

Why Women Choose to Delivery at Home in India: A Study of Prevalence, Factors, and Socio-Economic Inequality

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Why women choose to delivery at home in India: A study of prevalence, factors, and socio-economic inequality

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46 Why women choose to delivery at home in India: A study of prevalence, factors, and 47 socio-economic inequality

Abstract:

49 **Background:** Most of childbirth complications usually arise during the time of delivery and
50 are difficult to predict, but can be effectively managed through delivery at the health facility
51 equipped with skilled birth attendants placed in an enabling environment. Despite many efforts
52 put by the Government to reduce maternal and neonatal deaths through institutional birth
53 deliveries, statistics suggest that these deaths are still very high in India. This study sought to
54 determine the prevalence of home births and identifying the factors influencing women choice.

55 **Methods:** Data from the National Family Health Survey (NFHS) conducted during 2005-06
56 and 2015-16 was used in the study. The respondents were women 15-49 years, a sample of
57 36,850 and 1, 90,898 women from two time period were included in the study. Multivariate
58 logistic regression was used to determine the factors influencing home delivery.

59 **Results:** Women's who give birth at home has reduced by 39.6% from 58.5%. As compared
60 to women below 18 years, those who were above 25 years were less likely to give birth at home
61 [OR: 0.57; CI: 0.49-0.68] and [OR: 0.76; CI:0.70-0.82]. Women with full ANC visit were less
62 likely to give birth at home as compare to women with no ANC visit [OR: 0.34; CI: 0.28-0.41]
63 and [OR: 0.41; CI: 0.38-0.45]. In central India the odds of delivering babies at home was high
64 in 2005-06 [OR: 1.15; CI: 1.01-1.32] whereas in 2015-16 the situation was opposite [OR: 0.92;
65 CI: 0.87 -0.98] in reference to women from north India.

66 **Conclusion:** There is a need to promote institutional deliveries, special focus to be given to
67 poor women, women with higher parity, uneducated women, and rural women. Much work
68 needs to be done in the rural parts of the country as rural women were more likely to opt for
69 home delivery than their counterparts.

70 Keywords: Place of delivery; Home delivery; Socio-economic inequality; India

Why women choose to delivery at home in India: A study of prevalence, factors, and socio-economic inequality

Background:

The choice of place of delivery has been mostly found to be associated with maternal and neonatal outcomes. Maternal and neonatal mortality arising from inadequate health services has been identified as the global challenge that has seen Southern Asian countries contributes about 20% of global maternal deaths and 38% of global neonatal deaths in 2017 [1], [2]. Most authors highlighted the factors associated with this maternal and fetal deaths is the occurrence of home deliveries as they are mostly unplanned, accidental and unhygienic [3], [4]. According to the latest estimates, over 800 women around the world died everyday from complications in pregnancy and childbirth [1]. Globally the major reasons of maternal deaths are haemorrhage, hypertensive disorders, sepsis, unsafe abortion and embolism [5]. These complications usually arise during the time of delivery and are difficult to predict, but can be effectively managed and deaths can be prevented through delivery at the health facility equipped with skilled birth attendants placed in an enabling environment [6]. This raise concerns that if women give birth unattended by trained health workers, the risk of dying due to complications arising during childbirth may not be prevented. Moindi et al., (2015) acknowledge that the presence of skilled birth attendant during childbirth in a hygienic environment with necessary skills and equipment to identify and manage any emerging complications reduce the likelihood of women and child death during the delivery process [7]. Most pregnancy and birth complications are timely manage in the health facility [8], unlike home delivery where women are not attended by skilled birth attendant and the chances of complications resulting to death is high [9], [10].

94 The Government of India launched the Janani Suraksha Yojana (JSY) programme in
95 2005 with the objective to reduce maternal and neonatal mortality by encouraging institutional
96 delivery [11]. An evaluation of this cash incentive programme in 2007-2008 shows an increase

97 of Anti Natal Care (ANC) visits and institutional delivery [12]. However, this has not translated
98 into reduction of maternal and neonatal mortality rate [13], as these rates are still being reported
99 significantly high in India [1], [2]. The global estimated shows that there were 295,000
100 maternal deaths in 2017, India alone contributes about 12% (35,000) of global maternal deaths
101 [1], and about 26% of the global neonatal deaths [14].

102 Many studies related to this subject using qualitative and quantitative approach have
103 argued that there are factors that influence the choice of place of delivery [15]–[17]. The
104 significant factors that have been indentified are: distance to health facilities (women who have
105 to travel long distance to the health facilities end up giving birth at home) [6]: cost (when the
106 expenses are high and the delivering mother is of low income groups they might not afford to
107 pay the hospitalisation bills) [18] or (giving birth at home may be attributed to unavailability
108 of cash for transportation even in a case of free maternal health services) [19]: level of
109 knowledge and access to ante natal care (where mothers with lower knowledge about safe
110 delivery are more likely to delivery at home as compare to those with higher knowledge) [20],
111 [21]. Further, Das & Hammer, (2014) explained that people were not using institutional
112 delivery because of the quality of health facility is low [22]. Previous study also acknowledge
113 that the quality of care received during pregnancy has been found to positively associated with
114 the use of skilled delivery care [10].

