVIDENCE FROM INDIA

NANDITA SAIKIA AND ABHISHEK SINGH

International Institute for Population Sciences, Mumbai, India

Summary. The present paper examines the association between the type of household and maternal health in India using data from the National Family Health Survey 1998–99. The indicators of maternal health used in the analysis are contraceptive use, visit to obtain antenatal care in the first trimester, safe delivery and nutritional status of women measured in terms of body mass index (BMI). Binary and multinomial logistic regressions are used to establish associations. The type of household is coded into three categories, viz. nuclear household, joint household with in-laws and joint household without in-laws. The other independent variables used in the analysis are age, children ever born, work status, education of women, religion, caste, standard of living, exposure to mass media, women's autonomy and presence of others at the time of interview. The findings clearly suggest that type of household is significantly associated with the utilization of the above-mentioned services that positively affect maternal health. Women in nuclear households are more likely to utilize these services compared with women in joint households. However, an association between type of household and BMI was not found.

Introduction

Hundreds of thousands of women in developing countries die each year from complications of pregnancy, attempted abortion and childbirth. India is one of these countries where the number of deaths during the reproductive period is very high. According to the Registrar General of India (RGI), a woman dies every seven minutes in India because of complications during pregnancy or childbirth (www.unicef.org/india). UNICEF reports that nearly 130,000 women die annually from pregnancy and childbirth-related complications and almost all these deaths are preventable (UNICEF, 2005). The lack of an efficient health system, along with inadequate utilization of available health services, especially by women of reproductive ages, is one major factor affecting the health of mothers in India. Poor nutrition among women of reproductive age is another important contributing factor to poor health. Iron deficiency anaemia is the second leading cause of maternal death,

accounting for 15–30% of total deaths in India (Mukhopadhyaya, 1992; GOI, 1995). Whereas severe anaemia is closely related to risk of mortality, even mild anaemia carries health risks and reduces capacity to work (Cohen & Gibor, 1980). Keeping this situation in view, researchers have attempted to understand the factors responsible for the conspicuous poor health status among women during their reproductive period.

A quick glance at the statistics on utilization of maternal health services reveals that only 48% of currently married women were using some method of contraception in India in 1998–99 (IIPS & ORC Macro, 2000) and only around 17% of the women were using temporary methods of contraception. The data further show that mothers in India received antenatal checkups for only 65% of births during the three years preceding the survey. Again, only one-third of births in India took place in health facilities, most of the births taking place at home. Nutritional status of women in India also shows that more than one-third (36%) of women had a body mass index (BMI) below 18.5, indicating a high prevalence of nutritional deficiency (IIPS & ORC Macro, 2000). The nutritional status of women, utilization of prenatal, natal and postnatal care services, and use of contraception are some of the important determinants of maternal mortality and morbidity (Geubbels, 2006).

McCarthy & Maine (1992) and Thaddeus & Maine (1994) have presented frameworks for analysing the determinants of maternal mortality and morbidity. According to the framework by McCarthy & Maine (1992), there are some distant determinants viz. women's status in the family or community, family status in the community and community status. Women's status in the family depends upon factors like education, income, occupation and the social and legal autonomy of women, whereas the status of family in the community depends upon land possession, education, income and occupation of the members of the family. Previous studies conducted to examine the determinants of health status and health care behaviour or use of health services have considered various socioeconomic, biological and environmental factors. Most of the studies have used individual characteristics such as mother's education, place of residence and birth order along with other social, economic and demographic variables to examine health care utilization (Elo, 1992; Bhatia & Cleland, 1995; Celik & Hotchkiss, 2000; Matsumara & Gubhaju, 2001; Navaneetham & Dharmalingam, 2002; Gage & Calixte, 2006; Ram & Singh, 2006; Sunil *et al.*, 2006). Some of the other variables frequently used in the analysis are physical accessibility of maternal health services (Stephenson & Tsui, 2002; Wagle *et al.*, 2004; Gage & Calixte, 2006) and programme factors (Sunil *et al.*, 2006).

One of the important determinants of health status and health care behaviour, as identified by McCarthy & Maine (1992), is women's status in the household. Very few studies have focused on the relationship between women's status and the use of health services. Another study in a north Indian city revealed that women with greater freedom of movement obtained higher levels of prenatal care and were more likely to use safe delivery. The study further concluded that the influence of women's autonomy on the use of health care appears to be as important as other known determinants such as education (Bloom *et al.*, 2001). Indian women having higher autonomy were more likely to have knowledge about HIV/AIDS and condoms. They were also more likely to use condoms (Bloom & Griffiths, 2007).

The 'household type' in which women live may determine women's autonomy in the household to a certain extent. A few studies in the past have tried to associate household type with demographic behaviour. Some studies have found that nuclear families are favourable to smaller family size (Avan & Saima, 2006). However, some studies have found that joint families are not an essential prerequisite for abundant reproduction (Pakrasi & Malaker, 1967). Some studies have found that the joint family system is conducive for fertility control behaviour (Bebarta, 1977). Pakrasi & Malaker (1967) concluded that the possible association between family type and fertility appears to be a pertinent issue that cannot be ruled out from current socio-demographic research. Prasad & Srivastava (1977) concluded that fertility is firmly related to household type and, as such, the study of fertility necessarily involves the study of behaviour of couples within a given household set-up. Household structure has been found to be significantly related to utilization of prenatal care in Nepal. Women from extended households were more likely to use maternal health care (Matsumara & Gubhaju, 2001). A study conducted by Griffiths *et al.* (2002) in India found little variation between family structures in the nutritional status of children.

The concept of family is as old as human civilization. The basic institution of society for the survival, protection and development of human beings is the family. The role of family is indispensable in every walk of life. Family affects every arena of social, political, economic and religious life, yet in reality there is little empirical research on which to base the theories (Avan & Saima, 2006). Family influence starts right from the birth of children to giving security and care to the aged. In India, the family set-up has particular importance in the study of health status and health care behaviour of mothers and their infants as there are many beliefs and customs followed by Indian society during pregnancy and after the birth of a child. The composition of members in a household that basically determines the 'household type' becomes very important, particularly in the Indian context where mothers-in-law or other older women in the household have considerable influence in decisions regarding type of nutrition and health care behaviour. For instance, a study conducted by Kadir *et al.* (2003) in Pakistan found that mothers-in-law always expressed a desire to have more grandchildren.

