

**Predictors of out-of-pocket expenditure on institutional delivery
in states of India with the highest and lowest proportion of institutional delivery**

Master of Public Health Integrating Experience Project

Professional Publication Framework

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2020

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Acknowledgements

I would like to express my sincere gratitude to my advising team, Dr. Varduhi Petrosyan and Dr. Vahe Khachadourian, for their expertise and valuable insight on this project.

I am grateful to all academic and administrative members of the AUA community for their contribution to my academic journey.

I extend my thanks and appreciation to my colleagues, friends and family for their support.

Abstract

Background

Institutional delivery is an integral constituent in curbing maternal mortality by ensuring skilled parturition, reducing postpartum complications and promoting safe motherhood. A substantial proportion of women in India give birth at home without any professional assistance and one in every sixth woman cites high out-of-pocket expenditure as a reason for choosing home-birth over institutional birth. A conditional maternity benefit program, Janani Suraksha Yojana (JSY), was launched in India to reduce the maternal care associated mortality and morbidity burden. The aim of the project is to identify determinants of out-of-pocket expenditure on institutional delivery in two states of India with the highest and lowest proportion of institutional delivery, namely, Kerala and Nagaland respectively, and analyze the differential effects of the predictors in the two states.

Methods

The study used data from the 4th National Family Health Survey (NFHS-4) conducted in 2015-16. Secondary data analyses were conducted using a two-part hurdle model consisting of multivariable logistic regression to model the probability of incurring out-of-pocket expenditure on institutional delivery for a binary outcome (zero versus any out-of-pocket expenditure) and generalized linear model with log link and gamma distribution to understand independent variables associated with a continuous outcome (non-zero positive amount of out-of-pocket expenditure) among those women who made a payment.

Results

In Kerala, 2,126 women gave birth in a health care facility in the five years preceding the survey and 78.7% paid out-of-pocket for institutional delivery. Women who gave birth in a private health care facility (OR = 2.52, 95% CI = 1.90; 3.34), had a Caesarean delivery (OR = 1.39, 95% CI = 1.07; 1.79) and were JSY beneficiaries (OR = 1.38, 95% CI = 0.96; 1.96) had higher odds of making a payment. Among women who paid, the mean expenditure was higher among women who obtained higher education ($e^{\beta} = 1.17$, 95% CI = 1.05; 1.30), had Caesarean delivery ($e^{\beta} = 1.42$, 95% CI = 1.30; 1.54), gave birth in a private health care facility ($e^{\beta} = 2.75$, 95% CI = 2.39; 3.16), belonged to OBC caste category ($e^{\beta} = 1.15$, 95% CI = 0.97; 1.36) or other caste category ($e^{\beta} = 1.32$, 95% CI = 1.12; 1.57) and belonged to middle wealth index group ($e^{\beta} = 1.42$, 95% CI = 1.11; 1.80) or rich wealth index group ($e^{\beta} = 1.69$, 95% CI = 1.34; 2.16). The mean expenditure was lower among JSY beneficiaries ($e^{\beta} = 0.69$, 95% CI = 0.56; 0.84).

In Nagaland, 1,081 women gave birth in a health care facility in the five years preceding the survey and 70.9% paid out-of-pocket for institutional delivery. Women who resided in rural areas (OR = 1.51, 95% CI = 1.04; 2.19), obtained higher education (OR = 1.22, 95% CI = 0.77; 1.93), gave birth in a private health care facility (OR = 1.41, 95% CI = 0.90; 2.20), belonged to middle wealth index group (OR = 1.35, 95% CI = 0.89; 2.03) had higher odds of making a payment. The 'other caste' category of the variable 'caste' had a problem of sparse data; hence, the model could not produce meaningful estimates for it. Among women who paid, the mean expenditure was higher among women with higher education ($e^{\beta} = 1.15$, 95% CI = 0.91; 1.45), who had Caesarean delivery ($e^{\beta} = 2.63$; 95% CI = 2.20; 3.16) and who gave

birth in a private health care facility ($e^{\beta} = 2.59$, 95% CI = 2.14; 3.10). The mean expenditure was lower among JSY beneficiaries ($e^{\beta} = 0.82$, 95% CI = 0.66; 1.02).

Conclusion

The study found some similar and some differential patterns for socio-demographic and obstetric predictors of out-of-pocket expenditure on institutional delivery in the states of Kerala and Nagaland. It is recommended to adjust the JSY cash incentives based on several socio-economic and obstetric differentials.

Introduction

Background

The 2030 agenda for sustainable development enlists maternal health improvement as a priority, with the aim of reducing the global maternal mortality ratio to less than 70 maternal deaths per 100,000 live births (UNO, 2015). However, despite persistent and strenuous global efforts to promote safe motherhood, over 295,000 maternal deaths were reported worldwide with an uncertainty index of 279,000 to 340,000 in 2017 (WHO, 2019). It is estimated that 99% of the maternal deaths occur in lower-middle income countries (Issac et al., 2016).

In 2004-2005, the maternal mortality ratio in India was 254 maternal deaths per 100,000 live births, ranging from 95 maternal deaths per 100,000 live births in the state of Kerala to 480 maternal deaths per 100,000 live births in the state of Assam (NITI, 2017). In 2017, the maternal mortality ratio in India improved to 130 maternal deaths per 100,000 live births, ranging from 46 maternal deaths per 100,000 live births in the state of Kerala to 237 maternal deaths per 100,000 live births in the state of Assam (NITI, 2017). India has over 27 million births per year, which is the largest number of annual births in the world, and India is one of the largest contributors (about 35%) to the global burden of maternal mortality (Mavalankar, Vora and Prakasamma, 2008; WHO, 2019).

Literature suggests that more than 75% of maternal deaths can be averted by improving access to maternal health care (Tellis et al., 2018). Existing evidence suggests that increasing the uptake of skilled delivery service provided in public and private healthcare institutions can significantly reduce maternal mortality as well as postpartum complications (Govil et al., 2016). Hence, institutional delivery service utilization is an integral constituent in ensuring skilled parturition and safe motherhood (Shukla et al., 2015). Institutional delivery refers to the utilization of health care facilities and skilled assistance for the process

of childbirth (Kesterton et al., 2010). In low- and middle-income nations, more than 40 million births per year are not assisted by skilled health care personnel (Kebede et al., 2016). In 1993, about 74% of the births in India took place at home without any professional assistance (NFHS-1, 1993). In 2005-2006, about 61% of women in India delivered at home without any professional assistance (NFHS-3, 2006). In 2015-2016, about 21% of the births in India were at-home deliveries without any professional assistance (NFHS-4, 2016).

The Government of India has launched several programs over the last few decades to improve the accessibility, affordability, availability and overall quality of health services in various public health care institutions across India. Under the umbrella of initiatives by the National Health Mission (NHM) in India, the Janani Suraksha Yojana (JSY) conditional maternity benefit scheme was launched on April 12, 2005 with the overarching aim of reducing maternal mortality and promoting safe motherhood (Kerketta, 2015). The JSY, the largest cash assistance program worldwide, is an innovative program which encourages institutional delivery by providing cash incentives, especially to poor and marginalized women (Prinja et al., 2015). The Government of India states that “the success of the scheme would be determined by the increase in institutional delivery among the poor families” (MoHFW, 2006).

