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Is the use of maternal healthcare among prospective mothers higher in households that have experienced maternal death? Evidence from India FREE

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Abstract

Essential maternity care services include providing antenatal, delivery and postnatal care in a continuum to avert excess maternal deaths. This study assesses whether there is any significant difference in the utilization of maternal healthcare services between women from households that experienced any maternal death and women from households that did not experience any maternal death. Data from India's District Level Households and Facility Survey, 2007–08 were used. A sample of 321 women (unweighted) aged 15–49 years residing in households that had experienced maternal

death, and 217 737 women (unweighted) of the same age group living in households that did not experience any maternal death were found eligible for the analysis. Results indicate that women belonging to households that experienced maternal deaths were less likely to opt for full antenatal care [odds ratio (OR): 0.56; 95% confidence interval (CI): 0.35–0.88] and postnatal care (OR: 0.82; 95% CI: 0.61–0.91) compared with women from households that did not experience any maternal death. Conversely, women belonging to households experiencing maternal deaths were more likely to utilize skilled birth attendants (OR: 1.31; 95% CI: 1.03–1.73) for their last delivery. This study hopes to draw the attention of program and policy makers to improve the reach of antenatal and postnatal care services, which are considered to be a supply side barrier compared with institutional delivery even by households that have reported maternal death.

Keywords: : Maternal health, maternal mortality, health policy

Topic: india, maternal mortality, mothers, postnatal care, prenatal care

Issue Section: Original Articles

Key Messages

- This study compares the difference in the utilization of selected maternal healthcare services between women who belong to households that experienced at least one maternal death and that by women who belong to households that did not experience any maternal death.
- Women from households that experienced at least one maternal death were less likely to use full antenatal care, and receive postnatal care within 6 weeks of delivery compared with women living in households that did not experience any maternal death.
- Women who lived in households that experienced at least one maternal death were more likely to have skilled birth attendants for their last delivery compared with women who were living in households that did not experience any maternal death.

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Introduction

India, as a member of the United Nations, is one of the signatories of Sustainable Development Goal 3, which has reemphasized the target of reducing the global maternal mortality ratio (MMR), and set the target of achieving a MMR of 70 per 100 000 live births by 2030 (United Nations 2015). Having committed itself to Millennium Development Goal 5, India has witnessed a significant improvement in the coverage of basic maternal healthcare services through expansion of essential healthcare infrastructure, strengthening of human resources and addressing social determinants of health between 1990 and 2015 (UNICEF and World Health Organization 2015). Despite this remarkable progress, owing to its large population base, the MMR of India remains unacceptably high (178 per 100 000 live births) (Office of Registrar General 2013), which accounts for the highest number of maternal deaths globally—a total of 50 000 as in 2013 (UNICEF and World Health Organization 2015). Direct causes of maternal mortality such as hemorrhage, hypertensive disorders and sepsis are responsible for >50% of maternal deaths, which could be prevented through effective basic life-saving interventions comprising antenatal, delivery and postnatal care (PNC) (UNICEF and World Health Organization 2015; Victora *et al.* 2015). Under the guidance of the Partnership for Maternal, Newborn and Child Health, program and policy makers and leaders from the public health community are advocating for the implementation of the continuum of Reproductive, Maternal, Newborn and Child Health (RMNCH) care framework, which suggests that to avert preventable maternal deaths, every mother or prospective mother should receive the required antenatal, delivery and PNC in a continuum (UNICEF and World Health Organization 2015).

Thaddeus and Maine group the different factors that cause maternal mortality into the 'three-delay' model, which illustrates that pregnancy-related mortality is due to delays in seeking required medical help, seeking a medical facility in time and receiving adequate care (Thadddeus and Maine 1994). However, the three-delay model may probably be an oversimplification, and at each level of care, there may be a complex series of factors affecting care (Bhutta 2011). To comprehend and incorporate potential determining factors of maternity care in a set of analysis, this study refers to the health behaviour model proposed by Aday and Anderson (Andersen 1968, 1995; Aday and Andersen 1974; Andersen and Newman 2005), which has been successfully applied in several studies of healthcare services utilization in developing countries. Aday and Andersen (1974) propose that healthcare seeking behaviour is a function of three sets of variables:

1. Predisposing factors, such as age, gender, marital status, family size, social status, education and race.
2. Enabling factors, such as family income, health insurance, service availability and health level symptoms or perceived sickness.

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3. The need to use available services, perhaps the most powerful predictor of healthcare utilization.

The need is classified into two categories—perceived need and evaluative need (Aday and Andersen 1974). This study has taken into account 'perceived need'—defined as 'how people view their own general health and functional state, as well as how they experience symptoms of illness, pain and worries about their health and whether or not they judge their problems to be of sufficient importance and magnitude to seek professional help' (Andersen 1995). Thus, the 'need' to access or use maternity care is expected to be stronger among women who lived in households that experienced maternal death as compared with women who resided in households that did not experience any maternal death. This study hypothesizes that if a household has witnessed a death related to pregnancy, it is more likely that the household members will ensure appropriate maternity care for the prospective mother living in the same household, and using a nationally representative dataset of India, this premise was tested. While performing the analyses, this study takes into account the predisposing as well as enabling factors responsible for the utilization of healthcare services based on previous studies undertaken in low- and middle-income countries (Ministry of Health and Family Welfare 2013; Kassebaum *et al.* 2014; UNICEF and World Health Organization 2015; World Health Organization 2015).