The region of residence in India has particular importance in the demographic performance of the residents. With the exception of one or two states, north Indian states have less satisfactory demographic indicators such as relatively high overall fertility, earlier age at first marriage, higher infant and child mortality and comparatively high ratios of female to male infant and child mortality as compared with their southern counterparts. Dyson & Moore (1983) established that division between the areas of northern (unfavourable) and southern (favourable) demographic regimes broadly coincides with the division between areas of northern kinship/low female autonomy and southern kinship/high female autonomy. The kinship system in northern India has some important socio-cultural consequences that in turn forbid women to take innovative steps to use contraceptive or to take advantage of using health care facilities. On the other hand, the southern system can be contrasted with that of the north with respect to most of these principles and their consequences (Dyson & Moore, 1983).

The presence of other household members at the time of interview may contaminate the responses to behavioural questions (Aquilino, 1993; Smith, 1997; Tu, 2000). The presence of a third person during interview may also undermine a respondent's ability to provide correct answers and may also degrade the quality of response (Tu, 2000). This may result from the possible interaction between the presence of others and the nature of questions (Aquilino, 1993; Smith, 1997; Tu, 2000). The presence of others during an interview may affect the responses to questions, especially on contraceptive use. A study conducted in India reported higher contraceptive use when women were interviewed in the absence of others than when they were interviewed in the presence of their husbands/in-laws or others (Krishna Mohan, 2004). Other members of the household are more likely to be present at the time of interview in joint and extended households than in nuclear households. This may result into lower reporting of contraceptive use. But the presence of other members may not affect the reporting of other outcome variables analysed in the paper.

There is hardly any research focusing on the relationship between household type and the health status and health care behaviour in India. In this paper, therefore, an effort has been taken to explore the relationship of household type with the utilization of selected maternal care services and nutritional status of women using the large-scale NFHS data collected in India in 1998–99.

Data and Methods

Data used in the study come from the National Family and Health Survey carried out in India in 1998–1999 (IIPS & ORC Macro, 2000). The National Family Health Survey (NFHS) is a large-scale, multi-round survey conducted in a representative sample of households throughout India. The second NFHS (NFHS-2), conducted in 1998–99, is the outcome of collaborative efforts of many organizations like the International Institute for Population Sciences (IIPS), United States Agency for International Development (USAID) and United Nations International Children Fund (UNICEF). Responsibility for data collection was entrusted to thirteen reputable organizations in India, including some Population Research Centers. The survey covers a representative sample of about 91,000 ever-married women aged 15–49 from 26 states in India who were covered in two phases, the first starting in November 1998 and the second in March 1999. The principal objective of NFHS-2 was to provide state and national estimates of fertility, the practice of family planning, infant and child mortality, maternal and child health and the utilization of health services provided to mothers and children. In addition, the survey includes information on the quality of health and family welfare services and provides indicators of the status of women, women's reproductive health and domestic violence. The survey provides state-level estimates of demographic and health parameters as well as data on various socioeconomic and programme dimensions, which are critical for bringing about the desired change in demographic and health parameters.

The dependent variables analysed in the paper measure important dimensions of health status and health care behaviour among women of reproductive age. The

dependent variables used in the analysis are use or non-use of a method of contraception, an antenatal visit in the first trimester, opting for safe delivery (delivering either in a medical institution or delivering in the presence of a trained medical attendant), and BMI (less than 18.5 and greater than or equal to 18.5). Type of household has been considered as an independent variable in the analysis. The type of the household is coded into three categories, viz. nuclear households, joint households with in-laws and joint households without in-laws. A nuclear household is defined as one that consists of parents and their unmarried children. The other independent variables used in the analysis are important socioeconomic, demographic and nutrition related variables like education of women (non-literate, literate but middle school not completed, middle school completed and high school and above), working status of women (working and not working), place of residence (rural and urban), mass media exposure (no exposure, partial exposure and full exposure), education of husband (non-literate, literate but middle school not completed, middle school completed and high school and above), standard of living of household (low, medium and high), religion (Hindu, Muslim and others), caste (scheduled caste/scheduled tribe (SC/ST), other backward caste (OBC) and others), and presence of others during the interview (no one present, mother-in-law present, other members present).

The survey includes radio, television and newspaper as mass media. This information on mass media has been used to assess the mass media exposure of the respondent. Exposure to mass media has been categorized as no exposure, partial exposure and full exposure. Partial exposure refers to either one source or at most two sources, while full exposure comprises that group of women who are exposed to all three types of mass media. The standard of living index (SLI) has been considered as a proxy measure of the economic condition of the household. The index has been computed by taking into account information on the type of house, number of rooms, separate room for kitchen, toilet facility, source of drinking water facility, source of lighting, type of fuel used for cooking and other resources and material goods available in the household. Higher weightage has been given to responses that reflect a higher standard of living than other responses. The weights assigned to different items are given in the NFHS final report. The SLI score ranges from 0–14 for low SLI, 15–24 for medium SLI to 25–67 for a high SLI (IIPS & Macro, 2000, pp. 40–41).

Women's autonomy can be assessed by taking three dimensions into account, viz. women's mobility (freedom to visit places unescorted), access to economic resources and decision-making authority (Jejeebhoy, 2002). The NFHS-2 data provide sufficient information about all the three different dimensions giving scope to construct a composite index to assess women's autonomy. On the basis of available information, the female autonomy index has been computed for use in multivariate analysis. In the construction of the autonomy index different variables have been taken into account, such as who decides to go to health facilities (decision-making authority), who decides to purchase jewellery (decision-making authority), whether permission is needed to go to market (women's mobility), whether permission is needed to visit relatives (women's mobility) and whether permission is needed to keep money aside (access to economic resources). A higher weight was allocated if the women were involved in decision-making or do not require permission to go out. The composite index of

autonomy is sufficient in explaining maternal and child health outcomes (Singh *et al.*, 2007). Further, since autonomy was only a control variable, it was decided to use a single index instead of having different indices for the different components of women's autonomy.

To adjust for the presence of others at the time of interview a variable named 'presence of others during interview' has been included. Since the kinship structure varies by region of residence, particular attention was paid to adjust the estimates for region of residence. For this purpose India was divided into six regions based on the geographical locations and cultural settings. The six regions include north (Jammu & Kashmir, Himachal Pradesh, Punjab, Haryana, Rajasthan, Delhi and Uttaranchal), central (Uttar Pradesh, Madhya Pradesh and Chattisgarh), east (Bihar, Jharkhand, West Bengal and Orissa), north-east (Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim and Tripura), west (Gujarat, Maharashtra and Goa) and south (Andhra Pradesh, Karnataka, Kerala and Tamil Nadu). This analysis further includes variables related to dietary pattern as control variables in the model using BMI.