To maximize the benefits of the program for the poor pregnant women, several Low Performing States (LPS) have been identified by the government. LPS are those states which have extremely low institutional delivery rates, namely the states of Uttar Pradesh, Uttaranchal, Bihar, Jharkhand, Madhya Pradesh, Chhattisgarh, Assam, Rajasthan, Orissa and Jammu and Kashmir (MoHFW, 2006). Other states in India have been classified as High Performing States (HPS). In the LPS, all pregnant women giving birth in accredited private institutions or in government health centers such as district and state hospitals are eligible for the cash assistance under the JSY (MoHFW, 2006). In the HPS, all pregnant women aged 19

years and above, belonging to the Below Poverty Line (BPL) division are eligible for the cash assistance under the JSY for up to two live births (MoHFW, 2006). Since the JSY program focuses on increasing the uptake of institutional delivery services among poor women, women residing in LPS are given special dispensation such as no age restriction, no restriction on the number of births and no requirement for marriage or BPL certificate (MoHFW, 2006). It is also noteworthy to mention that the cash incentive amounts are higher in the LPS as compared to the HPS (MoHFW, 2006).

Several studies suggest that the implementation of the JSY has substantially improved the rates of institutional delivery (Lim et al., 2010). However, according to the latest NHM quarterly progress reports, the percentage of institutional deliveries out of total reported deliveries has only improved marginally in more recent years, from 2013 to 2018 (Shukla and Kapur, 2019). Additionally, a number of studies have shown that those women who benefit from the program are not always the poorest or the most in need (Lim et al., 2010; Mishra and Mohanty, 2019; Shukla et al., 2015). Many studies suggest that despite improvements in maternal mortality rates, the out-of-pocket expenditure on institutional deliveries and maternity care continues to be high, even up to being catastrophic for some families in rural India (Bonu et al., 2009; Mohanty and Kastor, 2017; Shukla et al., 2015). In 2012, according to the Consumer Expenditure Survey, about 18% of households in India experienced catastrophic health expenditures (NHSRC, 2017). Every year, more than 63 million Indians experience financial impoverishment due to catastrophic costs associated with health care services (The Commonwealth Fund, 2017).

According to the 4th National Family Health Survey (NFHS-4) 2015-16, the state of Kerala has the highest proportion of institutional deliveries (99.9%) and the state of Nagaland has the lowest proportion of institutional deliveries (32.8%) in India (NFHS-4, 2016). When JSY was launched, it was not possible to recruit community health workers from most states

in India due to lack of trained workforce, limited funding and inadequate infrastructure (India Development Gateway, 2017; NHSRC, 2011; NOSKK, 2015; PACS, 2016). Hence, despite identifying several states with low proportion of institutional delivery (including Nagaland), only those states, which had at least some pre-established system of community workforce were listed as LPS (NHSRC, 2011; NOSKK, 2015; PACS, 2016). Nagaland has never been classified as a LPS under the JSY program due to feasibility issues and no revisions were made in the JSY protocol since 2005 (NHSRC, 2011; PACS, 2016).

In 2016, the average out-of-pocket cost paid for delivery in a health care facility in the states of Kerala and Nagaland were 19,768.0 INR (259.8 USD) and 9,791.0 INR (128.7 USD) respectively (NFHS-4 Kerala, 2016; NFHS-4 Nagaland, 2016). The infant mortality rate, estimated as the number of deaths before the age of one year per 1,000 live births, was 6 in the state of Kerala and 30 in the state of Nagaland in 2016 (NFHS-4 Kerala, 2016; NFHS-4 Nagaland, 2016). In 2006, the infant mortality rate in the state of Kerala was 15 deaths per 1,000 live births and 38 deaths per 1,000 live births in the state of Nagaland (NFHS-3 Kerala, 2006; NFHS-3 Nagaland, 2006; NFHS-4 Kerala, 2016; NFHS-4 Nagaland, 2016). Although the data on maternal mortality is not captured by NFHS-3 and NFHS-4, the population census and government projects in association with United Nations Development Program (UNDP) have reported some estimates (PIB, 2016). The maternal mortality ratio, estimated as the number of maternal deaths per 100,000 live births, was 46 in the state of Kerala and 160 in the state of Nagaland in 2016 (GOI-UNDP, 2016; SRS, 2016).

Taking this into account, in 2017, the National Health Policy of India set a goal to reduce the out-of-pocket expenditures and to subsequently decrease the proportion of households experiencing health-related financial catastrophe by one-fourth by 2025 (MoHFW, 2017; NHSRC, 2017). Under this goal, the Ministry of Health and Family Welfare (MoHFW) of the Government of India expects to see a positive change in the service

utilization, meaning that with the decline in out-of-pocket expenditure over time, the health care service utilization is expected to increase due to lower financial burden (MoHFW, 2017; NHSRC, 2017). High cost of health care services is a serious impediment to health care service utilization (Bhatia and Cleland, 1995; Borghi, 2001; Celik and Hotchkiss, 2000; Enso and Witter, 2000; Falkingham, 2003; Gwatkin et al., 2004; Navaneetham and Dharmalingam, 2002). In general, about 69% of health care expenditure in India comes from out-of-pocket payments (The Commonwealth Fund, 2017). About 16% of women in India reported high out-of-pocket expenditure as the reason for choosing home-birth over institutional birth in 2016 (NFHS-4, 2016).

Literature suggests that there are several factors, which are attributable to high out-of-pocket expenditure for institutional deliveries in India. For instance, area of residence, socio-economic level of household, age of mother, educational level of mother, birth order, type of delivery, and type of health facility are significant factors associated with expenditure on institutional delivery (Mohanty and Srivastava, 2013).

Mothers residing in urban areas tend to have higher expenditures on institutional childbirth as compared to mothers residing in rural areas (Mohanty and Srivastava, 2013). Mothers belonging to higher wealth quintiles have approximately twice higher out-of-pocket expenditure on institutional childbirth compared to mothers from the lowest wealth quintiles (Mohanty and Srivastava, 2013; Shukla et al., 2015). Some studies have reported that the higher age of the mother is linked to higher expenditure on institutional delivery (Dunlop, Benova, and Campbell, 2018; Mohanty and Srivastava, 2013). The maternal educational level is another factor associated with out-of-pocket expenditure on institutional delivery. In general, mothers with higher educational level tend to have higher expenditure on institutional delivery (Mohanty and Srivastava, 2013). Higher-order births are less likely to be institutional births and there is a decline in expenditure for higher order births (Mohanty

and Srivastava, 2013; NFHS, 2016). For instance, in 2016, 88% of the first births were institutional deliveries however, only 48% of sixth or higher order births were delivered at a health care institution (NFHS, 2016). Caesarean births are related to increased expenditure as compared to normal deliveries (Mohanty and Srivastava, 2013). Private health facilities are associated with higher expenditure for institutional delivery. For instance, the average out-of-pocket expenditure for a delivery was 39 USD in a public health care institution and 139 USD in a private health care institution in 2008 (Mohanty and Srivastava, 2013). Several studies have also reported that the childbirth and maternal care services provided at public health centers in India are inferior in quality as compared to private health centers (Mohanty and Srivastava, 2013; Skordis-Worrall et al., 2011).

