

Explaining the gap in use of maternal healthcare services between social groups in India

Abstract

Background In order to further reduce the maternal mortality ratio, India needs to narrow down the social inequity in the use of maternal healthcare services. This study quantifies the contribution of factors explaining the average gap in the use of full antenatal care, medical assistance at delivery and postnatal check-ups between Scheduled Castes/Scheduled Tribes (SCs/STs) and the remaining population in India.

Methods Using the most recent round of the National Family Health Survey conducted during 2005–06, this study quantifies the contribution of selected predictors explaining the gap in the use of maternal healthcare services between SCs/STs and the remaining population.

Results Coverage of all three services is considerably lower among women of SCs/STs than the remaining population. Differences in household wealth contribute about 37–55 per cent of the gap in use of the services between the social groups. A considerable part of the gap in coverage of medical assistance at delivery and postnatal check-ups is contributed by differences in the coverage of antenatal care.

Conclusions The Indian constitution provides reservation for SCs/STs in enrolment in government educational institutions and jobs. There is need for special policy in a similar way, to increase the coverage of maternal healthcare services among SCs/STs women of the country.

Keywords: Social groups, Antenatal care, Medical assistance at delivery, Postnatal check-up, Decomposition analysis, India.

Introduction

Scheduled Castes (SCs) and Scheduled Tribes (STs) are historically marginalised and disadvantaged social groups officially recognised and listed by the Constitution of India¹. According to the Census of India (2011), together they constitute 25.2% (about 300 million) of the total population of India – SCs contribute 16.6% and STs contribute 8.6%.² The Constitution of India has accorded them special status and provided reservation in politics, education and jobs; and various other arrangements such as laws that abolish the practices that perpetuate social inequities, and development programs specially designed to cater their needs³. Nevertheless, they continue to face multiple disadvantages compared to the rest of the population⁴⁻⁶. STs/STs have worse social and economic development indicators than rest of the population⁷. The same is true for their demographic and health indicators as well. SCs/STs have substantially lower wealth than other social groups in the country.⁸ Their life expectancy is relatively low and child and adult mortality relatively high.⁹⁻¹¹ They contribute about 50% of all maternal deaths in the country and their children are relatively more undernourished.¹²⁻¹³

One of the reasons behind such a dismal health situation prevailing among STs/STs is poor utilization of healthcare services. The same is true with regard to the utilization of maternal healthcare services.¹⁴ Previous studies conducted at national and sub-national level have shown the coverage of both antenatal care and institutional delivery is worse among SCs/STs compared to rest of the population.¹⁵⁻¹⁷ They find that low income, low education, remote location, and lack of awareness are the main factors responsible for low coverage of maternity services. These studies further suggest that social and cultural reasons as well as social discrimination by healthcare providers are also responsible for low coverage of the services among SCs/STs.

Although existing studies have documented the factors associated with low coverage of maternal healthcare services among different social groups, none of them, however, has quantified the contribution of factors explaining the average gap in the use of maternal healthcare services between SCs/STs and the remaining population. Since SCs/STs constitute about a quarter of the total population, raising the level of healthcare utilization among them may lead to a further reduction in maternal mortality and improvement in maternal health in India as a whole. The present study, therefore, aims to understand the respective contributions of the factors which explain the average gap in the use of maternal healthcare services between SCs/ STs and the remaining population.

For this purpose, we use cross-sectional data from the National Family Health Survey conducted during 2005–06 and employ the modified Blinder-Oaxaca decomposition method which is useful in explaining the gap in a non-linear (binary) outcome between two population groups.¹⁸ This decomposition technique explains the average gap in an outcome between groups through endowment and unobserved endowment. The endowment component explains the gap due to differences in the distribution of the determinants between the groups, while the coefficient component is the portion of the gap due to group differences in immeasurable or unobserved endowments. An advantage of the decomposition analysis over regression analysis is that it quantifies the contribution of factors that explain the average gap in an outcome between two groups. Understanding the contribution of the determinants that explain the gap in the use of maternal healthcare services is extremely important in order to design appropriate, context-relevant program and policy responses.

Methods

Data source

This study used the third round of the National Family Health Survey (NFHS–3) conducted in India during 2005–06. The NFHS–3 is a large scale and household-based survey and collected information spanning across the states and union territories of India. The main purpose of the survey was to provide reliable estimates of fertility and family planning, infant and childhood mortality, utilization of maternal healthcare services, maternal and childhood nutritional status etc. The survey adopted a multi-stage sampling design – two-stage sampling design in most of the urban areas and three-stage design in most of the rural areas. The survey collected information using household schedules, individual/women's schedule, and men schedule. The household and individual response rates were more than 95%. The detail about the sampling design, sample size, response rate and content of the schedule is given the national report of NFHS–3.¹⁹

Outcome variables

We used full antenatal care, medical assistance at delivery and postnatal check-ups as indicators of maternal healthcare services. These variables are defined as follows:

Full antenatal care: Those women who have visited for at least three antenatal check-ups and taken at least two tetanus injections and consumed iron folic tables/syrups for at least 90 days during their pregnancy are considered as having full antenatal care.²⁰

Medical assistance at delivery: It is defined as any home or institutional delivery assisted by medical professionals, such as a doctor, an Auxiliary Nurse Midwife (ANM)/Lady Health Visitor (LHV) or other health personnel. In the NFHS–3, the questions on birth attended by medical professionals are regarding the last three births with a reference period of five years.