To examine the effect of household type on maternal health, bivariate and multivariate analyses were performed. Multinomial logistic regression was carried out to find out the determinants of contraceptive behaviour and the utilization of antenatal care services among couples. Here contraceptive behaviour was coded into three categories, namely, non-use of any method of contraception, use of a permanent method and use of a temporary method of contraception. The analysis of contraceptive use was restricted to 82,998 women. Of these 53% were not using any contraceptive, 35% were using permanent methods and only 12% were using temporary methods of contraception. The analysis of BMI was restricted only to non-pregnant women. Therefore, the sample size reduced to 77,204. Women who were pregnant at the time of survey were excluded to avoid increase in BMI readings due to pregnancy. The sample for the other two outcomes (utilization of antenatal care and safe delivery) included only those women who had at least one birth in the three years preceding the survey. Thus the sample consisted of only 32,766 women. Utilization of antenatal care was coded as no visit, visit in first trimester and visit after first trimester. Binary logistic regression has been used to find out the association between household type and BMI, and between household type and safe delivery.

Further, for each outcome four different sets of models were carried out to examine the unadjusted and adjusted effects of 'household type' on the outcome. This was done to understand the pathway through which 'household type' affects the outcome of interest. Model 1 gives the unadjusted effect of 'household type' on the four outcomes. Model 2 includes 'household type' and demographic variables. Model 3 includes socioeconomic variables along with the variables used in Model 2. The autonomy index is added in Model 4, along with the variables used in Model 3.

Results

Table 1 presents the percentage distribution of women by their background characteristics for the four dependent variables. A majority of women were illiterate,

not working, came from rural areas and belonged to the Hindu religion. The husbands of women were on average more educated than the women themselves. Women were exposed to any source of mass media in 53–60% of the cases. The percentage of women not working, having no exposure to mass media, having a low standard of living and coming from rural areas was much higher in the case of recent mothers compared with all women. Again, a higher percentage of recent mothers were found to be living with their in-laws in joint households than all women. The distribution by education, religion and caste was the same across all women and recent mothers. In about 30% of cases, some other person was present at the time of interview. In cases where somebody was present, the mother-in-law was present only during less than 1% of the interviews.

Contraceptive use behaviour of women aged 15–49 by background characteristics is presented in Table 2. The findings clearly suggest that women living in nuclear households were more likely to report use of a contraceptive method compared with women living in joint households with or without in-laws. However, there was no difference in the use of temporary methods of contraception among women living in nuclear households and those living in joint households. The presence of others at the time of interview was again found to be associated with the non-report of use of any contraceptive method. Women interviewed in complete privacy were more likely to report using a contraceptive method than women who were interviewed in the presence of others (50% as against 30–40%). The use of both temporary and permanent methods of contraception was higher when women were interviewed alone than when they were interviewed in the presence of others. The findings in the case of other variables were consistent with the findings of other studies. For example, educated women, working women, women from urban areas, women having exposure to mass media, and women belonging to high standard of living households were not only more likely to report using a contraceptive method, but were also more likely to report use of a temporary method of contraception compared with their counterparts. The association between the different background characteristics and contraceptive use was significant for almost all the characteristics.

Utilization of antenatal care and safe delivery by background characteristics of women aged 15–49 is given in Table 3, and Table 2 presents the data on BMI of women by the same background characteristics. Women living in joint households with in-laws and without in-laws were more likely to utilize antenatal care services compared with women living in nuclear households. In joint households, around 68% of women went for antenatal care as compared with 61% of women living in nuclear households. One finding is that women living in joint households were more likely to visit a health centre for antenatal care in the first trimester compared with women living in nuclear households. Therefore, the higher proportion of antenatal visits among women living in joint households is associated with more visits during the first trimester. However, there is no significant difference in the utilization of safe delivery and BMI by type of household. The percentage of health care facility/deliveries with a trained professional varies from 75 to 80% among women living in nuclear and joint households.

Like in the case of contraceptive use, there are expected associations between the other background characteristics and utilization of antenatal care and institutional

Table 1. Percentage distribution of women by background characteristics, India, NFHS 1998–99

Covariate and category	Contraceptive use		BMI		ANC and safe delivery	
	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>
Type of household						
Nuclear	39.1	32,067	39.4	30,453	33.1	10,822
Joint with in-laws	24.2	20,216	23.6	18,238	29.1	9519
Joint without in-laws	37.8	30,715	36.9	28,513	38.0	12,425
Education of women						
Non-literate	57.1	47,470	57.3	44,268	58.8	19,260
Literate<middle school	20.0	16,609	20.1	15,486	18.0	5908
Middle school complete	8.4	6990	8.3	6415	9.1	2974
High school complete	14.4	11,929	14.3	11,036	14.1	4624
Working status						
Not working	60.1	49,919	59.6	45,989	68.9	22,580
Working	39.9	33,080	40.4	31,215	31.1	10185
Place of residence						
Rural	73.7	61,133	73.4	56,658	77.8	25,499
Urban	26.3	21,865	26.6	20,546	22.2	7267
Mass media exposure						
None	40.3	33,438	40.1	30,934	47.3	15,491
Partial	12.2	10,113	12.3	9484	10.0	3263
Full	47.5	39,447	47.6	36,785	42.8	14,011
Education of husband						
Non-literate	30.8	25,539	30.9	23,818	31.5	10,333
Literate<middle school	25.8	21,391	25.8	19,943	23.8	7807
Middle school complete	13.5	11,077	13.2	10,225	14.5	4748
High school complete	30.1	24,992	30.1	23,219	30.2	9878
Standard of living index						
Low	33.7	27,962	33.5	25,889	37.7	12,348
Medium	46.2	38,343	46.0	35,542	46.6	15,255
High	20.1	16,694	20.4	15,773	15.8	5163
Religion						
Hindu	82.0	68,055	82.2	63,460	79.2	25,949
Muslim	12.1	10,006	11.8	9108	15.8	5177
Others	6.0	4938	6.0	4637	5.0	1639
Caste						
ST/SC	27.4	22,708	27.1	20,956	29.5	9678
OBC	33.4	27,724	33.4	25,817	32.1	10,514
Others	39.2	32,567	39.4	30,431	38.4	12,573
Presence of others during interview						
Nobody presents	69.7	57,837	—	—	—	—
Mother-in-law present	0.7	603	—	—	—	—
Others present	29.6	24,558	—	—	—	—

