Tiziana Leone

Demand and supply factors affecting the rising overmedicalization of birth in India

Article (Accepted version) (Refereed)

Original citation:
Leone, Tiziana (2014) *Demand and supply factors affecting the rising overmedicalization of birth in India.* International Journal of Gynecology and Obstetrics. ISSN 0924-8447 (In Press)
DOI: 10.1016/j.ijgo.2014.05.018

CLINICAL ARTICLE

Demand and supply factors affecting the rising overmedicalization of birth in India

Tiziana Leone *

Department of Social Policy, London School of Economics, London, UK

* Corresponding author: Tiziana Leone

Department of Social Policy, London School of Economics, Houghton St, London, WC2 2AE, UK. Tel.: +44 20 7955 7515; fax: +44 20 7955 7415.

E-mail address: t.leone@lse.ac.uk

Keywords: Cesarean delivery; Demand; Low-income countries; India; Overmedicalization; Supply

Synopsis: After controlling for risk factors and socioeconomic characteristics, the probability of cesarean delivery in India was driven mainly by supply factors rather than by demand.

ABSTRACT

Objective: To understand the interaction between health systems and individual factors in determining the probability of a cesarean delivery in India.

Methods: In a retrospective study, data from the 2007–2008 District Level Household and Facility Survey was used to determine the risk of cesarean delivery in six states (Punjab, Delhi, Maharashtra, Andhra Pradesh, Kerala, and Tamil Nadu). Multilevel modeling was used to account for district and community effects.

Results: After controlling for key risk factors, the analysis showed that cesareans were more likely at private than public institutions ($P<0.001$). In terms of demand, higher education levels rather than wealth seemed to increase the likelihood of a cesarean delivery. District-level effects were significant in almostall states ($P<0.001$) demonstrating the need to control for health system factors.

Conclusion: Supply factors might contribute more to the rise in cesarean delivery than does demand. Further research is needed to understand whether the quest for increased institutional deliveries in a country with high maternal mortality might be compromised by pressures for overmedicalization.

1. Introduction

Low- and middle-income countries need to deliver quality maternal health care, but some are faced with persistently high levels of maternal mortality and morbidity alongside rising levels of overmedicalization, which is most commonly measured by rates of nonemergency cesarean delivery [1]. The proportion of all deliveries conducted by cesarean is used as an indicator of the level of complications and access to quality obstetric care [1]. However, concerns raised about nonclinical reasons for performing this procedure are often ignored [2].

Many low- and middle-income countries are currently experiencing a double burden of inefficiency within maternal healthcare. On one hand, there is a struggle to meet the demands of Millennium Development Goal 5 (MDG 5) for increased skilled attendance at birth and institutional deliveries (MDG 5 aims to reduce maternal mortality; MDG 5b specifically uses the maternal mortality ratio and percentage of institutional deliveries as target indicators). On the other hand, increasing rates of cesarean in both the private and public sectors raise concerns about the generalized overmedicalization of delivery, which might ultimately affect the ability of countries to improve the quality of intrapartum care [3]. Lack of regulation and indiscriminate use of healthcare services are possible side effects that the push toward meeting targets might create; they are increasing in many low- and middle-income countries [1,4].

Unnecessary cesareans place an extra burden on women and households [5], particularly in financial terms. Even in cases when the procedure is nominally free, under-the-table payments are likely; in addition, more days are spent in hospital, which can mean higher loss of earnings for the family and extra accommodation

costs if the woman lives out of town, as well as the extra burden if she is cared for in a private institution [6]. The burden on institutions is also clear in terms of the extra need for equipment, infrastructure, and personnel [7]. Furthermore, the increasing incidence of cesarean delivery might hinder attempts to increase institutional deliveries (currently 67% in India) because, as demonstrated in Bangladesh, women fear that they will have a cesarean if they deliver in a hospital [8].

In India, the number of maternal healthcare interventions in general (and cesarean rates specifically) has risen sharply, but persistently high levels of maternal mortality remain [9]. In 2012, there were an estimated 67 000 maternal deaths among 28 million pregnancies in India [10]; thus, maternal morbidity and mortality are key health issues.

The current National Rural Health Mission program [11] includes interventions to improve the use of reproductive and child health services. Health service interventions include the use of conditional cash transfers to pregnant women with low incomes for institutional delivery (e.g. the Janani Suraksha Yojana [JSY] program in India [12]), with higher payments for cesarean delivery. An initial evaluation [12] showed that 4% of respondents did not use JSY services because they were afraid of unnecessary cesarean—a finding that is in line with women's perception of risk when using hospitals [8]. However, state-level variations notwithstanding, the JSY program resulted in an increase in the overall number of women using institutional delivery facilities in 2005–2006 and 2009–2010 [13], but it is still not enough to keep pace with the number of women still in need to give birth in institutions. Given the surge in available obstetric services over the past decade in

India, there is a need to capitalize on the gains to improve the quality of obstetric care, much of which does not meet government targets [14].