Postnatal check-ups: Postnatal check-up is defined as postnatal care within 42 days after childbirth.²¹⁻²² In NFHS-3, this was estimated for the most recent live birth in five years preceding the survey date.

All three indicators were estimated for the most recent live birth with a reference period of the five years preceding the survey date in order to minimize the recall bias. Hence, the final analytical sample size was 36850 women (women with the most recent live births).

Predictors

The affiliation to a social group is the main predictor used in the analysis. Caste/tribe is defined based on the respondent's self-report as belonging to STs, SCs, OBC, and others. In the NFHS–3, information on caste/tribe was collected under four categories – SCs, STs, Other Backward Classes (OBC), and others. In the present analysis, we combine SCs and STs and refer to them as SCs/STs. The other two groups (OBC and others) are referred to as the “remaining population”.

The low use of health services in a population may be attributed to an array of supply and demand factors.²³⁻²⁵ Hence, looking into data availability and context, the present study includes a number of socioeconomic and demographic factors to assess their contribution in explaining the gap in the use of maternal healthcare services between SCs/STs and the remaining population. These variables are found to be significantly associated with the use of maternal healthcare services in India. The variables used in the analysis are – place of

residence (urban, rural), age of women at birth of the child (≤ 19 years, 20–24 years, 25–29 years, and ≥ 30 years), household wealth (poorest; poor; middle; rich; richest), women's education (no schooling, 1–5 years of schooling, 6–12 years of schooling, >12 years of schooling), husband/partner education (no schooling, 1–5 years of schooling, 6–12 years of schooling, >12 years of schooling), women's exposure to media (unexposed, exposed), current working status of the women (no, yes), birth order and interval (first order birth, higher order birth with less than <24 months intervals, higher order birth with 24–47 months intervals, higher order birth with ≥ 48 months intervals), women's autonomy (low, medium, high) and geographic region of residence within India (north, east, central, northeast, west, south). The geographic regions have been included to adjust state level variations in the progress of health and development indicators.

Previous studies have measured women's autonomy based on indicators of women's mobility (freedom to visit places unescorted) and decision-making authority.²⁶⁻²⁷ The NFHS-3 provides sufficient information on all these indicators to compute a women's autonomy index. Five decision-making indicators are used: (i) decision on own health care, (ii) decision on large household purchases, (iii) decision on purchase of daily household needs, (iv) decision on visits to family and relatives, (v) decision on spending husband's earnings. Three mobility indicators are used: (i) allowed to go to market, (ii) allowed to go to a health facility, and (iii) allowed to go outside the village. Based on these indicators a composite index is computed using Principal Component Analysis termed as women's autonomy and divided into three categories: relatively low, medium and high autonomy. The geographic regions are formulated based on the regional classification of the NFHS-3.¹⁹

Statistical analysis

Bivariate analysis is used to examine the differences in the use of full antenatal care, medical assistance at delivery, and postnatal check-ups between SCs/STs and the remaining population. We applied chi-square test to understand the nature of the association before putting the exposure variables into the multivariate analysis. Blinder-Oaxaca decomposition technique is a commonly used approach to identify and quantify the factors associated with inter-group differences in mean level of outcome.²⁸⁻²⁹ In the present study, this reveals how the differences in the use of the maternal healthcare services between the SCs/STs and remaining population can be explained by differences in socioeconomic status between the groups. This technique however is not appropriate if the outcome is binary (as in our case) in nature.¹⁸ Hence, we used the Blinder-Oaxaca decomposition technique modified for binary outcomes to decompose the gap between social groups in use of maternal healthcare services.¹⁸ For the decomposition analysis we used the *'fairlie'* command available in Stata 10. The decomposition method proposed by Fairlie (2005) is described in detail in Appendix 3. The exposure variables were tested for possible multicollinearity before entering them into the analysis. As the NFHS-3 used multistage sampling design, standard errors were adjusted for weighting and clustering in all estimations. The detail of the sampling weight is given in the report of NFHS-3.¹⁹

Results

Table 1 shows the differences in the selected socioeconomic indicators among the women of SCs/STs and the remaining population. Marriage and child bearing starts early among SCs/STs women compared to the women of remaining women.. Individual as well as husband's schooling is lower among the SCs/STs than the remaining population. For instance, only 5% of SCs/STs women have completed education up to high school; the

corresponding figure is 18% among the women of remaining population. About 40% SC/ST women belong to the poorest wealth quintile compared to only 14% women of the remaining population. Current use of contraceptive is 40% vs. 50% among the women of SCs/STs and remaining population respectively.. About 80% SCs/STs women live in rural area whereas about 60% women of the remaining population are rural dwellers.