Table 1. Continued

Covariate and category	Contraceptive use		BMI		ANC and safe delivery	
	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>
Region						
South	18.6	15,543	26.4	20,408	19.0	6233
West	12.0	10,054	15.3	11,811	13.6	4470
North-east	12.3	10,306	3.5	2683	3.5	1134
East	18.1	15,180	23.0	17,771	21.8	7155
Central	15.5	13,020	19.7	15,194	29.2	9575
North	23.5	19,672	12.1	9337	12.8	4200
Women's autonomy index ^a						
0	26.7	22,173	26.1	20,172	34.2	11,206
1	32.8	27,257	32.5	25,055	36.2	11,864
2	15.3	12,737	15.5	11,994	14.0	4583
3	12.9	10,669	13.1	10,100	9.4	3093
4	7.1	5927	7.4	5721	4.4	1432
5	5.1	4235	5.4	4162	1.8	587

^aA higher value indicates higher autonomy.

delivery/delivery in the presence of a trained professional and BMI. With an increase in education, the chances of utilizing antenatal care in the first trimester and opting for safe deliveries were likely to increase. Seventy-three per cent of women among those educated above high school went for antenatal care in the first trimester compared with only 19% among non-literate women. Similarly, the percentage of safe deliveries varies from 70% among non-literate women to 95% among women educated above high school. Urban women, women exposed to mass media, women whose husbands were educated above high school, women who belonged to medium and high standard of living households, women who belonged to religions other than Hindu or Muslim, and women who belonged to castes other than SC/ST were more likely to utilize antenatal care in the first trimester. They were again more likely to either deliver their babies in medical institutions or deliver in the presence of a trained medical attendant compared with their counterparts. These are also the women who were more likely to have better BMIs than their counterparts.

The bivariate analysis clearly suggests that the type of household has a significant effect on contraceptive use, utilization of antenatal care and women opting for institutional delivery/delivery in the presence of a trained professional. To get the adjusted effects of type of household on the above dependent variables, multivariate analysis was carried out and the results are presented in Tables 4, 5 and 6. Further, it is worthwhile mentioning that the parameter estimates presented in Table 4 are relative to the reference category 'non-use' of contraception. Similarly, the parameter estimates for antenatal care (ANC), BMI and safe delivery are relative to the reference categories 'no ANC', 'low BMI' and 'unsafe delivery', respectively. Women living in joint households were less likely than women living in nuclear households to

Table 2. Percentage distribution of women aged 15–49 using a contraceptive method and having low and high BMI by selected socioeconomic and demographic characteristics, India, NFHS 1998–99^a

Covariate and category	Contraceptive use			BMI	
	No use	Temporary	Permanent	Low	High
Type of household					
Nuclear	44.5	11.8	43.7	37.0	63.0
Joint with in-laws	60.3	11.52	28.2	35.3	64.7
Joint without in-laws	58.2	11.2	30.7	35.7	64.3
Education of women					
Non-literate	58.7	5.8	35.5	42.9	57.1
Literate<middle school	46.8	12.23	41.0	33.0	67.0
Middle school complete	48.4	19.1	32.5	28.2	71.8
High school complete	44.4	28.6	27.0	17.8	82.2
Working status					
Not working	54.3	14.9	30.8	31.8	68.2
Working	52.0	6.5	41.5	42.5	57.5
Place of residence					
Rural	56.6	8.8	34.6	41.0	59.0
Urban	44.5	18.9	36.6	22.7	77.3
Mass media exposure					
None	64.3	6.3	29.4	44.9	55.1
Partial	47.0	12.9	40.1	18.8	81.2
Full	42.4	23.2	34.4	33.2	66.8
Education of the husband					
Non-literate	60.8	5.3	33.9	45.6	54.4
Literate<middle school	49.9	8.7	41.4	38.9	61.1
Middle school complete	53.6	13.1	33.3	35.0	65.0
High school complete	48.7	19.6	31.7	24.5	75.5
Standard of living index					
Low	62.2	6.3	31.5	47.9	52.1
Medium	52.7	10.4	37.0	35.8	64.2
High	40.2	23.0	36.8	17.4	82.6
Religion					
Hindu	52.5	10.4	37.1	37.2	62.8
Muslim	63.5	15.8	20.7	33.9	66.1
Others	45.9	18.1	36.0	25.1	74.9
Caste					
ST/SC	59.1	7.5	33.4	43.8	56.2
OBC	55.0	7.5	37.5	36.0	64.0
Others	48.0	17.7	34.3	30.9	69.1
Presence of others during interview					
Nobody present	50.3	12.4	37.4	—	—
Mother-in-law present	71.6	7.1	21.3	—	—
Others present	60.4	9.6	30.0	—	—

Table 2. Continued

Covariate and category	Contraceptive use			BMI	
	No use	Temporary	Permanent	Low	High
Region					
South	46.8	5.3	47.9	32.9	67.1
West	44.0	9.7	46.2	39.2	60.8
North-east	60.6	23.3	16.1	26.2	73.6
East	58.0	15.3	26.6	43.0	57.0
Central	65.5	10.3	24.2	37.0	63.0
North	48.7	18.4	33.0	27.5	72.5
Women's autonomy index ^b					
0	59.5	9.9	30.5	42.1	57.9
1	54.2	12.3	33.5	37.4	62.6
2	46.3	12.4	41.3	33.4	66.6
3	46.4	12.8	40.8	29.8	70.2
4	44.1	13.9	41.9	26.9	73.1
5	68.3	5.4	26.3	35.2	64.8

^a χ^2 test significant at 1% level for all variables.

^bA higher value indicates higher autonomy.

report use of either a temporary or a permanent method of contraception. The results do not change when one moves from Model 1 to Model 4. The association between household type and use of any method of contraception holds even after adjusting for other important socioeconomic and demographic characteristics. The result remains the same even after accounting for the presence of others at the time of interview. Again, the relative risk of reporting use of contraception by women varies with the presence of others at the time of interview. The chance of reporting use of temporary methods of contraception was 50% lower if the mother-in-law was present at the time of interview compared with cases where no one was present. The chance of report of a permanent method of contraception was 25% lower if the mother-in-law was present. In cases where others were present, the relative risk of report of contraceptive use was lower by 24–26% than cases when no one was present. The result suggests that the presence of others at the time of interview clearly affects the reporting of use of contraception by women.