The rate of cesarean in India has increased in recent years: in some areas, it is now over 30% (unpublished data) and in many other areas it is greater than the previously WHO recommended rate of 5%–15% (Figure 1). Whereas the proportion of women delivering by cesarean has increased, the perinatal mortality rate has not declined, which sheds doubt on the medical necessity of the increased number of procedures being performed [9].

Advances in surgical techniques have made cesarean delivery much less risky, encouraging Indian obstetricians to perform more of them [18]. Previous research in India [19] has also found that high rates of cesarean are associated with several factors: availability of facilities and trained obstetricians; source of payment for delivery (through insurance) and place of birth (private institutions); physician practice styles; obstetrician's clinical attitude and fear of litigation; and emphasis on the astrologic calendar with the demand for neonates to be born at a certain time [18,20]. However, the choice to do a cesarean is often made by the obstetric surgeon, who might be partly motivated by profit. In addition—as is happening in other countries where cesarean is becoming popular—a lack of midwives supervising deliveries may also have a role [1].

What is unclear is the balance between supply (health system) and demand (from the individual) in both public and private contexts. Studies by Hopkins (2000) [21][in Brazil have highlighted how rising overmedicalization of intrapartum care is often

mistaken as a woman's choice. In India, few studies highlight issues regarding quality of care and decision making at the time of delivery and during the pregnancy.

The primary aim of this study was to analyze the determinants of cesarean delivery in India to examine the extent to which the increasing trend is driven by supply or demand. Secondary aims were to determine how communities affect rising cesarean rates, whether gender preference for boys matters, and how individual and health systems affect the likelihood of cesarean delivery.

2. Materials and methods

In a retrospective study, data were analyzed from the third District Level Household and Facility Survey (DLHS) done between December, 2007, and December, 2008. Births in the 3 years prior to the survey were considered for six states or union territories: Punjab, Delhi, Maharashtra, Andhra Pradesh, Kerala, and Tamil Nadu [22]. No ethical clearance or informed consent was needed for the present study because it used secondary data that had undergone clearance [23].

The states were chosen for their cesarean rates (at least 10% at state level), regional divide (north/south), health systems' features, and gender preference for boys (Punjab, Delhi, and Maharashtra show strong boy preference [23]). Kerala, Tamil Nadu, and Andhra Pradesh are traditionally states with a low gender preference, have a large share of public expenditure as a percentage of the overall public expenditure, and also have the highest rates of caesarean delivery in the country (e.g. 31% in Kerala).

The DLHS represents a unique source of data because it allows incorporation of district-level data currently not available in standard Demographic and Health Surveys. Each state is divided into 50 primary sampling units (PSU), each containing an average of 15 districts. It is particularly important to consider district-level data, because districts are the key units in India administering the tertiary hospitals that are in charge of most cesarean deliveries. In addition, many of the public health campaigns and services are decided at district level.

Data extracted from the DLHS included socioeconomic characteristics at the household (e.g. wealth quintile) and maternal (e.g. education, residence, religion, caste, and sex of child) levels, and information on risk factors (e.g. mother's age, birth weight, previous cesarean, parity, pregnancy complications) and health-system factors (e.g. private vs public, distance to health center, and prenatal care program). For the present analysis, wealth quintiles were calculated separately for rural and urban areas in each state by the Filmer and Pritchett asset indicator, using principal component analysis to account for the weights that each asset had in the two areas [24].

Indicators of prepregnancy and postpregnancy risk factors included whether the woman received at least one warning about pregnancy complications, if the respondent was advised on where to go in case of pregnancy complications, and if the respondent had at least one complication during delivery. Age and parity were included as risk factors because evidence suggests that maternal age is positively correlated with risk of cesarean, and women with lower parity or who have had a previous cesarean are usually at higher risk of cesarean [1]. High birth weight and

maternal obesity were also included as they have been associated with a high risk of cesarean [2,18]. These risk factors were included to account for all cesarean deliveries that might have been medically necessary; the net effect after controlling for these factors indicates procedures that were not necessarily needed and might be a sign of overmedicalization.

Variables describing the provision of information to women—such as whether the respondent had heard of government family-planning programs, government programs for institutional delivery, or government prenatal-care programs—were included to capture both the level of informal knowledge on these key reproductive matters and the overall local government effort to improve uptake of services.