Aim

The project aimed to identify the determinants of out-of-pocket expenditure on institutional delivery in the states of Kerala and Nagaland and analyze the differential effects of the predictors in the two states. For the first time in 2015-2016, the NFHS-4 collected data regarding out-of-pocket expenditures on institutional delivery for the last birth (Mishra and Mohanty, 2019; NFHS-4, 2016).

Research questions

The specific research questions were:

1. What were the predictors of incurring out-of-pocket expenditure on institutional delivery in the state of Kerala among women who gave birth in the five years preceding the survey?
2. What were the predictors of the amount of out-of-pocket expenditure on institutional delivery in the state of Kerala among those women who made a payment?

3. What were the predictors of incurring out-of-pocket expenditure on institutional delivery in the state of Nagaland among women who gave birth in the five years preceding the survey?
4. What were the predictors of the amount of out-of-pocket expenditure on institutional delivery in the state of Nagaland among those women who made a payment?

Methods

Data source

The project used publicly available secondary data from the 4th National Family Health Survey (NFHS-4) 2015-16 dataset. The NFHS-4 data was collected through a nationally representative cross-sectional survey under the supervision of the International Institute for Population Sciences (IIPS), Mumbai and Ministry of Health and Family Welfare (MoHFW), Government of India (NFHS-4, 2016).

The NFHS-4 collected information on health, nutrition and welfare status in all states and union territories of India, using a stratified two-stage sampling technique for which, the 2011 census served as the sampling frame (NFHS-4, 2016). The total sample size comprised of 601,509 households in India (NFHS-4, 2016). The data was collected using four survey instruments (household, woman's, man's and biomarker questionnaires) in 17 local languages, after obtaining an informed verbal consent from participants (NFHS-4, 2016). The project utilizes information collected through the woman's questionnaire (NFHS-4 Woman's Questionnaire, 2016).

Study population

The study population comprised of women aged 15 – 49 years who gave birth in a health care facility in the five years preceding the survey, and lived in the states of Kerala or Nagaland at the time of the survey.

Inclusion/Exclusion criteria

To be eligible for inclusion in the study, the participants must be:

1. living in the states of Kerala and Nagaland at the time of the survey
2. women who gave birth in the five years preceding the survey.

Women who gave birth at home were excluded from the study because they did not incur any expenditure on institutional delivery; hence, they do not demonstrate variability with respect to the outcome variable, that is, out-of-pocket expenditure on institutional delivery.

Analyses

The data analyses were conducted using a two-part model, namely, hurdle model, to understand the significant predictors of out-of-pocket expenditure on institutional delivery in the state of Kerala and in the state of Nagaland. The two-part model is evidenced in literature as the current best econometric practice for analyses of outcomes with a significant proportion of zero values and skewed distributions, such as expenditure (Deb and Norton, 2018; Deb et al., 2006; Mohanty and Srivastava, 2013). The first part of the two-part analytical approach modeled the probability of incurring out-of-pocket expenditure on institutional delivery using a multivariable logistic regression where the outcome variable was binary, that is, no out-of-pocket expenditure on institutional delivery versus any out-of-pocket expenditure on institutional delivery. The second part of the two-part analytical model used generalized linear model with log link and gamma distribution, for those who incurred any out-of-pocket expenditure on institutional delivery, where the outcome variable was continuous, that is, the non-zero positive amount of out-of-pocket expenditure on institutional delivery (Deb and Norton, 2018).

The independent variables were age of mother (categorical –15–24 years, 25–34 years, 35–49 years), place of residence (dichotomous – urban/rural), educational level of mother (dichotomous – up to secondary/higher), place of delivery (dichotomous – public

facility/private facility), type of delivery (dichotomous – normal/caesarean), wealth index of household (categorical – poor, middle, rich), being a JSY beneficiary (dichotomous – yes/no), caste/tribe of mother (categorical – schedule caste (SC), schedule tribe (ST), other backward class (OBC), other) and birth order (categorical – 1, 2, 3, more than or equal to 4). Several independent variables, such as age of mother, educational level of mother, place of delivery, wealth index of household and caste/tribe of mother, were condensed into categories and the cut-off points for the categories were referenced from existing literature (Mishra and Mohanty, 2019; Mohanty and Srivastava, 2013).

It must be noted that the data for the most recent birth was used for the purpose of analyses and all analyses were conducted using standardized weights for each state after accounting for the complex sample design and cluster effect, based on the adjustments provided by the Demographic and Health Surveys (DHS, 2006; NFHS-4, 2016).

Data analyses were conducted using STATA version 16.0. Descriptive data analysis for continuous variables included the estimation of medians and means with standard deviations, and for categorical variables included the estimation of frequencies and proportions. Multicollinearity between variables was tested in the entire sample by the Variance Inflation Factor (VIF) and tolerance statistics.

To select the final set of predictors, in the first part of the analytical model, a univariable logistic regression was conducted for each state. Based on the results of the univariable logistic regression, all the statistically significant variables (level of significance < 0.05), such as, place of residence, place of delivery and type of delivery, were entered in the multivariable logistic regression model. In addition to these variables, the wealth index of the household, educational level of mother, caste/tribe of mother and JSY beneficiary status, were also included in the multivariable logistic regression model, based on the clinical meaningfulness of the variables. In the second part of the analytical model, the continuous

outcome variable, that is, any non-zero positive out-of-pocket expenditure on institutional delivery, was regressed against the same set of predictors as in the multivariable logistic regression model, after conducting a univariable generalized linear regression for each state. All the associations were reported with their corresponding 95% confidence intervals and p-value. The regression coefficients and 95% confidence intervals were exponentiated and interpreted as odds' ratio for the logistic regression models and as the percent change in the mean outcome for the generalized linear models. The approach for statistical inference was to estimate the effect range by interpreting the precision of estimates and the width of the confidence intervals, instead of a dichotomous test decision based on statistical significance alone.

Ethical considerations

The Institutional Review Board (IRB) at American University of Armenia (AUA) deemed the project exempt as the publicly available data did not contain any personal or household identifiers.

Results

Kerala

Descriptive analysis for the state of Kerala

The sample from the state of Kerala consisted of 2,126 women who gave birth in a health care facility in the five years preceding the survey; 1,673 of them paid out-of-pocket for institutional delivery in the state of Kerala. Table 1 presents the results of the descriptive analysis. Most women were in the age group of 25-34 years (68.1%), had obtained up to secondary level of education (61.4%) and belonged to the OBC caste category (57.8%). Most women gave birth in a private health care facility during the last delivery (60.3%),

belonged to the rich wealth index (86.5%) and were not beneficiaries of the JSY program (79.6%). Most of the births were first-order births (42.7%) and second-order births (42.1%) and normal deliveries (64.4%). The sample consisted of almost equal proportions of urban (47.2%) and rural residents (52.8%). For the total sample of Kerala (n = 2,216), the mean out-of-pocket expenditure on institutional delivery was 15,828.4 INR (211.6 USD) with a standard deviation of 19,849.8 INR (265.4 USD) and the median out-of-pocket expenditure on institutional delivery 10,000.0 INR (133.7 USD).