Education of women, education of husband, place of residence, exposure to mass media, standard of living of household and autonomy of women were found to be significantly and positively associated with the report of use of contraception by women in the multivariate analysis as well. With an increase in the education of women and their husbands, the probability of reporting the use of temporary methods of contraception significantly increased. The increase in exposure to mass media was likely to increase the report of use of permanent methods of contraception as compared with report of use of temporary methods of contraception, as was also the case with an increase in education of women.

Table 3. Percentage distribution of women aged 15–49 utilizing antenatal care (ANC) and natal care (safe delivery) by selected socioeconomic and demographic characteristics, India, NFHS 1998–99^a

Covariate and category	ANC			Safe delivery ^b
	No visit	Within 3 months	After 3 months	
Type of household				
Nuclear	39.0	28.1	33.0	74.9
Joint with in-laws	32.3	35.4	32.3	79.9
Joint without in-laws	31.9	35.3	32.7	78.1
Education of women				
Non-literate	48.9	18.7	32.5	70.3
Literate<middle school	19.6	38.3	42.0	81.8
Middle school complete	13.8	52.7	33.5	88.2
High school complete	6.0	73.0	21.0	95.2
Working status				
Not working	33.5	35.8	30.7	80.3
Working	36.3	26.7	37.0	71.5
Place of residence				
Rural	40.2	26.7	33.1	73.3
Urban	13.8	55.1	31.1	92.3
Mass media exposure				
None	53.2	16.6	31.1	68.2
Partial	21.6	42.3	36.1	83.8
Full	4.1	70.6	25.3	95.3
Education of husband				
Non-literate	42.9	18.2	32.5	70.3
Literate<middle school	32.9	29.3	37.8	81.8
Middle school complete	30.8	34.0	35.3	88.2
High school complete	21.7	50.7	27.6	95.2
Standard of living index				
Low	45.2	20.5	34.3	69.3
Medium	33.0	33.4	33.6	78.9
High	12.5	61.4	26.1	93.2
Religion				
Hindu	34.9	32.5	32.6	76.7
Muslim	36.6	31.3	32.1	79.3
Others	18.7	45.3	35.9	85.9
Caste				
ST/SC	40.3	24.8	34.9	72.4
OBC	35.0	33.9	31.0	80.1
Others	29.2	38.4	32.3	79.4

Table 3. Continued

Covariate and category	ANC			Safe delivery ^b
	No visit	Within 3 months	After 3 months	
Region				
South	6.2	58.1	35.7	89.1
West	11.0	43.2	45.8	85.1
North-east	37.2	30.6	32.2	58.6
East	39.9	24.4	35.7	79.3
Central	56.7	19.6	23.7	63.2
North	39.8	30.4	29.7	87.3
Women's autonomy index ^c				
0	41.7	23.4	34.9	72.2
1	35.0	33.3	31.7	77.1
2	29.0	39.0	32.0	81.6
3	23.4	46.4	30.2	86.9
4	14.8	55.1	30.1	88.8
5	29.4	37.2	33.3	79.7

^a χ^2 test significant at 1% level for all variables.

^bSafe delivery is defined as delivery taking place in a medical institution or delivery assisted by a trained medical attendant.

^cA higher value indicates higher autonomy.

Age showed a positive association with report of use of both temporary and permanent methods of contraception by women. With increasing age women were more likely to use a permanent method of contraception. The coefficient of age squared suggests that the effect of age on the adoption of a permanent method of contraception significantly diminished with an increase in age. The adoption of contraception also increased with an increase in the number of children born to women. However, the increase in number of children did not have any effect on the increase in adoption of temporary methods of contraception.

As in the case of report of use of contraception, women living in joint households were less likely to utilize antenatal care compared with women living in nuclear households (Table 5). Women living in joint households where in-laws were present were less likely to either deliver in a medical institution or deliver in the presence of a trained medical attendant after adjusting the other characteristics (Table 6). However, no significant differences were found in the BMI of women living in nuclear and non-nuclear households after eliminating the effect of other variables (Table 6). Other variables were again significantly associated with the three dependent variables in the multivariate analysis (Tables 5 and 6). Women who were drinking milk occasionally, weekly or daily were more likely to have a BMI greater than 18.5 compared with women who never consumed milk. Women who consumed vegetables and meat daily were also more likely to have better nutrition than women who did not do so. Household type clearly has a significant effect on utilization of antenatal

Table 4. Multinomial regression results (RR)^a showing the effect of type of household and socioeconomic, demographic and autonomy related variables on contraceptive use, India, NFHS 98–99

Covariate and category	Model 1		Model 2		Model 3		Model 4	
	Temp	Perm	Temp	Perm	Temp	Perm	Temp	Perm
Type of household								
Nuclear (Ref.)								
Joint with in-laws	0.71***	0.47***	0.98	0.84***	0.70***	0.76***	0.68***	0.76***
Joint without in-laws	0.72***	0.53***	0.83***	0.70***	0.67***	0.65***	0.67***	0.63***
Age			1.64***	1.88***	1.49***	1.84***	1.47***	1.90***
Age ²			0.99***	0.99***	0.99***	0.99***	0.99***	0.99***
Children ever born			0.93***	1.06***	1.16***	1.14***	1.16***	1.21***
Education of women								
Non-literate (Ref.)								
Literate<middle school					1.86***	1.40***	1.82***	1.31***
Middle school complete					2.64***	1.24***	2.61***	1.17***
High school complete					3.19***	0.82***	3.51***	0.77***
Working status								
Not working (Ref.)								
Working					0.71***	1.32***	0.83***	1.13***
Place of residence								
Rural (Ref.)								
Urban					1.22***	1.01	1.39***	0.94
Mass media exposure								
None (Ref.)								
Partial					1.45***	2.06***	1.78***	1.67***
Full					1.47***	2.04***	1.69***	1.31***

Table 4. *Continued*

Covariate and category	Model 1		Model 2		Model 3		Model 4	
	Temp	Perm	Temp	Perm	Temp	Perm	Temp	Perm
Education of husband								
Non-literate (Ref.)								
Literate<middle school					1.41***	1.296***	1.45***	1.31***
Middle school complete					1.54***	1.00	1.53***	1.12***
High school complete					1.37***	0.89***	1.37***	1.01***
Standard of living index								
Low (Ref.)								
Medium					1.17***	1.22***	1.27***	1.25***
High					1.73***	1.48***	1.81***	1.56***
Religion								
Hindu (Ref.)								
Muslim					0.99	0.36***	1.06***	0.33***
Others					1.24***	0.88**	1.26***	0.83***
Caste								
ST/SC (Ref.)								
OBC					0.78***	1.19***	0.96	1.06**
Others					1.56***	1.31***	1.50***	1.26***
Women's autonomy index							1.03***	1.04***
Presence of other during interview								
Nobody present (Ref.)								
Mother-in-law present							0.51***	0.84
Others present							0.75***	0.80***

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

^aRelative risk.