115 There is dearth of knowledge as to why women still give birth at home in India despite
116 government interventions in promoting institutional delivery by giving cash assistance.
117 Existing studies on the subject of home delivery in India were mostly based from micro level
118 data from different sections of the country and the results may not represent the entire
119 population [16], [23], [24]. Hence this study tries to fill this gap by using the data from the
120 national representative survey to determine the prevalence of home birth among women and
121 identifying the factors influencing their choice. Identifying the factors which determine the

122 choice of place of delivery will help in reducing maternal and neonatal mortality target of the
123 Sustainable Goal 3 through increase child birth at health facility supervised by skilled birth
124 attendant.

125 **Methods:**

126 **Data**

127 The data for this study has been derived from the two rounds of the National Family Health
128 Survey (NFHS): NFHS-3 and NFHS-4, which were carried out in 2005-06 and 2015-16
129 respectively. The NFHS series is a cross-sectional national representative survey, conducted
130 under the stewardship of the Ministry of Health and Family Welfare (MoHFW), Government
131 of India, and provides the information on population, health and nutrition for India and each
132 state/union territory. NFHS-3 gathered information from 124,385 women aged 15-49 years
133 whereas in NFHS-4, interviews were conducted with 601,509 households, and 699,686 women
134 aged 15-49 years. The survey used a two-stage stratified sampling procedure for the selection
135 of the sample where the sampling frame was taken from the national census for the selection
136 of primary sampling units (PSUs). PSUs were villages in rural areas and Census Enumeration
137 Blocks (CEBs) in urban areas. PSUs with fewer than 40 households were linked to the nearest
138 PSU. Within each rural stratum, villages were selected from the sampling frame with
139 probability proportional to size (PPS). The detailed methodology, sampling design and data
140 collection procedure, was published in the survey report. The effective sample size for the study
141 was 36,850 and 190,898 women aged 15-49 years who gave recent child during five year
142 preceding the survey for NFHS 2005-06 and 2015-16, respectively.

143 **Outcome variable**

144 The question was asked to women ‘Where did you give birth to (NAME)?’ The responses were
145 home (included your home, parents’ home and other home), public health sector (included

146 govt./municipality hospital, government dispensary, uhc/uhp/ufwc, chc/rural hospital/block
147 phc, phc/additional phc, sub-centre, other public sector health facility) and private (included
148 hospital/maternity home/clinic, other private sector health facility, ngo or trust hospital/clinic,
149 other). The outcome variable was dichotomous and coded as '1' if women delivered at home
150 and '0' otherwise.

151 **Predictor variables**

152 The predictors included age at first birth (<18 years, 18-24 years and 25 years or more), parity
153 (first, second, third and four or more), antenatal care (no, partial and full), skill birth attendant
154 (no and yes), mass media exposure (no and yes), educational attainment (no schooling, primary,
155 secondary, and higher), caste (Scheduled Caste, Scheduled Tribe, Other Backward Class,
156 others), religion (Hindu, Muslim, and others), wealth index (poor, middle, rich), place of
157 residence (urban and rural), and region (North, Central, East, Northeast, West, and South).

158 **Statistical analysis:**

159 The bivariate and multivariate logistic regression analysis were applied to assess the factors
160 associated to home deliveries. In bivariate analysis, a chi-square test was performed to assess
161 the association of socio-demographic factors with home deliveries. The study included
162 variables in multivariate analysis that were statistically significant ($p<0.05$) in bivariate
163 analysis. The adjusted odds ratio with a 95% confidence interval were presented in results.

164 ***Concentration Index (CI)***

165 Income related inequality in home delivery was quantified by the concentration index (CI) and
166 the concentration curve (CC), using the wealth score as the socio-economic indicator and
167 binary outcome as home delivery. The concentration curve is obtained by plotting the
168 cumulative proportion of poor health against the cumulative proportion of the population
169 ranked by the socio-economic indicator. The concentration index can be written as follows:

$$C = \frac{2}{\mu} cov(\mathbf{y}_i, \mathbf{R}_i)$$

170
 171 Where, C is the concentration index; y_i is the outcome variable index; \mathbf{R} is the fractional rank
 172 of individual i in the distribution of socio-economic position; μ is the mean of the outcome
 173 variable of the sample and cov denotes the covariance.

174 If the curve lies above the line of equality, the concentration index takes a negative value,
 175 indicating a disproportionate concentration of inequality among the poor (pro-rich).
 176 Conversely, if the curve lies below the line of equality, the concentration index takes a positive
 177 value, indicating a disproportional concentration of inequality among the rich (pro-poor). In
 178 absence of socio-economic related inequality, the concentration index is zero.

179 ***Decomposition of the concentration index***

180 The study used Wagstaff decomposition analysis to decompose the concentration index.
 181 Wagstaff's decomposition demonstrated that the concentration index could be decomposed
 182 into the contributions of each factor to the income-related inequalities. Based on the linear
 183 regression relationship between the outcome variable y_i , the intercept α , the relative
 184 contribution of x_{ki} and the residual error ε_i

$$185 \quad y_i = \alpha + \sum \beta_k x_{ki} + \varepsilon_i$$

186 Where ε_i is an error term, given the relationship between y_i and x_{ki} , the CI for y (C) can be
 187 rewritten as:

$$188 \quad C = \sum \left(\frac{\beta_k \bar{x}_k}{\mu} \right) C_k + \frac{G\varepsilon}{\mu} / \mu$$

189 Where μ is the mean of y_i , \bar{x}_k , is the mean of x_k , β_k is the coefficient from a linear regression
190 of outcome variable, C_k is the concentration index for x_k (defined analogously to C, and GC_ϵ is
191 the generalized concentration index for the error term (ϵ_i).