Differences in use of maternal healthcare services between SCs/STs and remaining population

Figure 1 presents differences in the utilization of maternal healthcare services among women belonging to SCs/STs and the remaining population. The utilization of all three services is lower among SCs/STs than among the remaining population. The coverage of full antenatal care is 15% among SCs/STs women compared about 25% among the remaining population. A similar gap can be observed for medical assistance at delivery – 38% among the SCs/STs compared to 55% among the remaining population – and postnatal check-ups – 34% among SCs/STs compared to 45% among remaining population.

We have also carried out a binary logistic regression analysis to examine the determinants of full antenatal care, medical assistance at delivery, and postnatal check-ups across three population sub-groups – SCs/STs population, non-SCs/STs population and the overall population (combining them together). Our findings suggest significant influence of the membership of a social group on the use of the maternal healthcare services – SCs/STs women are significantly less likely to use all three maternal healthcare care services than the women in the remaining population. Regression results are not discussed in detail and can be referred to in Appendix 2.

Result of the decomposition analysis

We used Fairlie decomposition analysis to quantify the contribution of different socioeconomic and demographic predictors explaining the gap in use of maternal healthcare services between SCs/STs and the remaining population. Summary results of the decomposition analysis are presented in Table 2. Results indicate that after controlling other factors, the coverage of all three services is lower among SCs/STs than among the remaining population. For instance, the probability of full antenatal care is 0.172 among SCs/STs compared to 0.311 among remaining population. Similarly, the probability of medical assistance at delivery is 0.435 and 0.625, and the probability of postnatal check-ups is 0.378 and 0.525 among women of SCs/STs and the remaining population, respectively. Results further indicate that more than 70 per cent of such differences are explained by the factors included in the analysis. Even among the explained gap, 70–80 per cent of the gap is explained by the differences in the distribution of only some selected predictors such as household wealth, woman and her husband's education. The unexplained gap (about 20-30 per cent) might be associated with the other supply-side or structural factors which are not covered by the dataset.

Table 3 presents the details of decomposition analysis of the social gap in use of the maternal healthcare services in India. To make our result more convenient, we present the coefficient in terms of percentage (Figure 2). A positive contribution indicates that particular variable is widening the gap in the use of the services between SCs/STs and the remaining population. The converse holds true for a negative contribution. Household wealth is the main contributor explaining 37–55 per cent of the gap in use of the maternal healthcare services between SCs/STs and the remaining population. Woman's schooling is another important contributor

explaining 19–29 per cent of the gap in the use of the maternal healthcare services. Importantly, antenatal care visit has a greater contribution in explaining the gap in medical assistance at delivery (32%) and postnatal check-ups (38%) between women of SCs/STs and the remaining population. Husband's schooling and the place of residence are two other contributors widening the social gap within the use of all three maternal healthcare services. Woman's age at birth narrowed the gap, though its contribution is negligible. Surprisingly, exposure to mass media and woman's autonomy plays a negligible role in widening or reducing the social gap in use of the maternal healthcare services.

Discussion

Main findings of this study

Identification of the determinants which are responsible for the poor use of maternal healthcare services among socially deprived groups is vital from policy perspectives. Our findings show lower use of the maternal healthcare services among the SCs/STs women than the remaining population. This finding is consistent with the findings of previous national and sub-national studies from the country.^{15, 30-31} Lower use of the healthcare services among these socially deprived groups is mainly because they are at a disadvantage across nearly all determinants which affect maternal healthcare utilization. This study further provides an understating of the respective contributions of the factors – household wealth, woman's education, place of residence etc. – which explain the disparity between SCs/STs and the remaining population in the use of the maternal healthcare services. To accomplish this, the study employs Fairlie's decomposition method and decomposes the average gap in use of the maternal healthcare services between SCs/STs and the remaining population of India. This method allows quantifying the proportion of the gap that is due to differences in the distribution of determinants, and also the part due to differences in the effects of determinants.

The results reveal that the majority of the gap is attributed to differences in the distribution of household wealth, individual education, antenatal check-ups and place of residence. Given the fact that about 40% SCs/STs women belong to the poorest of the poor economic groups, it is not surprising that household economic status turns out to be the largest contributor widening the social gap in the use of healthcare services. The effect of household economic status on the use of maternal healthcare services is well documented.³²⁻³⁴ It is argued that poor SC/ST households do not have enough resources to pay for healthcare expenses. In contrast, the remaining population is wealthier and better-educated, may have a more modern world view, greater acquaintance with the modern healthcare system, greater confidence in dealing with health officials and workers and greater ability and willingness to travel outside the community for their health needs³⁵, all of which may facilitate the use of the maternity care.