Distribution of out-of-pocket expenditure by socio-demographic, maternal and obstetric factors among out-of-pocket payers for the state of Kerala

Table 2 presents the distribution of out-of-pocket expenditure by socio-demographic, maternal and obstetric factors. Table 3 presents the median out-of-pocket expenditure by socio-demographic, maternal and obstetric factors among out-of-pocket payers. Among women who paid out-of-pocket for institutional delivery in the state of Kerala, majority of women belonged to the age group of 25-34 years (79.1%) and incurred a median out-of-pocket expenditure of 14,000 INR (Q1-Q3 = 5,500 – 27,500 INR), which was lower than the out-of-pocket expenditure of women in the age group of 35-49 years (median = 17,100 INR; Q1-Q3 = 8,000 – 30,000 INR) and higher than the out-of-pocket expenditure of women in the age group of 15-24 years (median = 13,500 INR; Q1-Q3 = 5,000 – 25,000 INR). Women who resided in rural areas (79.6%) had a median out-of-pocket expenditure of 14,000 INR (Q1-Q3 = 5,000 – 26,000 INR) in comparison to women who resided in urban areas (77.7%) and had a median out-of-pocket expenditure of 15,000 INR (Q1-Q3 = 6,500 – 30,000 INR). Majority of women belonged to the rich wealth index group (78.7%) and incurred the highest median out-of-pocket expenditure of 15,000 INR (Q1-Q3 = 7,000 – 30,000 INR) when compared to women in the middle wealth index group (median = 9,000 INR; Q1-Q3 = 3,000 – 17,000 INR) and women in the poor wealth index group (median = 4,000 INR; Q1-Q3 =

2,000 – 8,500 INR). Women who obtained up to secondary level of education (77.7%) had lower out-of-pocket expenditure (median = 4,500 INR; Q1-Q3 = 2,000 – 15,000 INR) in comparison to women who obtained higher education (median = 12,000 INR; Q1-Q3 = 5,000 – 24,000 INR). Most women belonged to the OBC caste category (77.4%) and incurred a median out-of-pocket expenditure of 14,000 INR (Q1-Q3 = 6,000 – 25,360 INR), which was higher than the out-of-pocket expenditure of women who belonged to the SC caste category (median = 6,050 INR; Q1-Q3 = 2,200 – 20,500 INR). Most women had normal delivery (76.4%) and incurred lower out-of-pocket expenditure (median = 12,000 INR; Q1-Q3 = 5,000 – 20,000 INR) in comparison to women who had Caesarean delivery (median = 23,400 INR; Q1-Q3 = 8,000 – 38,000 INR). Majority of women gave birth in a private health care facility (83.7%) and incurred higher out-of-pocket expenditure (median = 21,500 INR; Q1-Q3 = 13,000 – 34,700 INR) in comparison to women who gave birth in a public health care facility (median = 5,000 INR; Q1-Q3 = 2,000 – 9,000 INR). Women who were JSY beneficiaries (75.9%) had lower out-of-pocket expenditure (median = 5,000 INR; Q1-Q3 = 2,000 – 9,000 INR) in comparison to women who were not JSY beneficiaries (median = 17,900 INR; Q1-Q3 = 10,000 – 30,000 INR). Women who had one birth (78.3%) had higher out-of-pocket expenditure (median = 15,000 INR; Q1-Q3 = 7,000 – 30,000 INR) in comparison to women who had two births (median = 13,000 INR; Q1-Q3 = 5,000 – 27,000 INR), three births (median = 12,500 INR; Q1-Q3 = 5,000 – 25,000 INR) and four or more births (median = 13,500 INR; Q1-Q3 = 10,000 – 25,000 INR).

Multivariable logistic regression for the state of Kerala

Table 4 presents the results of the multivariable logistic regression. The odds of out-of-pocket expenditure on institutional delivery did not vary among women based on their place of residence and the data were not substantially compatible with the effect (OR = 1.04; 95% CI = 0.73, 1.48). No clear association was observed between attainment of higher education

and out-of-pocket expenditure (OR = 0.90; 95% CI = 0.67, 1.22). Amongst all caste categories, the odds of out-of-pocket expenditure on institutional delivery among women who belonged to ST caste category were the lowest, when compared to women who belonged to SC caste category; the observed effect range was suggestive of a moderate negative to a weak positive association between ST caste category and out-of-pocket expenditure (OR = 0.45; 95% CI = 0.12, 1.68). The odds of out-of-pocket expenditure on institutional delivery were lower among women who belonged to the OBC caste category (OR = 0.80; 95% CI = 0.49, 1.28). The odds of out-of-pocket expenditure on institutional delivery were higher among women who belonged to the other caste category (OR = 1.17; 95% CI = 0.69, 1.96). Across all wealth indices, the odds of out-of-pocket expenditure on institutional delivery were highest among women who belonged to the middle wealth index (OR = 1.19; 95% CI = 0.53, 2.68) when compared to women who belonged to the poor wealth index group; however, no clear association was observed between middle wealth index group and out-of-pocket expenditure. The odds of out-of-pocket expenditure on institutional delivery among women who belonged to the rich wealth index were lower when compared to women who belonged to the poor wealth index group (OR = 0.94; 95% CI = 0.44, 1.99). Women who had a Caesarean delivery had 1.39 times the odds of out-of-pocket expenditure on institutional delivery as compared to women who had a normal delivery; the observed effect range was suggestive of a weak positive association between Caesarean delivery and out-of-pocket expenditure (OR = 1.39; 95% CI = 1.07, 1.79). The odds of out-of-pocket expenditure on institutional delivery among women who gave birth in a private health care facility were 2.52 times the odds of out-of-pocket expenditure on institutional delivery among women who gave birth in a public health care facility; the observed effect range was suggestive of a moderately positive to a strongly positive association between birth in a private facility and out-of-pocket expenditure (OR = 2.52; 95% CI = 1.90, 3.34). The odds of out-of-pocket expenditure on

institutional delivery were higher among JSY beneficiaries; observed effect range was suggestive of a weak negative to a moderately positive association between JSY beneficiary status and out-of-pocket expenditure (OR = 1.38; 95% CI = 0.96, 1.96).

Multivariable generalized linear model for the state of Kerala

Table 5 presents the results of the multivariable generalized linear model. Among women who spent money on delivery, no clear association was observed between the place of residence and out-of-pocket expenditure on institutional delivery ($e^{\beta} = 0.98$; 95% CI = 0.87; 1.11). Women who obtained higher education had 17% higher mean out-of-pocket expenditure on institutional delivery; the observed effect range was suggestive of a weak positive association between attainment of higher education and out-of-pocket expenditure ($e^{\beta} = 1.17$, 95% CI = 1.05; 1.30). Women who gave birth in a private health care facility had a substantially higher mean out-of-pocket expenditure on institutional delivery by 175%; the observed effect range was suggestive of a strongly positive association between birth in a private facility and out-of-pocket expenditure ($e^{\beta} = 2.75$; 95% CI = 2.39; 3.16). Women who had a Caesarean delivery had 42% higher mean out-of-pocket expenditure as compared to women who had a normal delivery; the observed effect range was suggestive of a weak positive association between Caesarean delivery and out-of-pocket expenditure ($e^{\beta} = 1.42$; 95% CI = 1.30; 1.54). When compared to women who belonged to the SC caste category, the mean out-of-pocket expenditure on institutional delivery among women who belonged to OBC caste category was 15% higher; the observed effect range was suggestive of a weak positive association between OBC caste category and out-of-pocket expenditure ($e^{\beta} = 1.15$; 95% CI = 0.97; 1.36). The mean out-of-pocket expenditure on institutional delivery did not vary among ST caste category ($e^{\beta} = 1.01$; 95% CI = 0.64; 1.58). The mean out-of-pocket expenditure on institutional delivery was higher among the other caste category ($e^{\beta} = 1.32$; 95% CI = 1.12; 1.57). As compared to women who belonged to the poor wealth index,