192 Here C is the outcome of two components: First, the determinants or ‘explained’ factors. The
193 explained factors indicate that the proportion of inequalities in the outcome (home delivery)
194 variable is explained by the selected explanatory factors, i.e., x_k . Second, a residual or
195 ‘unexplained’ factor $(\frac{GC_\epsilon}{\mu})/\mu$, indicating the inequality in health variable that cannot be
196 explained by selected explanatory factors across various socioeconomic groups.

197 **Results:**

198 Table-1 reveals the socio-demographic profile of study population in India. In 2005-06 almost
199 8.2% of women had age at first birth of 25 years or more whereas the in 2015-16 it was 15.4%.
200 In 2005-06 women with parity four and more was 27.8% whereas in 2015-16 it decreased to
201 15.3%. Women who received full ante-natal care (ANC) increased from 11.2% in 2011-06 to
202 19.5% in 2015-16. Women who delivered babies using skilled birth attendant increased from
203 49.8% in 2011-06 to 83.4% in 2015-16. Women with no education substantially decreased
204 from 2005-06 (47.4%) to 2015-16 (27.6%).

Table 1. Socio-demographic profile of study population in India.

Background characteristics	2005-06		2015-16	
	Percentage	Sample	Percentage	Sample
Age at first birth				
<18 years	30.5	9,132	13.0	23,627
18-24 years	61.3	22,829	71.6	1,35,243
25 or more years	8.2	4,889	15.4	32,028
Parity				
First parity	26.4	10,394	33.6	61,807
Second parity	28.7	10,934	34.5	62,484
Third parity	17.2	6,297	16.6	33,064
Four or more parity	27.8	9,225	15.3	33,543
Ante-natal care				
No	21.0	7,191	9.6	21,879

Partial	67.8	24,632	70.9	1,36,617
Full	11.2	5,027	19.5	32,402
Skilled birth attendant				
No	50.2	16,182	16.6	37,685
Yes	49.8	20,668	83.4	1,53,112
Mass media exposure				
No Exposure	30.9	8,486	24.6	49,374
Exposure	69.1	28,364	75.4	1,41,524
Educational status				
No Education	47.4	14,095	27.6	55,165
Primary	14.0	5,251	13.5	26,712
Secondary	32.7	14,215	46.9	88,871
Higher	6.0	3,289	12.0	20,150
Caste				
Scheduled Caste	20.0	6,331	21.2	35,170
Scheduled Tribe	9.4	5,733	10.3	37,889
Other Backward Class	40.0	11,858	43.6	74,060
Others	30.5	12,928	25.0	43,779
Religion				
Hindu	78.9	25,806	78.9	1,38,343
Muslim	16.4	5,851	16.1	29,309
Others	4.8	5,193	5.0	23,246
Wealth index				
Poor	45.8	12,622	44.5	90,521
Middle	19.6	7,418	19.9	38,393
Rich	34.6	16,810	35.6	61,984
Place of residence				
Urban	26.8	14,527	29.7	47,833
Rural	73.2	22,323	70.3	1,43,065
Region				
North	12.8	6,557	13.2	36,079
Central	28.0	7,875	25.7	52,952
East	25.3	5,847	25.4	39,243
Northeast	4.1	6,965	3.9	28,825
West	12.9	4,178	13.1	13,892
South	16.9	5,428	18.7	19,907
Total	100.0	36,850	100.0	1,90,898

205

206 Table-2 represents bivariate and logistic regression analysis estimates for women delivering
 207 babies at home by their background characteristics in India. Women with age at first birth 25
 208 years or more had lower likelihood to deliver babies at home in comparison to women whose
 209 age at first birth was less than 18 years (2005-06 [OR: 0.57; CI: 0.49-0.68] and 2015-16 [OR:
 210 0.76; CI: 0.76-0.82]). Women with four or more parity had higher odds to deliver babies at