To fulfill the study objective, the utilization patterns of three key maternity care components were analyzed:

- Women who had full antenatal care (ANC).
- Those who had skilled birth attendants (SBA).
- Those who received PNC within 6 weeks of delivery.

We hope that the findings of this study may help develop strategies to improve the provision and use of maternal healthcare services to achieve the targeted RMNCH adopted by the Ministry of Health and Family Welfare (MoHFW), Government of India (Ministry of Health and Family Welfare 2013).

Materials and methods

Data

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The third wave of the District Level Household and Facility Survey, 2007–08 (DLHS III) (International Institute for Population Sciences 2010) was used to attain the study objective.

DLHS III covered a total sample of 643 944 ever-married women aged 15–49 years from 720 320 households in 27 states and 7 union territories, and 601 districts in India. A multi-stage stratified systematic sampling design was adopted for DLHS III. The survey was designed to collect data on various aspects of healthcare utilization for reproductive and child health and accessibility of health facilities. In DLHS III, the data were collected using different interview questionnaires, including household questionnaire, ever-married women questionnaire, unmarried women questionnaire, village questionnaire and health facility questionnaire. The household response rate was 94%. A detailed description of the sampling and weighting procedures is given in the DLHS III report (International Institute for Population Sciences 2010).

Ethical review

The DLHS III was executed by the International Institute for Population Sciences, Mumbai, India, under the aegis of the MoHFW, Government of India. The survey protocol, including the consent procedure was approved by the independent Institutional Ethical Review Board of International Institute for Population Sciences (IIPS) and the Technical Advisory Committee appointed by MoHFW. All the interviews in DLHS III were conducted with the written as well as verbal informed consent of the women respondents. Information on minors or children was also collected, and the written and verbal informed consent was obtained from the next of kin, caretakers, or guardians on behalf of the minors or children. The objective, procedure and purpose of the survey were explained to the respondents and those who agreed to participate had to put their signature or thumb impression on the consent form attached to the survey questionnaire. The dataset used for this study had no identifiable information related to survey participants.

Defining maternal mortality

In the household questionnaire of DLHS III (International Institute for Population Sciences 2010), nine questions (question numbers 142–150) were posed to self-identified household heads about the name of any person who died in the household since 1 January 2004 and the date of death. If the respondents were affirmative about the death of any member of the household, the next question was ‘Whether the deceased was a female in the age Group 15–49 at the time of death’. If the response was positive, another four questions were posed:

1. Was (deceased female person’s name) pregnant when she died.

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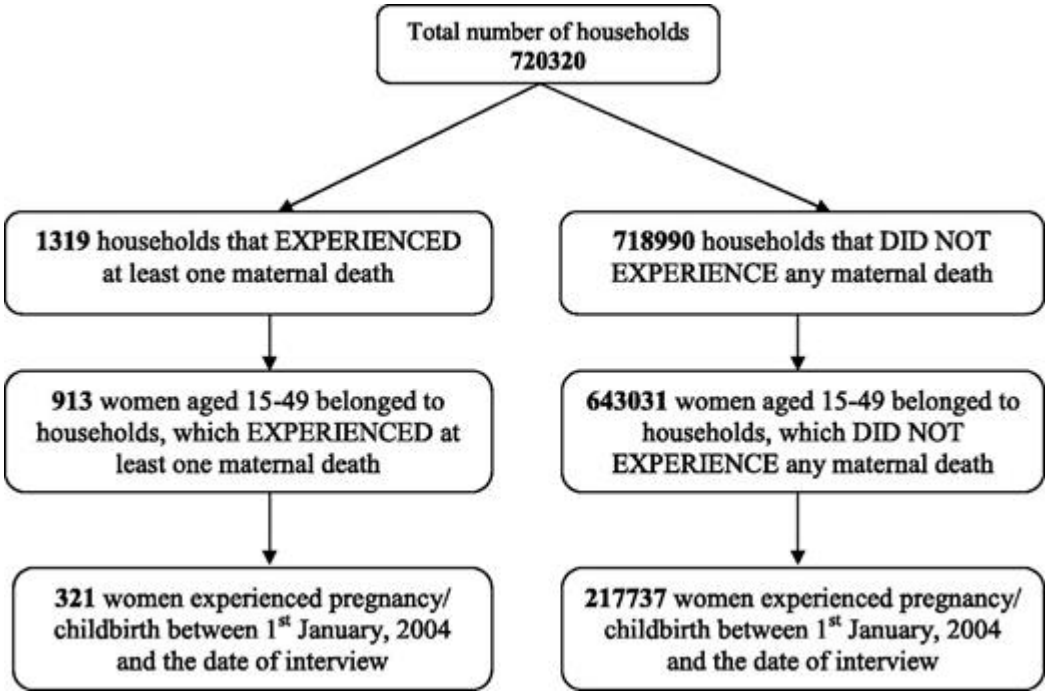
2. Did (name) die at the time of abortion or within 6 weeks of abortion.