women who belonged to the rich wealth index had 69% higher mean out-of-pocket expenditure on institutional delivery; the observed effect range was suggestive of a weak positive to a moderately positive association between rich wealth index group and out-of-pocket expenditure ($e^{\beta} = 1.69$; 95% CI = 1.34; 2.16). The mean out-of-pocket expenditure on institutional delivery was higher among middle wealth index group ($e^{\beta} = 1.42$; 95% CI = 1.11; 1.80). The mean out-of-pocket expenditure on institutional delivery was 31% lower among JSY beneficiaries; the observed effect range was suggestive of a moderately negative association between JSY beneficiary status and out-of-pocket expenditure ($e^{\beta} = 0.69$; 95% CI = 0.56; 0.84).

Nagaland

Descriptive analysis for the state of Nagaland

The sample from the state of Nagaland consisted of 1,081 women who gave birth in a health care facility in the five years preceding the survey; 767 of them paid out-of-pocket for institutional delivery in the state of Nagaland. Table 1 presents the results of the descriptive analysis. Most women were in the age group of 25-34 years (57.9%), had obtained up to secondary level of education (84.5%) and belonged to the ST caste category (84.2%). Most women gave birth in a public health care facility during the last delivery (74.8%), belonged to the poor wealth index (27.6%) or the middle wealth index (28.9%), and were not beneficiaries of the JSY program (70.1%). Most of the births were first-order births (38.1%) and second-order births (31.5%) and normal deliveries (80.2%). The sample consisted of almost equal proportions of urban (47.4%) and rural residents (52.6%). For the total sample of Nagaland ($n = 1,081$), the mean out-of-pocket expenditure on institutional delivery was 6,972.3 INR (93.2 USD) with a standard deviation of 12,699.0 INR (169.8 USD) and the median out-of-pocket low expenditure on institutional delivery 2,300.0 INR (30.8 USD).

Distribution of out-of-pocket expenditure by socio-demographic, maternal and obstetric factors among out-of-pocket payers for the state of Nagaland

Table 2 presents the distribution of out-of-pocket expenditure by socio-demographic, maternal and obstetric factors. Table 3 presents the median out-of-pocket expenditure by socio-demographic, maternal and obstetric factors among out-of-pocket payers. Among women who paid out-of-pocket for institutional delivery in the state of Nagaland, most women belonged to the age group of 25-34 years (70.9%) and incurred a median out-of-pocket expenditure of 4,500 INR (Q1-Q3 = 2,000 – 12,000 INR), which was lower than the out-of-pocket expenditure of women in the age group of 35-49 years (median = 5,000 INR; Q1-Q3 = 2,000 – 15,000 INR) and higher than the out-of-pocket expenditure of women in the age group of 15-24 years (median = 3,700 INR; Q1-Q3 = 2,000 – 8,600 INR). Women who resided in rural areas (74.1%) had a median out-of-pocket expenditure of 4,000 INR (Q1-Q3 = 1,700 – 10,000 INR) in comparison to women who resided in urban areas (67.5%) and had a median out-of-pocket expenditure of 5,000 INR (Q1-Q3 = 2,500 – 12,000 INR). Women who belonged to the rich wealth index group (70.2%) incurred the highest out-of-pocket expenditure (median = 7,500 INR; Q1-Q3 = 3,000 – 20,000 INR) when compared to women in the middle wealth index group (median = 4,000 INR; Q1-Q3 = 2,000 – 9,000 INR) and women in the poor wealth index group (median = 3,000 INR; Q1-Q3 = 1,500 – 6,400 INR). Women who obtained up to secondary level of education (70.5%) had a median out-of-pocket expenditure of 3,500 INR (Q1-Q3 = 1,600 – 7,000 INR) in comparison to women who obtained higher education (median = 4,000 INR; Q1-Q3 = 2,000 – 10,000 INR). Majority of women belonged to the ST caste category (70.9%) and incurred a median out-of-pocket expenditure of 4,000 INR (Q1-Q3 = 2,000 – 11,000 INR), which was lower than the out-of-pocket expenditure of women who belonged to the SC caste category (median = 4,900 INR; Q1-Q3 = 2,400 – 10,850 INR). Majority of women had a normal delivery (70.3%) and

incurred a lower out-of-pocket expenditure on institutional delivery (median = 3,500 INR; Q1-Q3 = 1,800 – 7,300 INR) in comparison to women who had Caesarean delivery (median = 19,000 INR; Q1-Q3 = 7,000 – 35,000 INR). Majority of women gave birth in a public health care facility (69.9%) and incurred a lower out-of-pocket expenditure on institutional delivery (median = 3,000 INR; Q1-Q3 = 1,500 – 6,300 INR) in comparison to women who gave birth in a private health care facility (median = 15,000 INR; Q1-Q3 = 8,000 – 30,000 INR). Women who were JSY beneficiaries (71.4%) had lower out-of-pocket expenditure (median = 3,100 INR; Q1-Q3 = 1,500 – 8,000 INR) in comparison to women who were not JSY beneficiaries (median = 5,000 INR; Q1-Q3 = 2,000 – 12,500 INR). Women who had one birth (71.9%) had higher out-of-pocket expenditure (median = 5,500 INR; Q1-Q3 = 2,100 – 15,000 INR) in comparison to women who had two births (median = 4,000 INR; Q1-Q3 = 2,000 – 10,000 INR), three births (median = 3,600 INR; Q1-Q3 = 2,000 – 8,500 INR) and four or more births (median = 4,000 INR; Q1-Q3 = 2,000 – 7,350 INR).