211 home in comparison to women with parity one (2005-06 [OR: 1.70; CI: 1.49-1.92] and 2015-
 212 16 [OR: 2.16; CI: 2.03-2.30]. women with full ANC had lower likelihood to deliver babies at
 213 home in comparison to women with no ANC (2005-06 [OR: 0.34; CI: 0.28-0.41] and 2015-16
 214 [OR: 0.41; CI: 0.38-0.45]). Women who delivered babies using SBA had lower likelihood to
 215 deliver babies at home (2005-06 [OR: 0.002; CI: 0.002-0.003] and 2015-16 [OR: 0.01; CI:
 216 0.01-0.01]) in reference to women who do no deliver using SBA. In 2015-16 women with
 217 media exposure had lower likelihood to deliver babies at home in comparison to women who
 218 had no media exposure [OR: 0.89; CI: 0.84-0.93]. Women from higher educational status had
 219 lower odds to deliver babies at home in comparison to women who had no education (2005-06
 220 [OR: 0.33; CI: 0.26-0.42] and 2015-16 [OR: 44; CI: 0.39-0.49]). Women from rich wealth
 221 index had lower likelihood to deliver babies at home in comparison to women from poor wealth
 222 quintile (2005-06 [OR: 0.51; CI: 0.45-0.58] and 2015-16 [OR: 0.65; CI: 0.61-0.71]). Women
 223 from rural areas had higher likelihood to deliver babies at home in comparison to women from
 224 urban areas (2005-06 [OR: 1.94; CI: 1.76-2.14] and 2015-16 [OR: 1.12; CI: 1.06-1.18]). The
 225 regional differences in case of women delivering babies at home is quite diverse and significant
 226 change was visible in last one decade. In central India the odds of delivering babies was high
 227 in 2005-06 [OR: 1.15; CI: 1.01-1.32] whereas in 2015-16 the situation was opposite [OR: 0.92;
 228 CI: 0.87 -0.98] in reference to women from north India. In case of Eastern and North-Eastern
 229 India the overall women delivering babies at home got lowered. The odds however were lower
 230 in 2005-06 (East [OR: 0.73; CI: 0.63-0.84] and North-East [OR: 0.88; CI: 0.76-1.01]) and
 231 higher in 2015-16 (East [OR: 1.37; CI: 1.29-1.47] and North-East [OR: 1.45; CI: 1.35-1.57])
 232 in comparison to women from North India. The odds for women delivering babies at home was
 233 low in Western and Southern India in comparison to North India in 2005-06 and 2015-16.

Table 2. Bivariate and logistic regression analysis estimates for women delivering babies at home by their background characteristics in India.

Background characteristics	2005-06		2015-16	
	%	AOR (95% CI)	%	AOR (95% CI)

	*		*	
Age at first birth				
<18 years	74.9	Ref.	28.9	Ref.
18-24 years	54.8	0.86***(0.78 -0.96)	18.7	0.95*(0.9 -1.01)
25 or more years	25.5	0.57***(0.49 -0.68)	11.4	0.76***(0.70-0.82)
Parity	*		*	
First parity	38.9	Ref.	9.0	Ref.
Second parity	49.1	1.49***(1.34 -1.66)	15.4	1.63***(1.54 -1.72)
Third parity	67.1	1.95***(1.72 -2.21)	26.1	2.02***(1.9 -2.15)
Four or more parity	81.6	1.70***(1.49 -1.92)	40.5	2.16***(2.03 -2.30)
Ante-natal care	*		*	
No	87.7	Ref.	43.2	Ref.
Partial	56.5	0.70***(0.62 -0.8)	19.2	0.59***(0.55 -0.62)
Full	16.1	0.34***(0.28 -0.41)	5.6	0.41***(0.38 -0.45)
Skilled birth attendant	*		*	
No	99.5	Ref.	88.3	Ref.
Yes	17.2	0.002***(0.002 -0.003)	5.0	0.01***(0.01 -0.01)
Mass media exposure	*		*	
No Exposure	81.9	Ref.	37.5	Ref.
Exposure	48.1	1.03(0.92 -1.17)	12.8	0.89***(0.84 -0.93)
Educational status	*		*	
No Education	80.5	Ref.	36.6	
Primary	61.0	0.83***(0.73 -0.94)	24.7	0.89***(0.84 -0.94)
Secondary	35.1	0.70***(0.63 -0.79)	10.8	0.68***(0.65 -0.72)
Higher	7.0	0.33***(0.26 -0.42)	3.1	0.44***(0.39 -0.49)
Caste	*		*	
Scheduled Caste	65.2	Ref.	19.7	Ref.
Scheduled Tribe	80.7	1.34***(1.18 -1.52)	30.0	1.08**(1.01 -1.16)
Other Backward Class	59.7	1.71***(1.47 -2.00)	17.8	1.40***(1.31 -1.5)
Others	45.8	1.48***(1.33 -1.65)	15.4	1.02(0.97 -1.09)
Religion	*		*	
Hindu	58.0	Ref.	17.1	Ref.
Muslim	64.7	0.84***(0.73 -0.96)	28.1	1.52***(1.43 -1.61)
Others	45.5	1.03(0.89 -1.19)	17.0	1.57***(1.46 -1.7)
Wealth index	*		*	
Poor	81.5	Ref.	31.4	Ref.
Middle	58.9	0.75***(0.66 -0.85)	13.4	0.82***(0.77 -0.86)
Rich	27.8	0.51***(0.45 -0.58)	6.2	0.65***(0.61 -0.70)
Place of residence	*		*	
Urban	29.5	Ref.	9.7	Ref.
Rural	69.1	1.94***(1.76 -2.14)	22.8	1.12***(1.06 -1.18)

Region	*		*	
North	59.3	Ref.	14.6	Ref.
Central	77.1	1.15**(1.01 -1.32)	26.6	0.92**(0.87 -0.98)
East	69.6	0.73***(0.63 -0.84)	27.8	1.37***(1.29 -1.47)
Northeast	70.2	0.88*(0.76 -1.01)	28.8	1.45***(1.35 -1.57)
West	36.2	0.36***(0.3 -0.42)	9.0	0.50***(0.45 -0.55)
South	24.7	0.21***(0.17 -0.24)	4.1	0.35***(0.31 -0.39)
Total	58.5		18.9	