3. Did (name) die during childbirth.

4. Did (name) die within 6 weeks of pregnancy or childbirth.

If any of the four questions was marked positive, it was recorded as maternal death. Of the 720 320 households covered in DLHS III, 1319 households (unweighted sample) experienced maternal deaths, 913 women (unweighted sample) aged 15–49 belonged to those households, and 321 women (unweighted sample) experienced pregnancy/childbirth since 1 January 2004 (Figure 1). The spatial variation in the number of sample households that experienced at least one maternal death during the stipulated period ranged from 286 in Uttar Pradesh to 1 in Kerala (Figure 2).

Figure 1.



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Derivation of sample size (unweighted) included in the analysis, DLHS 2007–08.

Figure 2.

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State-wise distribution of 1319 households (unweighted) that experienced maternal death, DLHS 2007–08.

Notes: The figures presented in the parentheses are the number of sample households that experienced at least one maternal death since 1 January 2004. Abbreviations shown for the states are as follows: AP (Andhra Pradesh) (erstwhile), AR (Arunachal Pradesh), AS (Assam), BR (Bihar), CG (Chhattisgarh), GJ (Gujarat), HR (Haryana), HP (Himachal Pradesh), JK (Jammu and Kashmir), JH (Jharkhand), KA (Karnataka), KL (Kerala), MG (Meghalaya), MH (Maharashtra), MN (Manipur), MP (Madhya Pradesh), MZ (Mizoram), OR (Orissa), PB (Punjab), RJ (Rajasthan), SK (Sikkim), TN (Tamil Nadu), TR (Tripura), UK (Uttarakhand), UP (Uttar Pradesh) and WB (West Bengal).

Outcome events

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The ANC policy in India follows the World Health Organization (WHO) approach to promote safe pregnancies as early detection of problems during pregnancy leads to timely treatment. The DLHS III defines full ANC as ‘at least three visits of ANC check-up, at least one tetanus toxoid injection received and 100 IFA tablets or equivalent syrup consumed’ (International

Institute for Population Sciences 2010), as indicated by the WHO ANC trial group (Villar *et al.* 2001). A delivery conducted either in a medical institution or at home assisted or attended by a doctor or auxiliary nurse midwife or nurse is considered to have SBA (World Health Organization 2004). Postnatal check-up within 6 weeks of childbirth is considered a potential maternal healthcare indicator (World Health Organization 2013), which is used as a pertinent outcome variable. The analysis was restricted to 321 women (who experienced pregnancy or childbirth between 1 January 2004 and the date of interview during 2007–08 and belonged to households that experienced at least one maternal death), and 217 737 women (who experienced pregnancy or childbirth between 1 January 2004 and the date of interview and belonged to households that did not experience any maternal death). Women from households with any maternal death were considered utilizing particular maternal healthcare services only after the maternal death was experienced in the household. Information on the timing of maternal death in the household and subsequent delivery was extracted from the household roster of the survey.

Covariates

Notable socioeconomic and demographic variables such as maternal age at childbirth (below 19, and 19 and above), birth order (1, 2 and 3+), women's education (illiterate and literate), husband's education (illiterate and literate), whether women had heard of or seen messages on ANC (yes and no), whether women had heard of or seen messages on delivery care (yes and no), social group (Others or Other Backward Classes, and Scheduled Castes or Scheduled Tribes), religion (Hindu, Muslim, and others), household wealth quintile (bottom two, middle and upper two), place of residence (rural and urban) and region of residence (high focus states and non-high focus states) were included in the analyses. Household wealth quintile, a relative index of household wealth, was calculated from a standard set of assets owned by the household, including ownership of consumer items and dwelling characteristics (Vyas and Kumaranayake 2006). Individuals were ranked on the basis of their household score and divided into five quintiles, each representing 20% of the score. In this study, the upper two quintiles (40%) and lower two quintiles (40%) have been merged in order to provide sufficient sample households to each classified group for robust statistical analyses. Because of the regional variation in the utilization of healthcare services in India, the analyses in this study have adjusted the estimates for region of residence. For this purpose, the sample households/individuals were classified as part of two groups: high focus states and non-high focus states. On account of the high fertility and mortality indicators, the nine states (Bihar, Chhattisgarh, Jharkhand, Madhya Pradesh, Orissa, Rajasthan, Uttarakhand, Uttar Pradesh and Assam), which account for about 48% of India's population, were designated as 'High Focus States' by the Government of India, and the remaining 18 states and 7 union territories were designated as non-high focus states.