Multivariable logistic regression for the state of Nagaland

Table 4 presents the results of the multivariable logistic regression. Women who resided in rural areas had higher odds of out-of-pocket expenditure on institutional delivery as compared to women who resided in urban areas; the observed effect range was suggestive of a weak to moderate positive association between rural residence and out-of-pocket expenditure (OR = 1.51; 95% CI = 1.04, 2.19). Women who had a higher education had 1.51 times the odds of out-of-pocket expenditure on institutional delivery as compared to women who had up to secondary level education; the observed effect range was suggestive of a weak negative to a moderately positive association between attainment of higher education and out-of-pocket expenditure (OR = 1.22; 95% CI = 0.77, 1.93). Across all wealth indices, the odds of out-of-pocket expenditure on institutional delivery were the highest among women with middle wealth index when compared to women with poor wealth index; the observed effect

range was suggestive of a weak negative to a moderately positive association between middle wealth index group and out-of-pocket expenditure (OR = 1.35; 95% CI = 0.89, 2.03). The odds of out-of-pocket expenditure on institutional delivery did not vary among rich wealth index group (OR = 1.04; 95% CI = 0.68, 1.58). Women who gave birth in a private health care facility had 1.41 times the odds of out-of-pocket expenditure on institutional delivery; the observed effect range was suggestive of a weak negative to a moderately positive association between birth in a private facility and out-of-pocket expenditure (OR = 1.41; 95% CI = 0.90, 2.20). No clear association was observed between Caesarean delivery and out-of-pocket expenditure (OR = 1.15; 95% CI = 0.73, 1.79). The odds of out-of-pocket expenditure on institutional delivery did not vary substantially among JSY beneficiaries (OR = 1.04; 95% CI = 0.73, 1.49) and among women who belonged to the OBC caste category (OR = 1.00; 95% CI = 0.19, 5.19) or the ST caste category (OR = 0.97; 95% CI = 0.40, 2.36) when compared to women who belonged to the SC caste category. The model produced very high OR and extremely wide CI for the 'other caste' category (OR = 10.66; 95% CI = 1.05, 107.84) suggesting that the 'other caste' category had a problem of sparse data and the model could not produce meaningful estimates.

Multivariable generalized linear model for the state of Nagaland

Table 5 presents the results of the multivariable generalized linear model. Among women who spent money on delivery, no clear association was observed between the place of residence and out-of-pocket expenditure on institutional delivery ($e^{\beta} = 1.05$; 95% CI = 0.74; 1.36). Women who obtained higher education had higher mean out-of-pocket expenditure on institutional delivery by 15% as compared to women who obtained up to secondary level education; the observed effect range was suggestive of a weak negative to a weak positive association between attainment of higher education and out-of-pocket expenditure ($e^{\beta} = 1.15$; 95% CI = 0.91; 1.45). The mean out-of-pocket expenditure on institutional delivery was

lower among women who belonged to OBC caste when compared to women who belonged to SC caste category ($e^{\beta} = 0.76$; 95% CI = 0.44; 1.34); no clear association was observed between OBC caste category and out-of-pocket expenditure. The mean out-of-pocket expenditure on institutional delivery did not vary among women who belonged to the ST caste category ($e^{\beta} = 0.94$; 95% CI = 0.66; 1.32) and the other caste category ($e^{\beta} = 0.97$; 95% CI = 0.68; 1.39) when compared to women who belonged to the SC caste category. No clear associations were observed between wealth indices and out-of-pocket expenditure. Women who gave birth in a private health care facility had substantially higher mean out-of-pocket expenditure on institutional delivery by 159% when compared to women who gave birth in a public health care facility; the observed effect range was suggestive of a strongly positive association between birth in a private facility and out-of-pocket expenditure ($e^{\beta} = 2.59$; 95% CI = 2.14; 3.10). Women who had a Caesarean delivery had substantially higher mean out-of-pocket expenditure on institutional delivery by 163% in comparison to women who had a normal delivery; the observed effect range was suggestive of a strongly positive association between Caesarean births and out-of-pocket expenditure ($e^{\beta} = 2.63$; 95% CI = 2.20; 3.16). The mean out-of-pocket expenditure on institutional delivery was 18% lower among JSY beneficiaries; the observed effect range was suggestive of a weak negative association between JSY beneficiary status and out-of-pocket expenditure ($e^{\beta} = 0.82$; 95% CI = 0.66; 1.02).

The multicollinearity assessment between all the predictors common across logistic regression and generalized linear models did not identify any violations, yielding VIFs and tolerance values below 2.0 and 1.0 respectively.

Discussion

The results were consistent with findings of many similar studies reported in the literature (Dunlop, Benova, and Campbell, 2018; Mishra and Mohanty, 2019; Mohanty and Srivastava, 2013; Shukla et al., 2015; Skordis-Worrall et al., 2011; Vora et al., 2015). The study found some similar and some differential patterns for socio-demographic and obstetric predictors of out-of-pocket expenditure on institutional delivery in the states of Kerala and Nagaland.

The study found that the median out-of-pocket expenditure on institutional delivery for the most recent birth in the state of Kerala was 10,000.0 INR (133.7 USD) and in the state of Nagaland was 2,300.0 INR (30.8 USD). The observed differences in the median out-of-pocket expenditure on institutional delivery in the two states could be due to the differences in the socio-economic situation of the two states, as measured by the economic indicators, per which Kerala ranks economically higher than Nagaland (NHP, 2010).

The study found that in both states, older women had lower odds of paying out-of-pocket for institutional delivery, however, when they paid, they were likely to pay more than younger women. In other words, advanced maternal age was associated with a higher mean out-of-pocket expenditure on institutional delivery in both states among those women who made an out-of-pocket payment for delivery. It is evidenced in literature, that advanced maternal age alone is a risk factor for several complications during pregnancy and childbirth, and obstetric complications could be attributable to added out-of-pocket expenses for delivery (Kesterton et al., 2010; Triunfo et al., 2019).

The study found that as compared to urban residents, the odds of paying out-of-pocket were similar among rural residents in Kerala, but higher among rural residents in Nagaland. The study found that in both states, the mean out-of-pocket expenditure of rural residents on institutional delivery was similar to that of urban residents. This was not in line with the

literature that suggests that mothers residing in urban areas tend to have higher out-of-pocket expenditures on institutional childbirth as compared to mothers residing in rural areas (Lim et al., 2010; Mishra and Mohanty, 2019; Mohanty and Srivastava, 2013; Shukla et al., 2015).

The study found that as compared to women who belonged to the SC caste category, the odds of paying out-of-pocket among women who belonged to OBC caste category were lower in Kerala, and similar in Nagaland. However, the mean out-of-pocket expenditure among those who made a payment was higher in Kerala. Among women who belonged to ST caste category, the odds of paying out-of-pocket were lower in both states, but the mean out-of-pocket expenditure was lower in Nagaland and similar in Kerala. As compared to the known literature, women belonging to SC/ST caste groups demonstrated poor maternal health care seeking behaviors due to their economically backward situation and their lack of awareness regarding available health care services (Bhatia and Cleland, 1995; Navaneetham, and Dharmalingam, 2002; Sontakke, Reshmi, and Sebastian, 2009).

The study found that among women with higher education, the odds of incurring out-of-pocket expenditure on institutional delivery were higher in Nagaland. However, in both states, women with higher education were likely to pay more than women with up to secondary level of education among those who made an out-of-pocket payment for delivery. Several past studies have also reported similar associations between maternal education, health care service utilization and institutional delivery related out-of-pocket expenses of women (Mohanty, and Pathak, 2009; Singh and Singh, 2007).

The study found that in both states, women who belonged to a middle and/or rich wealth index group and women who gave birth in a private health care facility had higher odds of paying out-of-pocket, and often paid more. Literature suggests that there is a strong positive correlation between socio-economic status and health care expenditure (Arpey et al., 2017; Borghi, 2001; Celik, and Hotchkiss, 2000; Maharlouei et al., 2017; Wellay et al., 2018;

Vora et al., 2015). Many past studies have reported that in India, the cost of delivery in a private health care facility is about 3–4 times higher than in a public health care facility (Kesterton et al., 2010; Mohanty and Srivastava, 2013; Skordis-Worrall et al., 2011; Vora et al., 2015).