* $p < 0.001$ based on chi-square test of significance; *** $p < 0.001$, ** $p < 0.05$, * $p < 0.10$; AOR: Adjusted odds ratio; CI: Confidence Interval

234

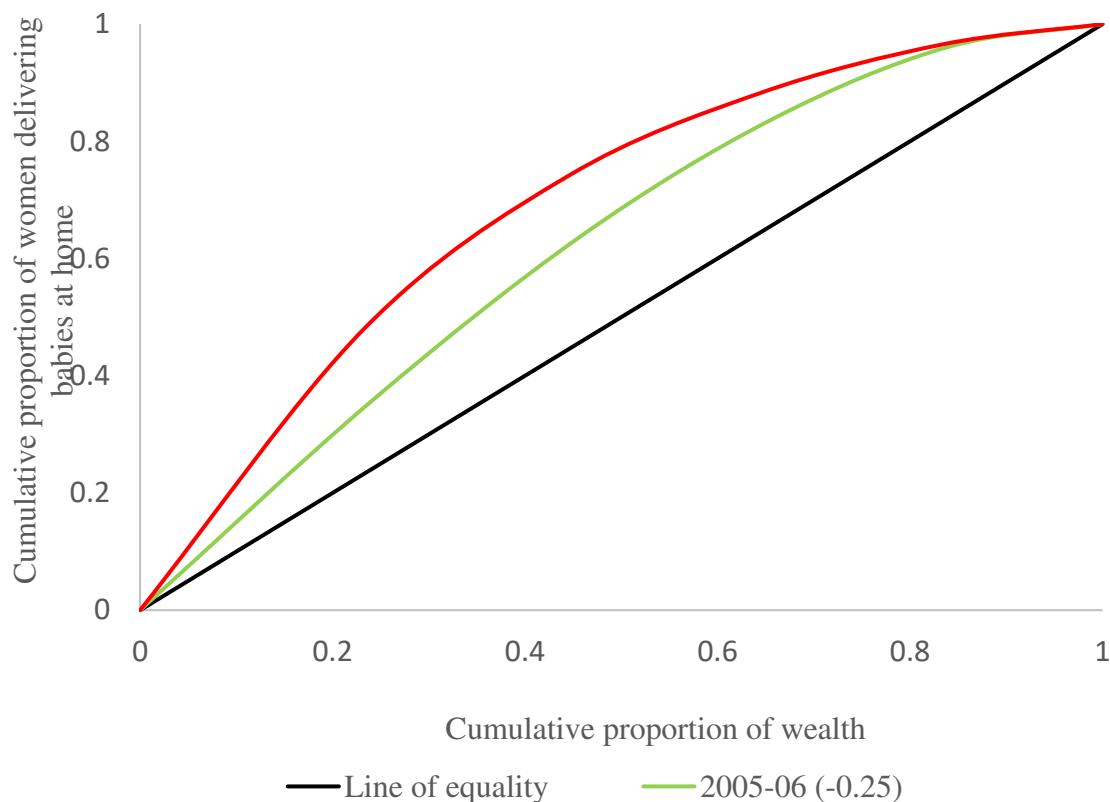
235 Figure-1 provide concentration curve for women delivering babies at home in India. It was
 236 found that the value of CI increased from -0.25 to -0.39 from 2005-06 to 2015-16; this depicts
 237 that the outcome variable (herein women delivering babies at home) got more concentrated
 238 among women from lower socio-economic status. This is a cause of concern as poorer women
 239 are at higher risk for delivering babies at home.

240 Table-3 provides decomposition analysis estimates for women delivering babies at home by
 241 their background characteristics in India. The first column is for coefficients from logistic
 242 regression analysis; second and third column are for elasticity and concentration index (CI)
 243 whereas the fourth column (absolute contribution) is the product of elasticity and CI. Fifth
 244 column (% contribution) is the proportion of absolute contribution multiplied by 100. The main
 245 aim of the decomposition analysis is to provide explain % contribution for socio-economic
 246 status (SES) related inequality for women delivering babies at home. Skilled birth attendant
 247 explained 70.3% and 68.6% of SES related inequality for women delivering babies at home in
 248 2005-06 and 2015-16 respectively. Moreover, wealth index explained 8.0% and 7.2% of SES
 249 related inequality followed by educational status (6.1% and 6.0%) and region (3.8% and 6.9%)
 250 for women delivering babies at home in 2005-06 and 2015-16 respectively. It was interesting

251 to observe that place of residence contributed less to explain SES related inequality for women
252 delivering babies at home in 2015-16 (0.7%) than in 2005-06 (5.2%).

253

254



255

256 Figure-1. Concentration curve for women delivering babies at home in India.

Table 3: Decomposition analysis estimates for women delivering babies at home by their background characteristics in India.