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Statistical analyses

Both the bivariate and multivariate analyses were performed. Bivariate analyses (with 95% confidence interval) and Chi-squared (χ^2) test were applied to determine the differences in proportions. To reiterate, the three key maternity care components were assessed as outcome variables: women who had received full ANC, those who had skilled birth attendance and those who received PNC within 6 weeks of delivery. To understand the net difference between utilization of maternal healthcare services between women from households that experienced any maternal death and women from households that did not experience any maternal death, binary logistic regression was deployed. Instead of a linear probability model, a binary logistic regression function is preferable to fit some kind of sigmoid curve when response variable is dichotomous (binary or 0–1) and that reasonably portrays the reality about outcome events (Retherford and Choe 1993). The logistic function takes an input that might be any value from negative infinity to positive infinity, whereas the output is confined to values between 0 and 1. In this study, the binary response (y, had full ANC or not; delivery conducted by SBA or not; received PNC within 6 weeks of delivery or not) for each individual was related to a set of categorical predictors, X, and a fixed effect by a logit link function:

$$\text{logit}\,(\pi_i) = \log[\pi_i/1-\pi_i] = \beta_0 + \beta\,(X) + \epsilon.$$

The probability that an individual had full ANC, or had delivery conducted by SBA, or received PNC within 6 weeks of delivery is π_i. The parameter β_0 estimates the log odds of the three outcome variables for the reference group, and the parameter β estimates with maximum likelihood, the differential log odds of full ANC, skilled birth attendance, PNC associated with the predictor X, as compared with the reference group. The term ϵ represents the error term or residual in the model. The appropriate sampling weight has been supplemented to perform the whole analyses. Data analyses were performed using the 'SVY' command in statistical software—Stata version 12 (StataCorp 2011), which allowed for adjustments of sampling weights while estimating standard errors and confidence intervals. The variables found significant at $P < 0.05$ level in the binary logistic regression model are discussed in this study.

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Results

Table 1 presents the distribution of households by the status of maternal death since 1 January 2004. Statistics show that 2240 households (weighted sample) experienced at least one maternal death. Out of the total number of households that experienced maternal deaths, 56% of the households (1256 households) reported that the woman's death occurred during pregnancy, which excludes the deaths that took place within 6 weeks of pregnancy (about 24%). Nearly 7% of those households (163 households) reported that the woman in the household died at the time of abortion or within 6 weeks of the abortion, whereas around 13% of the households (290 households) reported the death of the woman during childbirth.

Table 1.

Number of households by the status of maternal death since 1 January 2004, India, DLHS 2007–08

	Unweighted sample	Weighted sample
Households that did not experience any maternal death	718 990	1 303 969
Households that experienced at least one maternal death	1319	2240
Woman was pregnant when she died	738	1256
Woman died at the time of abortion/within 6 weeks of abortion	96	163
Woman died during childbirth	172	290
Woman died within 6 weeks of pregnancy	313	531

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Differentials in maternity care services by status of maternal death in the household

Full ANC

Table 2 presents the proportion of women receiving full ANC by selected variables in households that experienced any maternal death and those that did not. There were 8% and 19% of women, respectively, who recorded receiving full ANC, in households that experienced any maternal death and those that did not. The proportion of older women (age 19 and above) receiving ANC was higher (10%) among households that experienced any maternal death compared with younger women (age below 19). The proportion of women

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receiving full ANC in the case of first birth (birth order 1) was higher, if the women and their husbands were literate/educated, if the women had heard the messages related to ANC and delivery care, if the women belonged to non-SC/ST households and were affiliated to religions other than Hindu and Muslim. The proportion of women receiving full ANC was higher in urban areas (30%) in the case of households that did not experience any maternal death, whereas the proportion was higher in rural areas (9%) in the case of households that experienced any maternal death.

Table 2.

Proportion (%) of women receiving full ANC by background variables across households experienced no maternal death (no death) and households experienced at least one maternal death (any death), India, DLHS 2007–08

Background variables	No death	95% CI	Any death	95% CI
Mother's age at childbirth	[χ^2 = 175.32; P< 0.001]		[χ^2 = 5.53; P = 0.018]	
Below 19	15.5	[15.0–16.0]	1.3	[0.2–8.8]
19 and above	19.2	[19.0–19.4]	9.6	[6.5–13.8]
Birth order	[χ^2 = 2823.20; P < 0.001]		[χ^2 = 2.45; P = 0.086]	
1	25.6	[25.2–26.0]	10.8	[6.5–17.1]
2	23.4	[22.9–23.7]	9.8	[4.6–19.3]
3+	10.2	[9.91–10.3]	3.4	[1.2–8.7]
Women's education	[χ^2 = 1060.00; P < 0.001]		[χ^2 = 11.92; P < 0.001]	
Illiterate	6.9	[6.7–7.1]	3.2	[1.4–6.9]
Literate	27.5	[27.2–27.8]	13.3	[8.7–19.8]
Husband's education	[χ^2 = 4010.27; P < 0.001]		[χ^2 = 4.47; P = 0.034]	