Education of the women is another important contributor to the gap in the use of maternal healthcare services between SCs/STs and the remaining population. A lower level of education among SCs/STs is characterised with low awareness of health services, less knowledge of the benefits of preventive health care, poor communication with the husband and family members on health related issues and poor decision-making power within the family, low self-confidence, poor coping abilities and negotiating skills to reduce power differential towards healthcare providers and hence low ability to demand adequate services.³⁶

Rural residence of SCs/STs also appears as an important contributor explaining gap in the use of healthcare services. Previous studies have found that the geographical access to health facilities has a greater effect on utilization of healthcare services,³⁷⁻³⁸ particularly in rural areas with limited service provision.³⁹ In addition to accessibility, deep-rooted traditional beliefs and perceptions – *lay-health culture* – regarding childbearing and health-seeking behaviour among the rural SCs/STs might be another possible reason for their low use of maternity services. In rural India, pregnancy is still considered a natural state of being for a woman rather than a condition requiring medical care and women often do not avail preventive and curative medical services intended to safeguard their own health and well-being.⁴⁰

The antenatal check-up has an important contribution in explaining the gap in the use of medical assistance at delivery and postnatal check-up between SCs/STs and the remaining population. Such influence of the antenatal care could be understood by the fact that beyond the role of detecting malformation problems and other risk factors during pregnancy, antenatal check-up also acts as a means of educating women on the advantages of giving birth in medically-controlled conditions and having proper care after delivery.⁴¹

What is already known on the topic

Influence of caste/tribe on the use of healthcare services has already been articulated in India. However, there is a lack of evidence on the relative contribution of the factors explaining the average gap in the use of maternity services between social groups. A few studies have examined the factors affecting maternal healthcare utilization in India. Caste, along with wealth of the household, education of the women and her partner, place of residence have been found to be significantly associated with maternal healthcare use.¹⁴ SCs/STs have always lagged behind and are less likely to use maternal healthcare compared to rest of the population.¹⁵⁻¹⁷

What this study adds

To our knowledge, this study is the first study in India that has systematically investigated the factors that underlie and explain the gap in the use of maternal healthcare services between SCs/STs and the remaining population of India. The results obtained from the decomposition analysis clearly point out that the differences in the level of household wealth and women's education between SCs/STs and the remaining population contribute significantly to the gap in the use of the maternal healthcare services. The differences in the level of antenatal care also contribute considerably to the observed gap in the level of medical assistance at delivery and postnatal check-ups.

Our findings suggest that low use of maternal healthcare services among socially deprived groups should be addressed in order to increase the average level of service coverage in India. Although, the Government of India has made significant progress in increasing the coverage of antenatal care and institutional delivery under National Rural Health Mission⁴² – a major policy initiative to serve economically marginalized groups, a further success in lowering maternal mortality will be achieved by focusing on underserved social groups. As our findings indicate, this could be done by improving the level of education as well as economic status of SC/ST women; however this is possible only in the long-term. In the short-term, information dissemination and awareness generation can improve the use of subsidized maternal healthcare services. Moreover, there is also a need to ensure quality care as well as elimination of social discrimination against the SCs/STs at the health facilities. This

argument is backed by the evidence that lower caste women often elect home deliveries with traditional birth attendance from their community out of fear of being stigmatized and discriminated at health facilities.¹⁷ The other possible initiative may be to involve the SCs/STs in health-related interventions and programs. This study emphasizes that the health needs of the socially deprived groups be exclusively articulated in the proposed “National Health Packages” to ensure greater health equity, bridge gaps and reduce differentials among social groups in the country.⁴³

Limitations of this study

The methodological approach used in the study does not account for the contribution of the different effects of characteristics or "coefficients" of the groups. Due to data limitations, this study does not examine the influence of social discrimination on lower use of maternal healthcare services among the SCs/STs population as outlined by previous studies.^{15,44} The data limitations also prevented from accounting for the contribution of the supply side factors in social disparity in use of healthcare services. Another limitation is that there may be possibility of endogeneity between antenatal care and delivery care (when antenatal care is considered as a predictor of delivery care), which has not been taken into account.