'Temp' and 'Perm' indicate temporary and permanent methods of contraception, respectively.

Note: the results are adjusted for geographical regions of India.

Table 5. Multinomial regression (RR)^a results showing the effect of type of household and socioeconomic, demographic and autonomy related variables on utilization of antenatal care, India, NFHS 1998–99

Covariate and category	Model 1		Model 2		Model 3		Model 4	
	After 3 months	Within 3 months	After 3 months	Within 3 months	After 3 months	Within 3 months	After 3 months	Within 3 months
Type of household								
Nuclear (Ref.)								
Joint with in-laws	1.18***	1.52***	0.88**	1.01	0.81***	0.69***	0.79***	0.74***
Joint without in-laws	1.21***	1.53***	1.00	1.15***	0.94**	0.87**	0.86***	0.84***
Age			1.07***	1.36***	0.99	1.04**	0.99	1.03
Age ²			0.99**	0.99***	1.00	0.99	1.00	0.99
Children ever born			0.76***	0.53***	0.82***	0.71***	0.86***	0.77***
Education of women								
Non-literate (Ref.)								
Literate<middle school					2.27***	2.70***	1.89***	2.19***
Middle school complete					2.17***	3.71***	1.84***	3.00***
High school complete					2.44***	6.92***	1.97***	5.14***
Working status								
Not working (Ref.)								
Working					1.65***	1.55***	1.27***	1.11**
Place of residence								
Rural (Ref.)								
Urban					1.99***	2.74***	1.77***	2.41***
Mass media exposure								
None (Ref.)								
Partial					3.98***	6.51***	3.01***	4.12***
Full					1.94***	2.64***	1.63***	1.97***

Table 5. Continued

Covariate and category	Model 1		Model 2		Model 3		Model 4	
	After 3 months	Within 3 months	After 3 months	Within 3 months	After 3 months	Within 3 months	After 3 months	Within 3 months
Education of the husband								
Non-literate (Ref.)								
Literate<middle school					1.34***	1.43***	1.40***	1.55***
Middle school complete					1.12**	1.18**	1.38***	1.60***
High school complete					0.89**	1.09***	1.07	1.42***
Standard of living index								
Low (Ref.)								
Medium					0.95*	1.03	1.16***	1.29***
High					1.07	1.45***	1.56	2.27***
Religion								
Hindu (Ref.)								
Muslim					0.99	1.08	1.01	1.04
Others					1.39***	1.31**	1.23**	1.07
Caste								
ST/SC (Ref.)								
OBC					0.94*	1.13**	0.85***	0.91**
Others					1.07*	1.13**	1.07**	1.21***
Women's autonomy index							0.97**	1.06***

***p<0.01, **p<0.05, *p<0.10.

^aRelative risk.

Note: the results are adjusted for geographical regions of India.

Table 6. Logistic regression results (OR)^a showing the effect of type of household and socioeconomic, demographic and autonomy related variables on BMI and safe delivery, India, NFHS 1998–1999

Covariate and category	BMI				Safe delivery			
	Model 1	Model 2	Model 3	Model 4	Model 1	Model 2	Model 3	Model 4
Type of household								
Nuclear (Ref.)								
Joint with in-laws	1.08***	1.18***	0.97	1.01	1.34***	1.12**	0.88**	0.92**
Joint without in-laws	1.06**	1.09***	0.99	1.02	1.19***	1.05	0.90**	0.89**
Age		1.09***	1.02***	1.02**		1.15***	1.03	1.00
Age ²		0.99***	1.00	1.00		0.99***	1.00	1.00
Children ever born		0.89***	0.96***	0.96***		0.74***	0.84***	0.89***
Education of women								
Non-literate (Ref.)								
Literate<middle school			1.09***	1.09***			1.26***	1.15***
Middle school complete			1.13***	1.12**			1.63***	1.53**
High school complete			1.41***	1.35***			2.67***	2.31***
Working status								
Not working (Ref.)								
Working			0.82***	0.85***			0.89***	0.79***
Place of residence								
Rural (Ref.)								
Urban			1.47***	1.52***			2.49***	2.26***

Table 6. Continued

Covariate and category	BMI				Safe delivery			
	Model 1	Model 2	Model 3	Model 4	Model 1	Model 2	Model 3	Model 4
Mass media exposure								
None (Ref.)								
Partial			1.27***	1.19***			2.37***	2.06***
Full			1.05***	1.01			1.41***	1.29***
Education of husband								
Non-literate (Ref.)								
Literate<middle school			1.06***	1.08***			1.01	1.06
Middle school complete			1.11***	1.11			0.93*	1.08
High school complete			1.25***	1.25***			0.94	1.05
Standard of living index								
Low (Ref.)								
Medium			1.29***	1.22***			1.18***	1.25***
High			2.19***	1.98***			2.10***	2.19***
Religion								
Hindu (Ref.)								
Muslim			1.14***	1.12***			1.26***	1.27***
Others			1.41***	1.30***			1.25**	1.22**
Caste								
ST/SC (Ref.)								
OBC			1.14***	1.11***			1.24***	1.18***
Others			1.08***	1.08**			0.89**	0.92**
Women's autonomy index				1.05***				1.09**

Table 6. *Continued*

Covariate and category	BMI				Safe delivery			
	Model 1	Model 2	Model 3	Model 4	Model 1	Model 2	Model 3	Model 4
Milk consumption								
Never (Ref.)								
Weekly				1.07**				
Occasionally				1.10**				
Daily				1.26***				
Vegetable consumption								
Never (Ref.)								
Weekly				1.19				
Occasionally				1.19				
Daily				1.20				
Meat consumption								
Never (Ref.)								
Weekly				0.94**				
Occasionally				1.00				
Daily				1.19***				

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

^aOdds ratio.