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Background variables	No death	95% CI	Any death	95% CI
Illiterate	7.9	[7.5–8.1]	3.0	[0.9–8.9]
Literate	22.2	[21.9–22.4]	9.8	[6.5–14.4]
Heard/seen message of ANC	[χ^2 = 2972.72; P < 0.001]		[χ^2 = 3.83; P = 0.050]	
Yes	20.9	[20.6–21.1]	9.3	[6.2–13.5]
No	4.4	[4.0–4.6]	2.6	[0.6–9.6]
Heard/seen message of Delivery Care	[χ^2 = 3375.40; P < 0.001]		[χ^2 = 1.44; P = 0.229]	
Yes	22.0	[21.7–22.2]	9.0	[5.9–13.4]
No	7.4	[7.1–7.7]	5.1	[2.1–11.7]
Social group	[χ^2 = 657.53; P < 0.001]		[χ^2 = 1.2387; P = 0.625]	
Others/OBC	20.9	[20.6–21.2]	8.4	[5.3–13.0]
SC/ST	15.0	[14.6–15.3]	6.9	[3.4–13.1]
Religion	[χ^2 = 8.5757; P < 0.001]		[χ^2 = 1.66; P = 0.188]	
Hindu	18.8	[18.5–19.0]	7.7	[5.0–11.7]
Muslim	18.1	[17.4–18.8]	4.1	[1.0–14.9]
Others	20.2	[19.4–20.8]	15.6	[6.2–33.7]
Wealth quintile	[χ^2 = 5148.92; P < 0.001]		[χ^2 = 1.1924; P = 0.824]	
Bottom two	7.6	[7.3–7.7]	6.9	[3.8–12.0]

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Background variables	No death	95% CI	Any death	95% CI
Middle	16.0	[15.5–16.3]	8.6	[4.1–16.9]
Upper two	30.0	[29.5–30.4]	8.9	[4.4–17.1]
Place of residence	[χ^2 = 1881.28; P < 0.001]		[χ^2 = 1.59; P = 0.206]	
Rural	14.7	[14.4–14.8]	8.9	[6.0–12.8]
Urban	29.5	[28.8–30.1]	2.7	[0.3–17.2]
Region of residence	[χ^2 = 1070.0; P < 0.001]		[χ^2 = 2.52; P = 0.112]	
High focus states	8.2	[8.0–8.4]	6.5	[4.0–10.1]
Non-high focus states	32.1	[31.6–32.4]	12.1	[6.3–21.6]
Total	18.8	[18.5–19.0]	7.9	[5.4–11.3]
Sample size (unweighted *n*)	217 737		321	

Notes: OBC, Other Backward Classes; SC, Scheduled Castes; ST, Scheduled Tribes. Figures in parentheses are the χ^2 statistics and corresponding *P* values.

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Skilled birth attendants

Table 3 presents the proportion of women receiving SBA by selected characteristics (including service utilization) across households that experienced any maternal death and those that did not. There were 49% and 53% of women, respectively, who received SBA in households that experienced any maternal death and those that did not. There was no considerable difference in the proportion of older and younger women receiving SBA in both types of households. The proportion of women receiving SBA in the case of first birth (birth order 1) was higher, if the women and their husbands were literate/educated, if the women had heard the messages related to ANC and delivery care, if the women belonged to non-

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SC/ST households and were affiliated to religions other than Hindu and Muslim. Women who belonged to the upper two wealth quintiles and were residing in urban areas and non-high focus states received a higher proportion of SBA compared with their counterparts in the lower wealth quintile residing in rural areas and in high focus states in both types of households. Similarly, women who received full ANC were higher in proportion in receiving SBA compared with women who did not receive full ANC in both types of households.

Table 3.

Proportion (%) of women receiving skilled birth attendant by background variables across households that experienced no maternal death (no death) and households experienced at least one maternal death (any death), India, DLHS 2007–08

Background variables	No death	95% CI	Any death	95% CI
Mother's age at childbirth	[χ^2 = 11.44; P < 0.001]		[χ^2 = 1.00; P = 0.992]	
Below 19	51.5	[50.8–52.1]	49.1	[37.2–61.0]
19 and above	52.7	[52.3–52.9]	49.1	[42.6–55.4]
Birth order	[χ^2 = 7500.44; P < 0.001]		[χ^2 = 3.80; P = 0.022]	
1	68.0	[67.6–68.4]	58.5	[49.6–66.9]
2	58.6	[58.1–59.0]	46.0	[34.6–57.8]
3+	35.3	[34.8–35.7]	40.3	[31.0–50.3]
Women's education	[χ^2 = 1970.0; P < 0.001]		[χ^2 = 17.69; P < 0.001]	
Illiterate	31.2	[30.8–31.6]	37.4	[30.0–45.3]
Literate	68.1	[67.7–68.4]	62.6	[54.1–70.3]
Husband's education	[χ^2 = 1050.0; P < 0.001]		[χ^2 = 8.83; P = 0.003]	