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Table 1 Comparison of selected characteristics of married women by social groups in India, 2005–06

	SCs/STs	Remaining population
Mean age at marriage	17.7	18.9
Mean age at first birth	19.4	20.9
% of women attended high school and above	4.7	18.2
% of partners attended high school and above	20.4	43.4
% of women belonging to poorest wealth quintile	40.1	13.6
% of women with no media exposure	38.8	24.1
% of women living in rural area	81.6	63.6
% of women currently not using any contraceptive	60.1	49.6
% Children stunting	48.6	35.5

Figure 1 Percentage of women using maternal health services across social groups in India, 2005–06

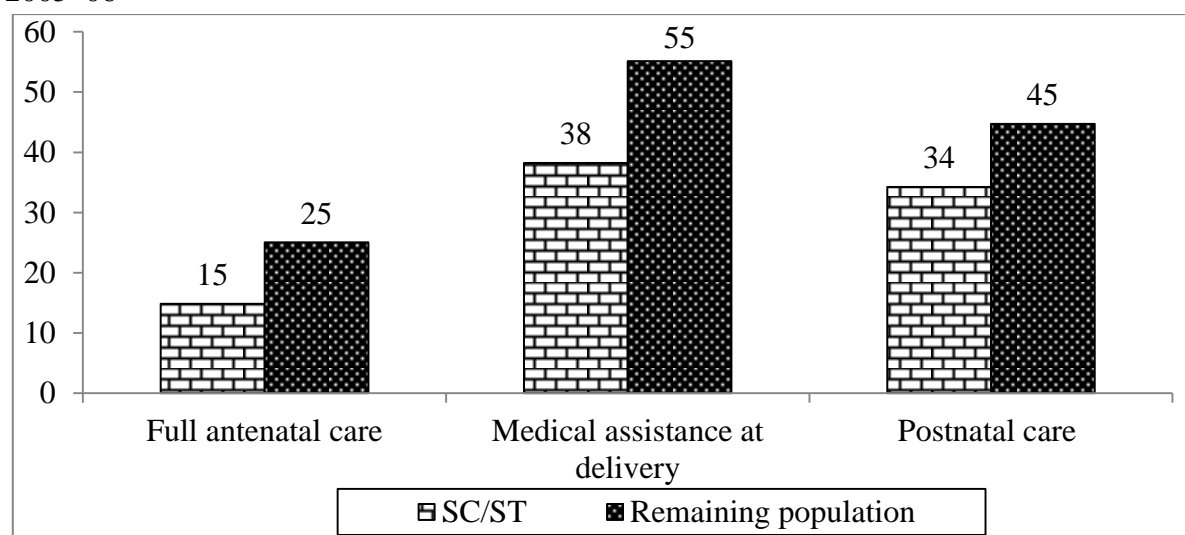


Table 2 Summary result of Fairlie decomposition analysis showing the mean differences in the use of maternal healthcare services between social groups in India, 2005–06

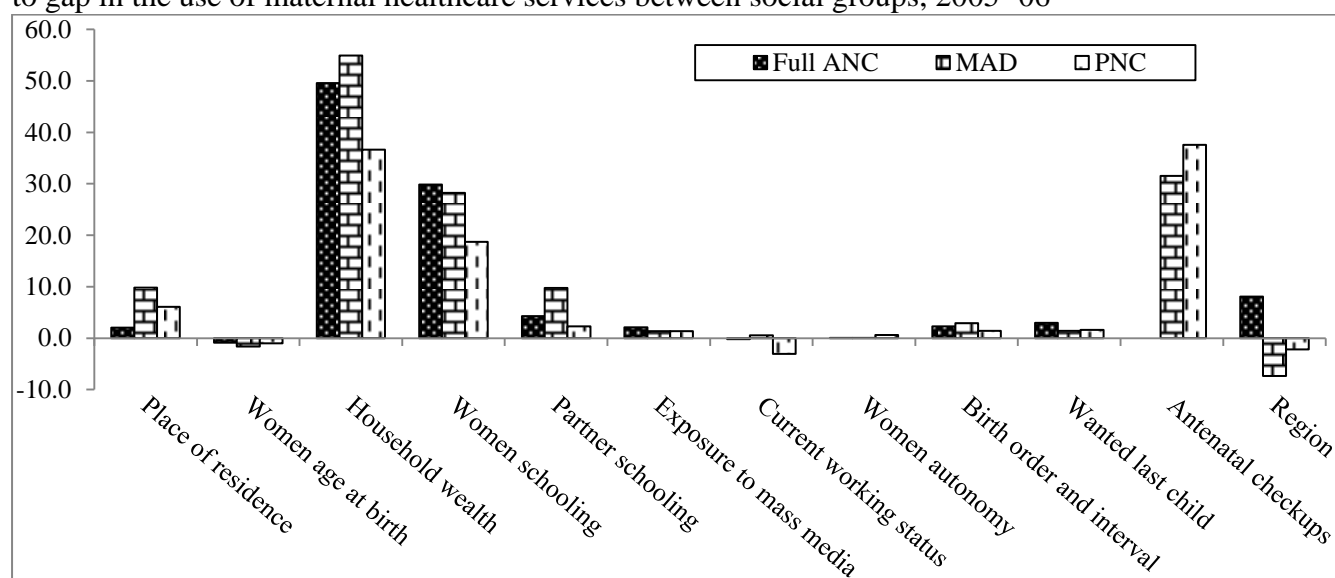
	Full antenatal care	Medical assistance at delivery	Postnatal check-ups
Mean prediction among SCs/STs	0.172	0.435	0.378
Mean prediction among remaining population	0.311	0.624	0.525
Raw differentials	0.139	0.189	0.147
Total explained	0.100	0.132	0.119
% Explained	71.8	70.1	80.9
% Unexplained	28.2	29.9	19.1