Note: the results are adjusted for geographical regions of India.

and natal care services. However, in the case of nutrition of women, the type of household was no longer significant when the socioeconomic variables were included in Model 3. Further, dietary pattern plays an important role in determining the nutritional status of women (Model 4).

Discussion

The results of this analysis reveal that household type is an important factor in determining utilization of maternal health services, even after controlling for other socioeconomic and demographic factors. The chances of utilization of maternal health services like contraception and use of prenatal and natal care are significantly lower among women living in non-nuclear households compared with women living in nuclear households. The results of this study to this extent differ from the results of other studies, where women from extended households were more likely to use maternal health services (Matsumara & Gubhaju, 2001). In non-nuclear households, women may be less involved in deciding about the utilization of maternal health services. Again, in non-nuclear households the chances of discussion among spouses on such subjects may be lower than those in nuclear households. The NFHS-2 data clearly show a significant association between household type and discussion on family planning issues between spouses. Discussion between spouses has been found to be one of the important determinants of contraceptive use and other maternal health services (Oni & McCarthy, 1991; Salway, 1994; Omondi, 1997; Singh, 2007).

As far as the nutritional level of women is concerned, significant associations between household type and the nutritional status of women have not been found (measured in terms of BMI). It is an important finding as it goes against the general notion that women living in nuclear households have better nutrition than women living in non-nuclear households. On the contrary, the variable that was more important than the type of household in explaining the BMI of women was dietary pattern. Women who drank milk, or ate vegetables or meat occasionally or regularly, were found to have better nutrition compared with women who did not consume these items, even after controlling for other important variables. This finding has important policy implications for improving the nutritional level of women.

One of the important variables analysed in the study was the presence of others at the time of interview in the contraceptive use model. It was thought that other persons would be more likely to be present at the time of interview in non-nuclear households than in a nuclear households, and that their presence might 'contaminate' the responses of individual women. It is found that even if adjustment for the presence of a third person was made, the association between household type and contraceptive use remained strong and significant, leading to the conclusion that household type has an independent and significant effect on contraceptive use. Similarly, the presence of a third person at the time of interview was found to have an independent effect on contraceptive use; the report of use of any contraceptive was significantly less when someone was present than when no one was present. This finding is consistent with the findings of other studies (Krishna Mohan, 2004). The presence of a third person during the interview might have resulted in under-reporting of use of contraception in this particular case. Women may not like to disclose use

of contraception in the presence of others as contraception is still considered a private matter in most parts of the country. Often women may start using contraception without informing other members of the household. The Indian National Family Health Survey 2005–06 shows that a small proportion of women were covertly (i.e. without the knowledge of their husbands) using contraception at the time of survey. Other studies have also found that the presence of a third person during interview may undermine a respondent's ability to provide true answers (Tu, 2000).

To examine the pathway through which type of household affects maternal health indicators, four sets of models were constructed. In all four models a significant association between type of household and the maternal health indicators was found. Further, the strength of association did not change much after adding the different socioeconomic and demographic variables. This suggests that there are differences between the types of households that cannot be explained by cross-sectional surveys like the National Family Health Survey. In non-nuclear households women may not be able to realize their preferences because of the presence of in-laws. Mothers-in-law play a dominant role in deciding the timing and number of children in a majority of Indian households (Karra *et al.*, 1997). They put pressure on their sons, as they would like to see their grandchildren soon. It is often important to examine the perception of mothers-in-law or other older members in the household to understand the utilization of maternal and child health services. Mothers-in-law, in a study conducted in Pakistan, often reported that Islam does not allow family planning (Kadir *et al.*, 2003). Women whose mother-in-law reported discussing family planning with them were 2–3 times as likely to use contraceptives as were other women (Fikree *et al.*, 2001). The role of the mother-in-law in deciding use or non-use of contraception cannot be captured using cross-sectional data like the NFHS. The studies of Kadir *et al.* (2003) and Fikree *et al.* (2001) in Pakistan may provide clues as to how to capture the role of mothers-in-law in influencing the health-seeking behaviour of women. The autonomy of women was controlled in the models. But controlling the autonomy of women may not ensure that the effect of presence of mother-in-law or other in-laws on autonomy is ruled out.

Only in the case of antenatal care use do the relative risk ratios for household type reverse when other variables are entered into the model, despite the fact that the relative risk ratios remain significant. Newly wed women and younger women in India are more likely to stay in non-nuclear households compared with older women. This cohort of women is more likely to be educated and knowledgeable about reproductive health matters compared with the older cohort of women mostly living in nuclear households. Earlier studies have clearly shown that educated women are far more likely than uneducated women to utilize reproductive health services. Therefore, once the education of women and other characteristics related to women are controlled for in the subsequent models, the relative risk ratios for household type reverse.

It is also important to examine the role of different members of the household in deciding the utilization of prenatal and natal care for pregnant women. In non-nuclear households, it is mostly the other members of the household who decide the place of delivery, and previous studies have shown that deliveries are more likely to take place in medical institutions or to be assisted by health professionals if the husband decides about the type of care to be sought (Singh, 2007). It was not possible

to control for the effect of actual decision-maker on the utilization of prenatal and natal care in this study due to the absence of information on decision-making on maternal health-related issues.

Programmes and policies must make efforts to target women living in non-nuclear and poor households since they are the most vulnerable group and are the least likely to use services. The auxiliary nurse midwives (ANMs) and other health workers must direct their attention to such women. Health promotion programmes must also target husbands of women to increase the utilization of maternal health services and to improve the nutrition of women. Husbands should be provided with basic information regarding reproductive health issues related to their wives and the type of food to be consumed by women during and after pregnancy. In non-nuclear households, where women have less say in matters related to reproduction and health seeking, previous research has shown that husbands can play a key role in making decisions on the utilization of maternal health services and on the nutrition of women. Providing such information to mothers-in-law can also yield positive health benefits to pregnant and lactating mothers.