The study found that women who had Caesarean-section delivery had higher odds of incurring out-of-pocket expenditure in Kerala, and when they paid, they were likely to pay more than women who did not have a Caesarean-section in both states. Many studies in the past have also reported a similar association between type of delivery and out-of-pocket expenditure on delivery in a health care facility (Lauer et al., 2010; Lumbiganon et al., 2010; Mohanty and Srivastava, 2013).

The study found that in both states, higher-order births, i.e. third-order or higher, had lower odds of incurring any out-of-pocket expenditure on institutional delivery and were associated with a lower mean out-of-pocket expenditure on institutional delivery. In other words, multiparous women were less likely to pay out-of-pocket on institutional delivery, and when they paid, they tended to pay less. Some researchers explained that the lower out-of-pocket expenditure for the third and higher-order births could be due to limited financial resources of the family, higher confidence of multiparous women due to prior deliveries, JSY's policy of providing financial incentives to the first two live births only and dissatisfaction with health care facilities and services during past deliveries (Govil, et al., 2016; Mishra and Mohanty, 2019; Mohanty and Srivastava, 2013; Vora et al., 2015).

The study found that the odds of out-of-pocket expenditure on institutional delivery were somewhat higher among JSY beneficiaries in Kerala, but did not vary substantially in Nagaland. The study found that in both states, women who were JSY beneficiaries had lower mean out-of-pocket expenditure as compared to non-beneficiaries of JSY program, implying that JSY beneficiaries paid less amount out-of-pocket on institutional delivery in both states;

this finding was consistent with other studies (Mohanty and Srivastava, 2013). This finding indicates the success of the JSY program at least in the two states, Kerala and Nagaland.

Strengths

The study was based on a state representative sample, which was obtained through a complex multistage sampling technique. The study used a large sample size and the sample was weighted for the analyses after accounting for the clustering effect. The study used the current best-known econometric methodology, namely, the hurdle model, to analyze the data. To best of researchers' knowledge, this is the first study in India which assessed the predictors of out-of-pocket expenditure on institutional delivery in two states of India with the highest and lowest proportions of institutional deliveries.

Limitations

Since the study was based on a cross-sectional survey, it precludes the assessment of causality from the observed relationships. There is also a possibility of recall bias among study participants, since they were required to remember details of their delivery and associated hospital payments in the last five years. Since the study utilized a secondary dataset, there were restrictions on the inclusion of potential predictors of out-of-pocket expenditure. Several measures were self-reported and may be subject to social desirability bias. The issue of sparse data was encountered for the 'caste' variable in the state of Nagaland, in the 'other caste' category. The variable was further investigated by excluding it from the final model. The investigation suggested that the results were unaltered by the presence of the 'caste' variable since there were no substantial changes in the models after exclusion of the variable. However, it is recommended for future studies to exclude the 'caste' variable from the multivariable logistic regression and generalized linear models across both states to draw comparisons.

Recommendations

Based on the study findings, it is recommended that the government continues the cash incentives under the JSY program. However, it is suggested that the JSY incentives must be adjusted based on several socio-economic and obstetric differentials, such as age of the mother, caste of the mother, socio-economic situation of the state, birth order, and Caesarean-section delivery (Mohanty and Srivastava, 2013; Vora et al., 2015). Future research could use both qualitative and quantitative studies to explore women's experience regarding their unmet obstetric needs, the quality of health care services and financial reimbursement received through financial government schemes (Vora et al., 2015).

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Tables

Table 1. Descriptive characteristics of participants

Characteristic	Kerala	Nagaland
Total OOPE (INR), mean (SD)	15,828.4 (19,849.8)	6,972.3 (12,699.0)
Total OOPE (INR), median	10,000.0	2,300.0
Age of mother, n (%)		
15–24 years	412.6 (19.4)	235.2 (21.7)
25–34 years	1,447.9 (68.1)	626.4 (57.9)
35–49 years	265.4 (12.5)	219.4 (20.3)
Place of residence, n (%)		
Urban	1,003.7 (47.2)	512.4 (47.4)
Rural	1,122.2 (52.8)	568.5 (52.6)
Educational level, n (%)		
≤Secondary	1,306.2 (61.4)	914.1 (84.5)
Higher	819.7 (38.5)	166.8 (15.4)
Place of delivery, n (%)		
Public facility	841.5 (39.5)	809.1 (74.8)
Private facility	1,283.1 (60.3)	269.3 (24.9)
Missing	1.2 (0.1)	2.5 (0.2)
Type of delivery, n (%)		
Normal	1,370.3 (64.4)	867.4 (80.2)
Caesarean	755.6 (35.5)	213.5 (19.7)
Wealth Index, n (%)		
Poor	37.6 (1.7)	299.2 (27.6)
Middle	247.6 (11.6)	312.5 (28.9)
Rich	1,840.6 (86.5)	469.2 (43.4)
JSY beneficiary, n (%)		
No	1,692.3 (79.6)	758.1 (70.1)
Yes	432.4 (20.3)	314.9 (29.1)
Missing	1.2 (0.1)	7.8 (0.7)
Caste of mother, n (%)		
SC	196.5 (9.2)	71.7 (6.6)
ST	37.4 (1.76)	909.8 (84.2)
OBC	1,230.5 (57.8)	12.4 (1.3)
Other	518.2 (24.4)	15.9 (1.5)
Missing	143.3 (6.7)	71.0 (6.6)
Birth order, n (%)		
1	909.6 (42.7)	412.1 (38.1)
2	894.3 (42.1)	341.3 (31.5)
3	242.4 (11.4)	169.8 (15.7)
≥4	79.6 (3.7)	157.7 (14.6)

OOPE – Out-of-pocket expenditure

INR – Indian Rupees

SD – Standard deviation

JSY – Janani Suraksha Yojana

SC – Scheduled caste

ST – Scheduled tribe

OBC – Other backward class

Table 2. Distribution of out-of-pocket expenditure by socio-demographic, maternal and obstetric variables

Variable	Kerala	Nagaland
Age of mother, n (%)		
15–24 years	321.7 (78.0)	170.7 (72.6)
25–34 years	1,145.7 (79.1)	444.1 (70.9)
35–49 years	205.6 (77.5)	152.4 (69.5)
Place of residence, n (%)		
Urban	780.2 (77.7)	345.7 (67.5)
Rural	892.8 (79.6)	421.4 (74.1)
Educational level, n (%)		
≤Secondary	1,014.5 (77.7)	644.7 (70.5)
Higher	658.6 (80.3)	122.5 (73.4)
Place of delivery, n (%)		
Public facility	598.5 (71.1)	565.6 (69.9)
Private facility	1,074.5 (83.7)	201.5 (74.8)
Type of delivery, n (%)		
Normal	1,047.0 (76.4)	609.5 (70.3)
Caesarean	626.0 (82.8)	157.6 (73.8)
Wealth Index, n (%)		
Poor	26.8 (71.3)	206.4 (69.0)
Middle	197.1 (79.6)	231.4 (74.0)
Rich	1,449.2 (78.7)	329.3 (70.2)
JSY beneficiary, n (%)		
No	1,345.0 (79.5)	542.4 (71.5)
Yes	328.0 (75.9)	224.8 (71.4)
Caste of mother, n (%)		
SC	155.4 (79.1)	48.5 (67.6)
ST	23.7 (63.4)	644.9 (70.9)
OBC	952.2 (77.4)	9.3 (75.0)
Other	432.8 (83.5)	12.8 (80.5)
Birth order, n (%)		
1	712.1 (78.3)	296.1 (71.9)
2	722.4 (80.8)	252.5 (74.0)
3	181.5 (74.9)	111.6 (65.7)
≥4	56.9 (71.5)	106.9 (67.8)