Table 3 Fairlie decomposition of average gap in the use of maternal healthcare services between social groups in India, 2005–06

	Full antenatal care		Medical assistance at delivery		Postnatal check-ups	
	Coefficient	P-value	Coefficient	P-value	Coefficient	P-value
Place of residence	0.002	0.06	0.009	0.00	0.007	0.00
Women age at birth	-0.001	0.00	-0.002	0.00	-0.001	0.00
Household wealth	0.049	0.00	0.050	0.00	0.043	0.00
Women education	0.030	0.00	0.026	0.00	0.022	0.00
Husband education	0.004	0.00	0.009	0.00	0.003	0.04
Exposure to mass media	0.002	0.00	0.001	0.07	0.002	0.01
Current working status	0.000	0.65	0.001	0.53	-0.004	0.00
Autonomy index	0.000	0.99	0.000	0.90	0.001	0.14
Birth order and interval	0.002	0.00	0.003	0.00	0.002	0.00
Wanted last child	0.003	0.00	0.001	0.00	0.002	0.00
Region	0.008	0.00	0.042	0.00	0.045	0.00
Antenatal care	NA	NA	-0.007	0.00	-0.003	0.00

NA: Not applicable for full antenatal care

Figure 2 Result of Fairlie decomposition analysis showing contribution (%) of each covariate to gap in the use of maternal healthcare services between social groups, 2005–06



Appendix 1 Percentage of women with most recent live birth during the five years preceding the survey years by background characteristics in India, 2005–06

Background characteristics	%	n
Social group		
SCs/STs	30.4	12064
Remaining population	69.6	23153
Place of residence		
Urban	26.8	14527
Rural	73.2	22323
Age at birth of women		
<20 years	17.3	5324
20-24 years	39.9	14091
25-29 years	26.4	10557
>29 years	16.3	6878
Household wealth		
Poorest	24.1	6154
Poor	21.7	6468
Middle	19.6	7418
Rich	18.3	8136
Richest	16.3	8674
Women education		
No education	47.5	14142
1-5 years of schooling	13.9	5203
6-12 years of schooling	32.7	14215
>12 years of schooling	6.0	3289
Husband education		
No education	28.0	8307
1-5 years of schooling	14.8	5213
6-12 years of schooling	46.0	17904
>12 years of schooling	11.1	5007
Women exposure to media		
Unexposed	30.9	8468
Exposed	69.2	28364
Current working status of women		
Not working	70.0	25897
Working status	30.1	10872
Women autonomy		
Low	33.2	9689
Medium	33.1	11436
High	33.8	14825
Birth order and interval		
First order	26.4	10394
Higher birth order and interval <24months;	18.0	6487
Higher birth order and interval 24-47 months	40.1	13778
Higher birth order and interval ≥48 months	15.4	6096
Wanted last child		
Not wanted	12.6	4187
Wanted but later	9.5	3848
Wanted then	78.0	28797
Antenatal check-ups		
No	62.7	19828
Yes	37.3	16619
Region		
North	32.2	11201
Central	23.6	5870
East	6.9	2992
Northeast	12.0	8270
West	8.3	3089
South	16.9	5428
Total number of respondents		36850

Appendix 2 Binary logistic regression (coefficient) showing the determinants of use of maternal healthcare services in India, 2005–06