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Background variables	No death	95% CI	Any death	95% CI
Illiterate	29.7	[29.2–30.2]	35.1	[25.3–46.2]
Literate	59.5	[59.1–59.8]	54.6	[47.9–61.1]
Heard/seen message of ANC	[χ^2 = 6021.52; P < 0.001]		[χ^2 = 10.31; P < 0.001]	
Yes	56.6	[56.2–56.9]	53.8	[47.5–60.0]
No	24.3	[23.6–24.9]	31.2	[20.9–43.7]
Heard/seen message of delivery care	[χ^2 = 7370.77; P < 0.001]		[χ^2 = 25.52; P < 0.001]	
Yes	59.1	[58.7–59.4]	58.4	[51.6–64.8]
No	29.2	[28.6–29.7]	26.0	[17.8–36.1]
Caste	[χ^2 = 2126.09; P < 0.001]		[χ^2 = 1.50; P = 0.220]	
Others/OBC	57.7	[57.2–58.0]	51.6	[44.4–58.6]
SC/ST	43.1	[42.6–43.6]	44.2	[35.1–53.6]
Religion	[χ^2 = 50.38; P < 0.001]		[χ^2 = 4.22; P = 0.014]	
Hindu	52.9	[52.5–53.2]	50.1	[43.7–56.4]
Muslim	48.7	[47.7–49.6]	32.5	[20.1–47.8]
Others	55.3	[54.2–56.2]	67.6	[48.0–82.5]
Wealth quintile	[χ^2 = 1250.0; P < 0.001]		[χ^2 = 11.96; P < 0.001]	

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Background variables	No death	95% CI	Any death	95% CI
Bottom two	29.1	[28.7–29.4]	35.1	[28.0–43.0]
Middle	48.5	[47.9–49.0]	52.6	[41.1–63.8]
Upper two	74.9	[74.5–75.3]	69.2	[57.5–78.7]
Place of residence	[χ^2 = 3997.01; P < 0.001]		[χ^2 = 3.56; P = 0.059]	
Rural	43.5	[43.1–43.7]	46.3	[40.5–52.1]
Urban	75.9	[75.1–76.6]	63.7	[46.3–78.0]
Region of residence	[χ^2 = 7541.53; P < 0.001]		[χ^2 = 18.52; P < 0.001]	
High focus states	39.5	[39.0–39.9]	41.5	[35.3–47.9]
Non-high focus states	68.8	[68.3–69.2]	71.6	[59.5–81.1]
Full ANC	[χ^2 = 1410.0; P < 0.001]		[χ^2 = 13.06; P < 0.001]	
No	45.3	[44.9–45.6]	46.2	[40.3–52.2]
Yes	83.5	[83.0–83.9]	82.3	[63.5–92.5]
Total	52.5	[52.2–52.8]	49.1	[43.4–54.7]
Sample size (unweighted *n*)	217 737		321	

Notes: OBC, Other Backward Classes; SC, Scheduled Castes; ST, Scheduled Tribes. Figures in parentheses are the χ^2 statistics and corresponding P values.

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Postnatal care

Table 4 presents the proportion of women receiving PNC by selected characteristics (including service utilization) across households that experienced any maternal death and those that did not. In total, there were 40% and 48% women, respectively, who received PNC in households that experienced any maternal death and those that did not. The proportion of women receiving PNC was higher if the women and their husbands were literate/educated, if the women had heard the messages related to ANC and delivery care, if the women belonged to the upper two wealth quintiles, and if the women were residing in urban areas and non-high focus states. In both types of households, the women who received PNC were in higher proportion if they had received the full ANC and SBA earlier.

Table 4.

Proportion (%) of women receiving PNC by background variables across households that experienced no maternal death (no death) and households that experienced at least one maternal death (any death), India, DLHS 2007–08

Background variables	No death	95% CI	Any death	95% CI
Mother's age at childbirth	[χ^2 = 33.51; P < 0.001]		[χ^2 = 1.01; P = 0.892]	
Below 19	45.7	[44.9–46.3]	40.2	[29.0–52.5]
19 and above	47.7	[47.3–48.0]	39.3	[32.9–45.9]
Birth order	[χ^2 = 4196.77; P < 0.001]		[χ^2 = 2.66; P = 0.069]	
1	58.6	[58.2–59.0]	47.5	[38.5–56.6]
2	53.3	[52.8–53.7]	36.3	[25.7–48.4]
3+	34.2	[33.7–34.5]	33.1	[24.8–42.6]
Women's education	[χ^2 = 1280.0; P < 0.001]		[χ^2 = 16.67; P < 0.001]	
Illiterate	29.7	[29.3–30.1]	28.7	[22.0–36.3]