Background characteristics	2005-06					2015-16				
	Coefficient	Elasticity	CI	Absolute contribution	% contribution	Coefficient	Elasticity	CI	Absolute contribution	% contribution
Age at first birth										
<18 years										
18-24 years	-0.148	-0.008	0.065	-0.001	0.4	-0.049	-0.008	-0.013	0.000	-0.1
25 or more years	-0.555	-0.004	0.408	-0.002	1.1	-0.273	-0.003	0.256	-0.001	1.0
Parity										
First parity										
Second parity	0.398	0.008	0.139	0.001	-0.8	0.489	0.007	0.090	0.001	-0.9
Third parity	0.669	0.008	-0.040	0.000	0.2	0.704	0.006	-0.126	-0.001	1.1
Four or more parity	0.528	0.009	-0.280	-0.003	1.8	0.770	0.008	-0.378	-0.003	4.0
Ante-natal care										
No										
Partial	-0.352	-0.004	0.033	0.000	0.1	-0.535	-0.030	-0.042	0.001	-1.7
Full	-1.082	-0.006	0.478	-0.003	2.1	-0.892	-0.009	0.306	-0.003	3.8
Skilled birth attendant										
No										
Yes	-6.182	-0.351	0.287	-0.101	70.3	-4.916	-0.647	0.077	-0.050	68.6
Mass media exposure										
No Exposure										
Exposure	0.033	-0.002	0.185	0.000	0.3	-0.120	-0.013	0.180	-0.002	3.3
Educational status										
No Education										
Primary	-0.185	-0.002	-0.046	0.000	0.0	-0.116	-0.002	-0.203	0.000	-0.4
Secondary	-0.356	-0.013	0.350	-0.005	3.2	-0.385	-0.014	0.159	-0.002	3.1
Higher	-1.105	-0.005	0.797	-0.004	2.9	-0.826	-0.004	0.622	-0.002	3.3

Caste										
Scheduled Caste		0.003	-0.168	-0.001	0.4	0.077	0.000	-0.139	0.000	-0.1
Scheduled Tribe	0.291	0.004	-0.421	-0.002	1.2	0.335	0.002	-0.372	-0.001	0.9
Other Backward Class	0.537	0.012	-0.001	0.000	0.0	0.024	0.000	0.031	0.000	0.0
Others	0.395									
Religion										
Hindu										
Muslim	-0.176	0.000	0.001	0.000	0.0	0.417	0.005	0.017	0.000	-0.1
Others	0.028	0.000	0.222	0.000	0.0	0.454	0.001	0.213	0.000	-0.4
Wealth index										
Poor										
Middle	-0.289	-0.002	0.112	0.000	0.1	-0.203	-0.003	0.089	0.000	0.4
Rich	-0.667	-0.017	0.654	-0.011	7.9	-0.425	-0.008	0.644	-0.005	6.8
Place of residence										
Urban										
Rural	0.663	0.041	-0.179	-0.007	5.2	0.113	0.003	-0.191	0.000	0.7
Region										
North										
Central	0.143	-0.003	-0.152	0.000	-0.3	-0.080	0.000	-0.127	0.000	0.1
East	-0.314	-0.007	-0.214	0.001	-1.0	0.318	0.008	-0.331	-0.003	3.5
Northeast	-0.130	-0.001	-0.075	0.000	0.0	0.375	0.001	-0.181	0.000	0.2
West	-1.030	-0.010	0.279	-0.003	2.0	-0.695	-0.003	0.226	-0.001	1.1
South	-1.583	-0.021	0.207	-0.004	3.1	-1.044	-0.005	0.291	-0.001	2.0
Calculated CI					-0.143	100.0			-0.073	100.0
Actual CI					-0.247				-0.391	
Residual					-0.104				-0.318	
CI: Concentration Index										

Discussion:

This article attempted to examine the risk factors associated with women delivering babies at home. Also, we tried to decompose the estimates for women delivering babies at home to examine the contribution of various factors contributing to baby deliveries at home. The results found improvements, over the decade, in the prevalence of women delivering baby at home, it declined from 58.5% in 2005-06 to 18.9% in 2015-16. Despite decline in prevalence of women delivering babies at home over the decade, the result noticed increase in concentration of women delivering babies at home towards poor, it rises from -0.25 in 2005-06 to -0.39 in 2015-16. It means more of poor women were delivering babies at home in 2015-16 than in 205-06. Furthermore, this study noticed certain factors that were contributing to the risk of women delivering babies at home. Women with low age at first birth, with higher parity, without antenatal care, without skilled attendant at birth were more likely to delivering babies at home than their counterparts. Moreover, women who had mass media exposure, educated women, Scheduled Tribes women, women from richest wealth quintile household, and urban women were less likely to deliver babies at home than their counterparts. Skilled attendants at birth was the biggest contributory factor, during both the time-periods, which explained socio-economic inequality in the prevalence of baby deliveries at home.

The results expectedly found huge decline in the prevalence of women delivering babies at home, a decline of around 40 percent point from 58.5% in 2005-06 to 18.9% in 2015-16. This decline can be attributed to the improvements in maternal and child health care services that took place in the country after 2005-06 [25], [26]. Age of the mother at their first born child is an important predictor of baby delivery at home. Results evidently concluded that as age of the mother at first birth increases, the odds of delivering baby at home declines. In other words, as age of a mother increases, there is a higher probability that she might choose institutional

delivery over delivering her baby at home. Increasing maternal age may increase the perception of risk, thus reducing the chances of home delivery [27].