	SCs/STs			Remaining population			Combined		
	Full ANC	MAD	PNC	Full ANC	MAD	PNC	Full ANC	MAD	PNC
Social group									
SCs/STs®									
Remaining population	NA	NA	NA	NA	NA	NA	0.18 ^a	0.23 ^a	-0.04
Place of residence									
Urban®									
Rural	-0.23 ^b	-0.52 ^a	-0.27 ^a	-0.08	-0.34 ^a	-0.26 ^a	-0.12 ^a	-0.41 ^a	-0.27 ^a
Age at birth of women									
<20 years®									
20-24 years	0.18 ^b	0.10	0.13	0.26 ^a	0.14 ^b	0.19 ^a	0.24 ^a	0.11 ^b	0.16 ^a
25-29 years	0.30 ^b	0.05	0.12	0.43 ^a	0.26 ^a	0.28 ^a	0.39 ^a	0.17 ^a	0.21 ^a
>29 years	0.19	0.14	0.14	0.40 ^a	0.28 ^a	0.31 ^a	0.33 ^a	0.20 ^a	0.22 ^a
Household wealth									
Poorest®									
Poor	0.35 ^b	0.14 ^b	0.26 ^a	0.37 ^a	0.25 ^a	0.12	0.32 ^a	0.21 ^a	0.16 ^b
Middle	0.48 ^a	0.59 ^a	0.58 ^a	0.69 ^a	0.58 ^a	0.49 ^a	0.56 ^a	0.58 ^a	0.51 ^a
Rich	0.82 ^a	1.06 ^a	0.91 ^a	1.08 ^a	1.03 ^a	0.71 ^a	0.94 ^a	1.04 ^a	0.75 ^a
Richest	1.38 ^a	1.64 ^a	1.19 ^a	1.65 ^a	1.69 ^a	1.18 ^a	1.50 ^a	1.66 ^a	1.16 ^a
Women education									
No education®									
1-5 years of schooling	0.32 ^b	0.27 ^a	0.24 ^b	0.50 ^a	0.29 ^a	0.22 ^a	0.43 ^a	0.28 ^a	0.15 ^a
6-12 years of schooling	0.63 ^a	0.54 ^a	0.33 ^a	0.78 ^a	0.62 ^a	0.53 ^a	0.72 ^a	0.59 ^a	0.46 ^a
>12 years of schooling	1.05 ^a	1.65 ^a	0.81 ^a	1.35 ^a	1.80 ^a	1.05 ^a	1.28 ^a	1.77 ^a	1.01 ^a
Husband education									
No education®									
1-5 years of schooling	0.22 ^b	0.16 ^b	0.08	0.31 ^a	0.18 ^b	0.19 ^b	0.27 ^a	0.18 ^a	0.15 ^b
6-12 years of schooling	0.21 ^b	0.25 ^a	-0.06	0.22 ^b	0.27 ^a	0.09	0.22 ^b	0.26 ^a	0.03
>12 years of schooling	0.28 ^b	0.24 ^a	-0.10	0.37 ^a	0.50 ^a	0.24 ^a	0.35 ^a	0.43 ^a	0.14 ^b
Women exposure to media									
Unexposed®									
Exposed	0.32 ^a	0.23 ^a	0.24 ^a	0.35 ^a	0.16 ^b	0.19 ^a	0.34 ^a	0.19 ^a	0.22 ^a
Current working status of women									
Not working®									
Working status	-0.02	-0.05	-0.06	0.03	-0.06	0.15 ^a	0.01	-0.07 ^b	0.06
Women autonomy									
Low®									
Medium	0.18 ^b	-0.02	-0.10	0.05	0.12 ^b	-0.01	0.08 ^b	0.07 ^c	-0.04
High	0.14 ^b	0.04	-0.08	0.06	0.07	0.05	0.07	0.04	-0.02
Birth order and interval									
First order®									
Higher birth order and interval <24months	-0.50 ^a	-0.87 ^a	-0.78 ^a	-0.52 ^a	-0.79 ^a	-0.30 ^a	-0.53 ^a	-0.81 ^a	-0.37 ^a
Higher birth order and interval 24-47 months	-0.45 ^a	-0.91 ^a	-0.42 ^a	-0.51 ^a	-0.82 ^a	-0.31 ^a	-0.50 ^a	-0.85 ^a	-0.35 ^a
Higher birth order and interval ≥48 months	-0.16 ^a	-0.58 ^a	-0.23 ^b	-0.19 ^a	-0.48 ^a	-0.24 ^a	-0.18 ^a	-0.50 ^a	-0.22 ^b
Wanted last child									
Not wanted®									
Wanted but later	0.27 ^b	-0.08	0.20 ^b	0.40 ^a	0.15	0.24 ^b	0.35 ^a	0.08	0.23 ^a
Wanted then	0.24 ^b	0.02	0.17 ^b	0.44 ^a	0.19 ^b	0.35 ^a	0.39 ^a	0.12 ^b	0.28 ^a
Antenatal check-ups									