References

- Aquilino, W. S.** (1993) Effects of spouse presence during the interview on survey response concerning marriage. *Public Opinion Quarterly* **57**, 358–376.
- Avan, B. I. & Saima, A.** (2006) Role of family type in idealization of a larger number of children by husbands in Pakistan. *Journal of Biosocial Science* **38**, 203–220.
- Bebarta, P. C.** (1977) *Family Type and Fertility in India*. Christopher Publishing House.
- Bhatia, J. C. & Cleland, J.** (1995) Determinants of maternal care in a region of South India. *Health Transition Review* **5**, 127–142.
- Bloom, S. S. & Griffiths, P. L.** (2007) Female autonomy as a contributing factor to women's HIV-related knowledge and behaviour in three culturally contrasting states in India. *Journal of Biosocial Science* **39**, 557–573.
- Bloom, S. S., Wypij, D. & DasGupta, M.** (2001) Dimensions of women's autonomy and the influence on maternal health care utilization in a North Indian city. *Demography* **38**, 67–78.
- Celik, Y. & Hotchkiss, D. R.** (2000) The socioeconomic determinants of maternal health care utilization in Turkey. *Social Science and Medicine* **50**, 1797–1806.
- Cohen, B. J. B. & Gibor, Y.** (1980) Anaemia and menstrual blood loss. *Obstetrical & Gynecological Survey* **35**, 561–597.
- Dyson, T. & Moore, M.** (1983) On kinship structure, female autonomy, and demographic behaviour in India. *Population and Development Review* **9**, 35–54.
- Elo, I. T.** (1992) Utilization of maternal health care services in Peru: The role of women's education. *Health Transition Review* **2**, 49–69.
- Fikree, F. F., Khan, A., Kadir, M. M., Sajan, F. & Rahbar, M. H.** (2001) What influences contraceptive use among young women in urban squatter settlements of Karachi, Pakistan? *International Family Planning Perspectives* **27**, 130–136.
- Gage, A. J. & Calixte, M. G.** (2006) Effects of the physical accessibility of maternal health services on their use in rural Haiti. *Population Studies* **60**, 271–288.
- Geubbels, E.** (2006) Epidemiology of maternal mortality in Malawi. *Malawi Medical Journal* **18**, 206–225.
- GOI** (1995) *Health Information of India*. Government of India, New Delhi.

- Griffiths, P., Matthews, Z. & Hinde, A.** (2002) Gender, family, and the nutritional status of children in three culturally contrasting states of India. *Social Science and Medicine* **55**, 775–790.
- International Institute for Population Sciences (IIPS) & ORC Macro** (2000) *National Family Health Survey 1998–99*. IIPS, Mumbai, India.
- Jejeebhoy, S. J.** (1995) *Women's Education, Autonomy and Reproductive Behavior: Experience from Developing Countries*. Clarendon Press, Oxford.
- Kadir, M. M., Fikree, F. F., Khan, A. & Sajan, F.** (2003) Do mothers-in-law matter? Family dynamics and fertility decision making in urban squatter settlements of Karachi, Pakistan. *Journal of Biosocial Science*, **35**, 545–558.
- Karra, M. V., Stark, N. N & Wolf, J.** (1997) Male involvement in family planning: a case study spanning five generations of a South Indian family. *Studies in Family Planning* **28**, 24–34.
- Krishna Mohan, P. V. T.** (2004) On some methodological aspects of non-sampling errors in large scale sample surveys. PhD Thesis, International Institute for Population Sciences, Mumbai.
- McCarthy, J. & Maine, D.** (1992) A framework for analyzing the determinants of maternal mortality. *Studies in Family Planning* **23**, 23–33.
- Matsumara, M. & Gubhaju, B.** (2001) Women's status, household structure and the utilization of maternal health services in Nepal. *Asia Pacific Population Journal* **16**, 23–44.
- Mukhopadhyaya, A.** (1992) *State of India's Health*. Voluntary Health Association of India, New Delhi.
- Navaneetham, K. & Dharmalingam, A.** (2002) Utilization of maternal health care services in Southern India. *Social Science and Medicine* **55**, 1849–1869.
- Omondi-Odhiambo** (1997) Men's participation in family planning decisions in Kenya. *Population Studies* **51**, 29–40.
- Oni, G. A. & McCarthy, J.** (1991) Family planning knowledge, attitudes and practices of males in Ilorin, Nigeria. *International Family Planning Perspectives* **17**, 50–54 & 64.
- Pakrasi, K. & Malaker, C.** (1967) The relationship between family type and fertility. *Milibank Memorial Fund Quarterly* **45**, 451–460.
- Prasad, R. & Srivastava, D. C.** (1977) *Family Type Attitude of Newly Married Males Towards Appropriateness of their Age at Marriage, Desired Family Size and Family Planning*. Monograph Service No. 56, Demographic Research Center, Patna.
- Ram, F. & Singh, A.** (2006) Is antenatal care effective in improving maternal health in rural Uttar Pradesh? Evidence from a district level household survey. *Journal of Biosocial Science* **38**, 433–448.
- Salway, S.** (1994) How attitudes towards family planning and discussion between wives and husbands affect contraceptive use in Ghana. *International Family Planning Perspectives* **20**, 44–47.
- Singh, A.** (2007) Male involvement in family planning and maternal care: evidence from rural Ahmadnagar, Maharashtra. PhD Thesis, International Institute for Population Sciences, Mumbai.
- Singh, A., Hazra, A. & Ram, F.** (2007) Women's autonomy and sex differential in child mortality in India. *Genus* **LXIII**, 55–75.
- Smith, T. W.** (1997) The impact of the presence of others on a respondent's answers to questions. *International Journal of Public Opinion Research* **9**, 33–47.
- Stephenson, R. & Tsui, A. O.** (2002) Contextual influences on reproductive health service use in Uttar Pradesh, India. *Studies in Family Planning* **33**, 309–320.
- Sunil, T. S., Rajaram, S. & Zottarelli, C. K.** (2006) Do individual and program factors matter in the utilization of maternal care services in rural India? A theoretical approach. *Social Science and Medicine* **62**, 1943–1957.

- Thaddeus, S. & Maine, D.** (1994) Too far to walk: maternal mortality in context. *Social Science and Medicine* **38**, 1091–1110.
- Tu, S.** (2000) *The Presence of Others and Survey Response*. Social Statistics Section, American Statistical Association.
- UNICEF** (2005) *Well-being of Children and Women*. UNICEF and NSSO, New Delhi.
- UNICEF** (2005) <http://www.unicef.org/india> (accessed 20th November).
- Wagle, R., Sabroe, S. & Nielsen, B. B.** (2004) Socio-economic and physical distance to the maternity hospital as predictors for place of delivery: an observation study from Nepal. *BioMed Central Pregnancy and Childbirth* **4**, 8.