The results noticed that higher the parity, the more likely the mothers were to give birth at home. Previous studies also suggest that birth order or parity is important driver of institutional delivery and with higher parity or birth order chances of institutional delivery decreases among women, rising the odds of home delivery among them [28], [29]. The likely reason to choose home delivery by mothers with higher parity is that they perceive delivery as a normal process and develop confidence to give birth at home [30]. It is plausible that after delivering the birth previously, subsequent deliveries are perceived to be of low risk, thus increasing the likelihood of delivering subsequent babies at home [27]. Women prefer to use skilled delivery care for their first delivery but then withdraw from utilizing skilled delivery services for subsequent births. This finding is interesting, however raises certain speculation for why women with higher parity do not prefer to use such services? It is because of previous unpleasant experience with institutional delivery or due to factors related to high cost associated with skilled care services or as a part of social practice [31]. Further explorations required to examine the reason for this finding.

Ante-natal care and skilled attendant at birth are another significant variables that affected the maternal choice of planning their delivery accordingly. Results from both the time-periods evidently noted that mothers who opted for ante-natal care and SBA were less likely to go for home delivery. Previous studies in various Indian settings are in line with this finding [27]. Studies conducted in other developing countries also in concordance with the finding of this study [32], [33]. Women who opt ANC and SBA are more likely to receive guidance from health professionals that may prompt them to go for institutional delivery [33]. Furthermore, those who receive ANC from the beginning of their delivery care receive motivation to opt for SBA in an institutional care during their delivery [34], [35].

The study noticed education status of the mother as an important predictor of mothers delivering babies at home, mothers without any education were more likely to deliver their babies at home than educated mothers. This finding is consistent with studies from other developing countries [28], [29], [36], [37]. This finding is also concordant with studies from different settings in India [38]. Educated mothers are more likely to be aware of hazards of home deliveries and therefore prefer institutional deliveries over home deliveries [38]. Furthermore, education promotes better understanding of health messages and also empowers women, thus enabling them to make their choice of opting institutional delivery [28].

During both the time-periods, wealth index was noticed as an important factor that affected the home delivery among mother. Results concluded that richer women were less likely to deliver at home than their poor counterparts. Previous studies from India also revealed similar results for association between household wealth and place of delivery [24], [39]. Women from poor households find it difficult to utilize SBA due to high out of pocket expenditures associated with institutional delivery and ended up delivering at home [40], [41]. The poor utilization of SBA among poor in India is a severe cause of concern as these services are supposed to be available to all free of cost at all government facilities. The inequitable use of SBA between rich-poor raises questions regarding the availability, accessibility, quality, and cost incurred on utilizing SBA [31]. This study further noted that women from rural areas were more likely to deliver baby at home than their urban counterparts. Previous studies in various Indian settings also agree with this finding [31]. The plausible factors can include lack of availability of skilled personnel, women's reluctance or ignorance regarding using the services, or problems related to the poor quality of care in the rural area [42].

Apparently, socio-demographic factors such as age of the mother, household wealth, parity, caste, mass-media exposure, and educational status of the mother does not contribute heavily in explaining the inequality to the prevalence of delivering babies at home in the decomposition

analysis, even though these factors appeared to be plausible predictors of home delivery in the logistic regression model. Skilled birth attendant comes out as the single largest factor contributing to the inequality in the prevalence of deliveries at home. Furthermore, results from concentration curve revealed that most of the deliveries at home are concentrated among women in poor households and the rich-poor gap has widened in a decade. Despite introduction of National Rural Health Mission (NRHM) and other incentive scheme such as provision of free delivery care implemented in various states of India, a large chunk of poor women are still delivering their babies at home. This may be the plausible reason why skilled attendant at birth (SBA) is contributing heavily in explaining the inequality in the decomposition analysis result. Since poor women cannot afford care provided by SBA, they prefer to deliver at home, thereby raising the rich-poor inequality as explained by SBA in the decomposition model. Previous studies also noted rich-poor inequalities in the utilization of SBA in India [25], [26].

The current study is sensitive to few limitations. First, cross-sectional nature of the survey does not allow us to infer causality. Despite above limitation, this study made a reasonable attempt to examine the factors associated with home delivery among women in India.

Conclusion:

Given the encouraging evidence on the back of reduced prevalence of home delivery over the two survey period, sustained policy efforts are need of the hour to achieve further reductions in the prevalence of home-based delivery. Based on our findings, we can conclude that there is a need to promote institutional deliveries, special focus to be given to poor women, women with higher parity, uneducated women, and rural women. Furthermore, it is proposed to improve mass media exposure among women as it may indirect promote institutional delivery. Despite various efforts promoted by NRHM, much work needs to be done in the rural parts of the country as rural women were more likely to opt for home delivery than their counterparts.

Given the preponderance of home deliveries among the poorer section of the society, every effort should be made to ensure that poor women are attended by a trained SBA. Efforts should headway to ensure that every pregnant women receive required antenatal visits, specifically in rural areas. While the thrust for minimum four ante-natal care and skilled attendant at birth should continue, it is suggested to bring more and more women under the purview of government run health schemes. Mobilizing self-help groups and strengthening women's association with community health workers might bring a change at a community level by providing requisite information related to deliveries.