No [®]									
Yes	NA	1.13 ^a	1.16 ^a	NA	1.18 ^a	1.09 ^a	NA	1.17 ^a	1.13 ^a
Region									
North [®]									
Central	0.30 ^b	0.27 ^a	0.40 ^a	0.25 ^a	0.66 ^a	0.42 ^a	0.26 ^a	0.54 ^a	0.40 ^a
East	0.81 ^b	0.09	0.20 ^a	0.81 ^a	0.54 ^a	0.23 ^a	0.82 ^a	0.38 ^a	0.22 ^a
Northeast	-0.17	0.06	-0.29 ^a	0.13 ^b	0.44 ^a	0.09	-0.08	0.29 ^a	-0.11 ^b
West	0.56 ^a	0.81 ^a	0.83 ^a	0.62 ^a	1.08 ^a	0.73 ^a	0.60 ^a	0.99 ^a	0.74 ^a
South	1.37 ^a	1.37 ^a	1.41 ^a	1.43 ^a	1.65 ^a	1.56 ^a	1.42 ^a	1.56 ^a	1.50 ^a
Constant	-3.34^a	-1.15^a	-1.67^a	-3.88^a	-1.70^a	-2.28^a	-3.76^a	-1.65^a	-2.04^a
Pseudo R2	0.16	0.29	0.21	0.23	0.36	0.27	0.22	0.35	0.26

Full ANC: Full antenatal care; MAD: Medical assistance at delivery; PNC: Postnatal check-ups.

®: Reference category; ^ap<0.01; ^bp<0.05;

NA: Not applicable

Appendix 3

Fairlie Decomposition (2005)

This technique decomposes inter-group difference in the mean level of an outcome into those due to different observable characteristics or endowments across groups and those due to differences in immeasurable or unobserved endowments of groups.

The decomposition for a nonlinear equation $y = F(x\beta)$ can be written as¹⁷:

$$\bar{y}^O - \bar{y}^S = \left[\sum_{i=1}^{N^O} \frac{F(x_i^O \beta^O)}{N^O} - \sum_{i=1}^{N^S} \frac{F(x_i^S \beta^O)}{N^S} \right] + \left[\sum_{i=1}^{N^O} \frac{F(x_i^S \beta^O)}{N^S} - \sum_{i=1}^{N^S} \frac{F(x_i^S \beta^S)}{N^S} \right]$$

where, N^j is the sample size for interest group j . y^j is the average probability of the binary outcome of the interest group j and F is the cumulative distribution function from the logistic distribution. Here, superscripts O and S stand for ‘remaining population’ and ‘SCs/STs’. The first term in brackets in the equation above represents the part of the gap between social groups due to group differences in distributions of entire set of independent variables, and the second term represents the part due to differences in the group processes determining levels of y . The second term also captures the portion of the group gap due to group differences in immeasurable or unobserved endowments.

To find the total contribution, we need to calculate two sets of predicted probabilities by SCs/STs and the remaining population and take the difference between the average values of the two. However, obtaining the contribution of a specific covariate is not straightforward. As the sample sizes of the two groups are not the same, we need to carry out a regression for pooled data (SCs/STs and the remaining population together) and calculate the predicted probabilities, for each SCs/STs and the remaining population observation in the sample. Since the remaining population sample is bigger than SCs/STs sample, a random subsample of the remaining population equal in size to the full SCs/STs sample should be drawn. Each observation in the remaining population sample and full SCs/STs sample is then separately ranked by predicted probabilities and matched by their respective rankings. This procedure

matches the SCs/STs mothers who have characteristics placing them at the bottom (top) of their distribution with mothers from remaining population who have characteristics placing them at the bottom (top) of their distribution. Now assume that $N^1=N^2$ and a natural one-to-one matching of SCs/STs and remaining population observations exist. Also assume that there are two independent variables to explain the social gap in maternal care use.

Using coefficient estimates from a logit regression for a pooled sample, the independent contribution of x_1 to the group gap can then be expressed as:

$$\frac{1}{N^S} \sum_{i=1}^{N^S} F(\hat{\alpha} + x_{1i}^O \hat{\beta}_1^* + x_{2i}^O \hat{\beta}_2^*) - F(\hat{\alpha} + x_{1i}^S \hat{\beta}_1^* + x_{2i}^O \hat{\beta}_2^*)$$

Similarly, the gap due to x_2 can be expressed as:

$$\frac{1}{N^S} \sum_{i=1}^{N^S} F(\hat{\alpha} + x_{1i}^S \hat{\beta}_1^* + x_{2i}^O \hat{\beta}_2^*) - F(\hat{\alpha} + x_{1i}^S \hat{\beta}_1^* + x_{2i}^S \hat{\beta}_2^*)$$

The contribution of each variable to the gap is thus equal to the change in the average predicted probability from replacing SCs/STs distribution with remaining population' distribution while holding the distributions of the other variables constant.

However, the assumption of equal sample size is rarely true in the real world. Since the remaining population sample is substantially larger, a large number of random subsamples of the mothers of the remaining population (equal size to total SCs/STs sample) are drawn to match each of them to the SCs/STs sample and calculate separate decomposition. Finally, the mean value of all these separate decomposition estimates is used as an approximate decomposition for the entire remaining population sample. We used 1000 replications of such decomposition and presented the average result. It must be noted here that increasing the number of replications increases the stability of the results.