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Background variables	No death	95% CI	Any death	95% CI
Literate	60.4	[60.0–60.7]	52.0	[43.3–60.4]
Husband's education	[χ^2 = 6616.94; P < 0.001]		[χ^2 = 4.50; P = 0.0338]	
Illiterate	28.8	[28.3–29.3]	29.8	[20.8–40.5]
Literate	53.2	[52.8–53.5]	43.3	[36.5–50.3]
Heard/seen message of ANC	[χ^2 = 4405.24; P < 0.001]		[χ^2 = 14.90; P < 0.001]	
Yes	51.1	[50.8–51.4]	45.4	[38.8–52.1]
No	22.0	[21.3–22.6]	17.3	[9.5–29.2]
Heard/seen message of delivery care	[χ^2 = 5539.27; P < 0.001]		[χ^2 = 15.50; P < 0.001]	
Yes	53.2	[52.8–53.5]	46.4	[39.5–53.4]
No	27.1	[26.5–27.6]	22.2	[14.7–32.0]
Social group	[χ^2 = 1952.92; P < 0.001]		[χ^2 = 1.023; P = 0.961]	
Others/OBC	52.3	[51.9–52.7]	39.6	[32.7–46.8]
SC/ST	38.6	[38.1–39.0]	39.3	[29.7–49.6]
Religion	[χ^2 = 6.46; P = 0.001]		[χ^2 = 1.616; P = 0.505]	
Hindu	47.1	[46.7–47.4]	38.5	[32.1–45.2]
Muslim	48.4	[47.4–49.3]	37.9	[24.0–53.9]

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Background variables	No death	95% CI	Any death	95% CI
Others	48.7	[47.7–49.6]	50.6	[31.7–69.2]
Wealth quintile	[χ^2 = 9482.52; P < 0.001]		[χ^2 = 12.25; P < 0.001]	
Bottom two	27.0	[26.6–27.4]	24.8	[18.3–32.7]
Middle	43.0	[42.4–43.5]	45.1	[34.2–56.3]
Upper two	67.4	[66.9–67.8]	59.0	[46.5–70.4]
Place of residence	[χ^2 = 3239.22; P < 0.001]		[χ^2 = 5.37; P = 0.020]	
Rural	39.5	[39.1–39.8]	36.1	[30.4–42.1]
Urban	67.9	[67.1–68.7]	57.2	[39.9–72.9]
Region of residence	[χ^2 = 9061.15; P < 0.001]		[χ^2 = 19.07; P < 0.001]	
High focus states	33.6	[33.1–33.9]	31.9	[25.8–38.5]
Non-high focus states	64.8	[64.3–65.2]	62.0	[49.8–72.8]
Full ANC	[χ^2 = 1340.0; P < 0.001		[χ^2 = 3.89; P = 0.048]	
No	40.4	[40.0–40.7]	37.9	[32.0–44.1]
Yes	77.9	[77.4–78.3]	57.9	[38.5–75.0]
Safe delivery	[χ^2 = 4290.0; P < 0.001]		[χ^2 = 95.79; P < 0.001]	
No	15.1	[14.8–15.4]	12.5	[7.9–18.9]

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Background variables	No death	95% CI	Any death	95% CI
Yes	76.7	[76.3–77.0]	67.5	[59.3–74.7]
Total	47.5	[47.1–47.7]	39.5	[33.8–45.4]
Sample size (unweighted *n*)	217 737		321	

Notes: OBC, Other Backward Classes; SC, Scheduled Castes; ST, Scheduled Tribes. Figures in parentheses are the χ^2 statistics and corresponding *P* values.

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Influence of maternal death in the household on the use of maternity care services

Table 5 presents odds ratios (OR) with 95% CI (confidence interval), depicting the association between maternal death status in a household and prospective maternity care. The result indicates that after controlling for potential confounders, women from households that experienced any maternal death had less likelihood of receiving full ANC (OR: 0.56; 95% CI: 0.35–0.88; $P < 0.001$), whereas the likelihood of women receiving SBA was estimated to be higher (OR: 1.31; 95% CI: 1.03–1.73; $P < 0.01$) among households that experienced any maternal death. The probability of receiving PNC was lower among women in households that experienced any maternal death (OR: 0.82; 95% CI: 0.61–0.91; $P < 0.05$) compared with women from households that did not experience any maternal death.

Table 5.

OR estimated from logistic regression models showing the difference in receiving maternity care services between women from households that experienced at least one maternal death and women from households did not experience any maternal death, India, DLHS 2007–08

	Full ANC			
	Unadjusted OR	95% CI	Adjusted[a] OR	95% CI
Women from households that experienced no maternal death (Ref.)	1.00		1.00	

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	Full ANC			
Women from households that experienced at least one maternal death	0.37*	(0.25–0.55)	0.56***	(0.35–0.88)
	Skilled birth attendance			
	Unadjusted OR	95% CI	Adjusted[a,b] OR	95% CI
Women from households that experienced no maternal death (Ref.)	1.00		1.00	
Women from households that experienced at least one maternal death	0.87ns	(0.69–1.09)	1.31**	(1.03–1.73)
	PNC			
	Unadjusted OR	95% CI	Adjusted[a,c] OR	95% CI
Women from households that experienced no maternal death (Ref.)	1.00		1.00	
Women from households that experienced at least one maternal death	0.72*	(0.57–0.82)	0.82*	(0.61–0.91)

Notes: (Ref.), Reference category.