Abbreviations:

ANC: Antenatal care

CC: Concentration Curve

CEBs: Census Enumeration Blocks

CI: Confidence Interval

JSY: Janani Suraksha Yojana

MoHFW: Ministry of Health and Family Welfare

NFHS: National Family Health Survey

NRHM: National Rural Health Mission

OBC: Other Backward Class

OR: Odds Ration

PPS: Probability Proportional to Size

PSUs: Primary Sampling Units

SBA: Skilled Attendant at Birth

SC: Scheduled Caste

ST: Scheduled Tribe

Declarations:

Ethics approval and consent to participate: The data is freely available in public domain and survey agencies that conducted the field survey for the data collection have collected a prior consent from the respondent.

Consent for publication: Not applicable

Competing Interest: The authors declare that they have no competing interests.

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Author's Contribution: The concept was drafted by PK, SS, RP, and SC. PK and SS contributed to the analysis design. RP advised on the paper and assisted in paper conceptualization. SC and SPM contributed in the comprehensive writing of the article. All authors read and approved the final manuscript.

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Availability of data and materials: The data is publically available to everyone upon request.

The data can be accessed from <https://dhsprogram.com/methodology/survey/survey-display-355.cfm>

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Figure Title and Legend:

Figure 1:

Title: Concentration curve for women delivering babies at home in India.
Legend: Cumulative proportion of wealth

Figures

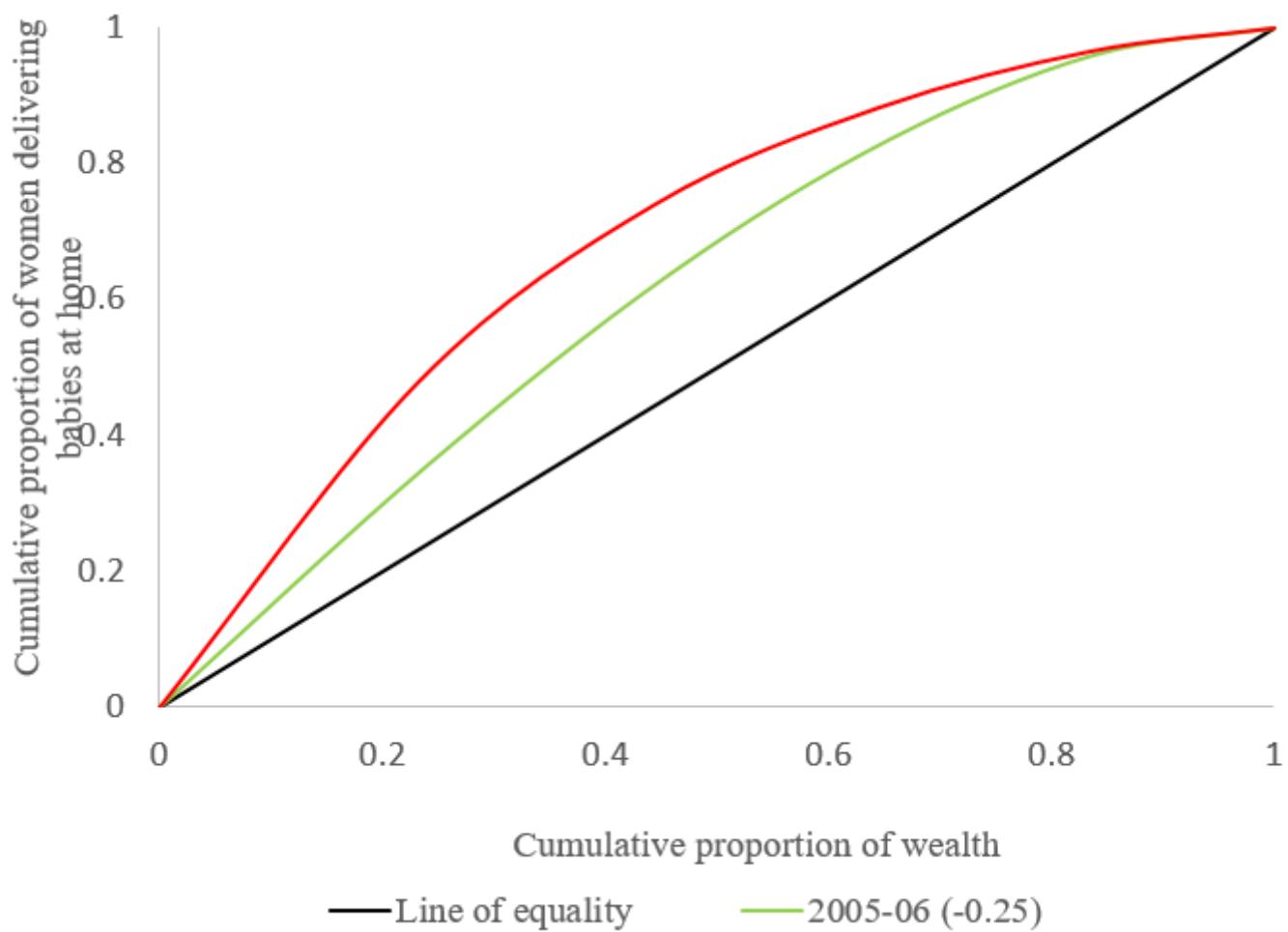


Figure 1

Concentration curve for women delivering babies at home in India. Legend: Cumulative proportion of wealth