JSY – Janani Suraksha Yojana

SC – Scheduled caste

ST – Scheduled tribe

OBC – Other backward class

Table 3. Distribution of out-of-pocket expenditure in 1,000 Indian Rupees (INR) by socio-demographic, maternal and obstetric variables among out-of-pocket payers

Variable	Kerala	Nagaland
	Out-of-pocket expenditure in 1,000 INR Median (Q1 – Q3)	Out-of-pocket expenditure in 1,000 INR Median (Q1 – Q3)
Age of mother		
15–24 years	13.5 (5.0 – 25.0)	3.7 (2.0 – 8.6)
25–34 years	14.0 (5.5 – 27.5)	4.5 (2.0 – 12.0)
35–49 years	17.1 (8.0 – 30.0)	5.0 (2.0 – 15.0)
Place of residence		
Urban	15.0 (6.5 – 30.0)	5.0 (2.5 – 12.0)
Rural	14.0 (5.0 – 26.0)	4.0 (1.7 – 10.0)
Educational level		
≤Secondary	4.5 (2.0 – 15.0)	3.5 (1.6 – 7.0)
Higher	12.0 (5.0 – 24.0)	4.0 (2.0 – 10.0)
Place of delivery		
Public facility	5.0 (2.0 – 9.0)	3.0 (1.5 – 6.3)
Private facility	21.5 (13.0 – 34.7)	15.0 (8.0 – 30.0)
Type of delivery		
Normal	12.0 (5.0 – 20.0)	3.5 (1.8 – 7.3)
Caesarean	23.4 (8.0 – 38.0)	19.0 (7.0 – 35.0)
Wealth Index		
Poor	4.0 (2.0 – 8.5)	3.0 (1.5 – 6.4)
Middle	9.0 (3.0 – 17.0)	4.0 (2.0 – 9.0)
Rich	15.0 (7.0 – 30.0)	7.5 (3.0 – 20.0)
JSY beneficiary		
No	17.9 (10.0 – 30.0)	5.0 (2.0 – 12.5)
Yes	5.0 (2.0 – 9.0)	3.1 (1.5 – 8.0)
Caste of mother		
SC	6.1 (2.2 – 20.5)	4.9 (2.4 – 10.9)
ST	4.0 (1.9 – 14.0)	4.0 (2.0 – 11.0)
OBC	14.0 (6.0 – 25.4)	6.0 (2.7 – 10.5)
Other	20.0 (9.0 – 33.0)	6.0 (4.5 – 15.0)
Birth order		
1	15.0 (7.0 – 30.0)	5.5 (2.1 – 15.0)
2	13.0 (5.0 – 27.0)	4.0 (2.0 – 10.0)
3	12.5 (5.0 – 25.0)	3.6 (2.0 – 8.5)
≥4	13.5 (10.0 – 25.0)	4.0 (2.0 – 7.4)

Q1 – First quartile (25th percentile)

Q3 – Third quartile (75th percentile)

JSY – Janani Suraksha Yojana

SC – Scheduled caste

ST – Scheduled tribe

OBC – Other backward class

Table 4. Multivariable logistic regression between out-of-pocket expenditure on institutional delivery and predictors

Variable	Kerala			Nagaland		
	OR	95% CI	p-value	OR	95% CI	p-value
Place of residence						
Urban	Ref.			Ref.		
Rural	1.04	0.73; 1.48	0.88	1.51	1.04; 2.19	0.03
Educational level						
≤Secondary	Ref.			Ref.		
Higher	0.90	0.67; 1.22	0.51	1.22	0.77; 1.93	0.39
Place of delivery						
Public facility	Ref.			Ref.		
Private facility	2.52	1.90; 3.34	<0.01	1.41	0.90; 2.20	0.13
Type of delivery						
Normal	Ref.			Ref.		
Caesarean	1.39	1.07; 1.79	0.01	1.15	0.73; 1.79	0.54
Wealth Index						
Poor	Ref.			Ref.		
Middle	1.19	0.53; 2.68	0.68	1.35	0.89; 2.03	0.15
Rich	0.94	0.44; 1.99	0.88	1.04	0.68; 1.58	0.86
JSY beneficiary						
No	Ref.			Ref.		
Yes	1.38	0.96; 1.96	0.08	1.04	0.73; 1.49	0.82
Caste of mother						
SC	Ref.			Ref.		
ST	0.45	0.12; 1.68	0.24	0.97	0.40; 2.36	0.95
OBC	0.80	0.49; 1.28	0.36	1.00	0.19; 5.19	0.99
Other	1.17	0.69; 1.96	0.55	10.66	1.05; 107.84	0.04

OR – Odds' Ratio

CI – Confidence Interval

Ref. – Reference category

JSY – Janani Suraksha Yojana

SC – Scheduled caste

ST – Scheduled tribe

OBC – Other backward class

Table 5. Multivariable generalized linear model between non-zero positive amount of out-of-pocket expenditure on institutional delivery and predictors

Variable	Kerala			Nagaland		
	e ^β	95% CI	p-value	e ^β	95% CI	p-value
Place of residence						
Urban	Ref.			Ref.		
Rural	0.98	0.87; 1.11	0.79	1.05	0.74; 1.36	0.98
Educational level						
≤Secondary	Ref.			Ref.		
Higher	1.17	1.05; 1.30	<0.01	1.15	0.91; 1.45	0.22
Place of delivery						
Public facility	Ref.			Ref.		
Private facility	2.75	2.39; 3.16	<0.01	2.59	2.14; 3.10	<0.01
Type of delivery						
Normal	Ref.			Ref.		
Caesarean	1.42	1.30; 1.54	<0.01	2.63	2.20; 3.16	<0.01
Wealth Index						
Poor	Ref.			Ref.		
Middle	1.42	1.11; 1.80	<0.01	0.91	0.64; 1.28	0.59
Rich	1.69	1.34; 2.16	<0.01	1.09	0.79; 1.51	0.56
JSY beneficiary						
No	Ref.			Ref.		
Yes	0.69	0.56; 0.84	<0.01	0.82	0.66; 1.02	0.07
Caste of mother						
SC	Ref.			Ref.		
ST	1.01	0.64; 1.58	0.95	0.94	0.66; 1.32	0.70
OBC	1.15	0.97; 1.36	0.11	0.76	0.44; 1.34	0.34
Other	1.32	1.12; 1.57	<0.01	0.97	0.68; 1.39	0.88

β – Regression coefficient
 Ref. – Reference category
 CI – Confidence Interval
 JSY – Janani Suraksha Yojana
 SC – Scheduled caste
 ST – Scheduled tribe
 OBC – Other backward class