[a]Adjusted for women's age at childbirth, birth order, women's education, husband's education, exposure to ANC messages, exposure to safe delivery care messages, social group, religion, wealth quintile, place of residence, and region of residence.

Sk

[b]Adjusted for the utilization of full ANC.

[c]Adjusted for full ANC and skilled birth attendance.

Level of significance: ***$P < 0.001$; **$P < 0.01$; *$P < 0.05$; ns, not significant.

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Discussion

This study attempts to understand whether there is any significant difference in the use of maternity care between women living in households that experienced any maternal death and women living in households that did not experience any maternal death. Referring to the health behaviour model proposed by Aday and Andersen (1974), it is hypothesized that the need to use maternity care could be higher among mothers or prospective mothers living in households that experienced any maternal death. Multivariate analysis reveals a mixed result, and an explanation is provided in support of the findings.

The results of this study indicate that women who lived in households that experienced at least one maternal death were less likely to use full ANC and receive PNC within 6 weeks of delivery compared with women living in households that did not experience any maternal death. Such differences can be explained by a host of factors. Women from households that experienced maternal deaths could have received special attention by healthcare providers and family members, but poor healthcare delivery services coupled with inability to access and afford required care might have resulted in suboptimum utilization of full ANC (Singh *et al.* 2014). Second, if the delivery of the child were conducted in a healthcare facility, the likelihood of getting PNC would be higher for women. In India, nearly 38% of rural Indian women had their delivery in a healthcare facility (International Institute for Population Sciences 2010). As most of the households that experienced maternal deaths belonged to rural areas and the poorer sections of society, one could expect that most of the deliveries were conducted at home because lack of functional healthcare facilities or unavailability of skilled healthcare providers at the village level (Singh *et al.* 2014). Therefore, most of the women could not receive any PNC even within 6 weeks of delivery.

Results also suggest that women who lived in households that experienced at least one maternal death were more likely to have SBA as compared with women who were living in households that did not experience any maternal death. A considerable proportion of these maternal mortality cases could be the result of not availing proper health facilities for delivery. Hence, women living in such households are more likely to feel the need for institutional delivery to avoid maternal death. Besides, if maternal death in a household is the result of delay in bringing high-risk women to hospital or in availing the services of a

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skilled birth attendant, the need to use delivery care could be stronger for women living in the same household. In addition, this result could be attributed to the incentive attached to skilled birth attendance (Lim *et al.* 2010). Under the ambit of the National Rural Health Mission (now National Health Mission) launched by the Government of India in 2005, Janani Suraksha Yojana (JSY), a conditional cash transfer scheme was offered to encourage women of low socioeconomic status to give birth in health facilities (Lim *et al.* 2010). According to JSY's guidelines, after delivery in one of these facilities, the eligible woman would receive Indian National Rupees (INR) 600 (US$11.30) in urban areas and INR 700 (US$13.18) in rural areas (Lim *et al.* 2010). The cash incentive was higher in the 10 high focus states (Assam, Bihar, Chhattisgarh, Jammu and Kashmir, Jharkhand, Madhya Pradesh, Orissa, Rajasthan, Uttarakhand and Uttar Pradesh)—INR 1000 (US$18.83) in urban areas and INR 1400 (US$26.36) in rural areas (Lim *et al.* 2010). The effect of JSY in reducing maternal mortality through institutional delivery is debatable (Randive *et al.* 2013; Ng *et al.* 2014; Powell-Jackson *et al.* 2015). However, it must be noted that women who lived in households that experienced maternal death belonged to low socioeconomic groups and opted for skilled birth attendance as they would have an incentive if they underwent the delivery conducted by a skilled birth attendant.

To conclude, the findings of this study question the efficacy of ANC and PNC service delivery as a means to prevent maternal mortality, while highlighting the fact that delivery conducted by SBA seems to have an enhanced compliance among women living in households that have experienced at least one maternal death. ANC and PNC are primarily a supply side barrier to maternity care where healthcare providers are expected to reach out to every woman in need, and this study indicates that healthcare providers have failed to reach out to households with a history of maternal death. On the other hand, for delivery care, where most women need to come to a healthcare facility, women have managed to remove the barrier to deliver under the supervision of SBA. In order to take corrective action that can overcome systematic and programmatic gaps in antenatal and postnatal service provision, the central government might opt for strengthening grassroots level workers namely Accredited Social Health Activists (ASHA) in rural areas, Urban Social Health Activists (USHA) in urban areas and Auxiliary Nurse Midwife (ANM). The government should develop a framework of accountability for the grassroots level healthcare providers to help perform, monitor and evaluate their performance, and to strengthen the performance of continuum of RMNCH in particular.

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