At the health-system level, variables included whether the delivery facility was private or public, distance to the health center, and whether there were local programs on prenatal care, institutional delivery, and family planning. Lastly, district-level variables were taken into account to test the effect of health systems, and PSU variables to test for social network and community-level effects. Previous studies have showed a strong effect of social diffusion when it comes to deciding whether or not to have a cesarean, in particular in Latin America [4,21,25].

Given the hierarchical nature of the data, modeling was carried out in two stages: in the first stage, fixed effects were considered to assess the strength of the relationships; in the second stage, a three-level random intercept model was considered at the individual, district (health system), and PSU (community) levels. A significant ($P \leq 0.01$ unless stated otherwise) clustering at PSU level would indicate

that there is a community-level influence on the risk of cesarean, whereas district-level variance would show effects due to health system boundaries. Modeling controlled for socioeconomic characteristics at the household's level and woman's level, as well as for risk factors and health systems factors. Gllamm in Stata 13 (StataCorp, College Station, TX, USA) was used for the analysis, taking into account the survey design and sampling weights.

3. Results

During the survey period, there were 117 309 births in the six states. Figures 2 and 3 show the relationships between cesarean and wealth and education, respectively, which were positively correlated with risk in most states. The rates of cesarean were higher in private facilities than in public facilities (Figure 4). However, the rate was higher than recommended by WHO in public facilities, especially in Kerala and Andhra Pradesh.

Table 1 reports the odd ratios of cesarean delivery for each variable that was significant in at least one state in the random effects model, because this model demonstrated an improvement over fixed effects. In the model, σ represented the standard deviation and ρ the proportion of the total variance due to the district-level variance component. PSU effects were excluded from the models because they were not significant.

Women's risk factors such as age and parity were significantly associated with cesarean in the expected directions (Table 1). Other factors such as pregnancy complications and delivery complications were associated with a higher risk in some

states (Table 1). Additionally, a higher number of prenatal visits increased odds of a cesarean (Table 1). However, the interaction of the prenatal visits variable and the complications variables was not significant (data not shown).

Sex of neonate was significant for Maharashtra only ($P<0.05$), whereas ultrasonography during pregnancy significantly increased risk in all six states ($P<0.001$) (Table 1).

Only Maharashtra and Andhra Pradesh showed a significantly higher risk of cesarean for women at the highest education level ($P<0.05$) (Table 1). There was not the same relationship with wealth: in a few states (Punjab, Kerala, and Delhi), the richest quintile had a lower risk ($P<0.10$) (Table 1). Findings for other socioeconomic variables such as religion and caste were not particularly notable, although Muslim women had significantly decreased odds in Kerala and Delhi, as did Christian women in Andhra Pradesh (Table 1). Additionally, women in other castes were significantly more likely to have cesarean deliveries (Table 1). As for wealth, findings became non-significant once district-level effects were taken into account (data not shown).

Supply factors showed a strong association with cesarean when the type of institution where the woman delivered (private much higher than public) and the district-level effects were considered (data not shown). The district-level variance was significant in all states but Delhi ($P<0.001$): the percentage of variation due to district-level effects ranged from 4.5% in Andhra Pradesh to 0.6% in Tamil Nadu. Given the wide range of variables included in the model, these percentages were not

negligible. However, the percentage of variance due to district-level effects was not as high as expected. Nevertheless, macro effects were clearly important in the risk of cesarean within the states considered. Notably, when unobserved heterogeneity was taken into account via random effects, the district-level effect nullified the significant gradient of the wealth quintiles obtained in the fixed effects model (data not shown).

4. Discussion

The present analysis shows a clear trend toward supply-driven factors increasing cesarean rates. Notably, odds of a cesarean were increased in private hospitals, and community and individual socioeconomic determinants were not strongly associated with the risk of having a cesarean when the model was controlled for risk factors. A more cautious interpretation should be made for the finding that odds increased with a higher number of prenatal visits. This variable has been used in previous studies as a proxy of overmedicalization [25]; however, it might also signify a pregnancy with complications. In addition, similar to prenatal visits, the association between ultrasound and cesarean might be due to endogeneity. Given the lack of collinearity with the other risk factors, ultrasound scans might be related to a high use of medical services which is often linked to overmedicalization—a possibility that is further strengthened by the strong positive relationship between private hospitals and cesarean.

The impact of community-related variables (e.g. information given or PSU-level effects) on the likelihood of cesarean was weak and not significant, which points against a trend toward social diffusion in India, unlike in other BRICS (Brazil, Russia, India, China, and South Africa) countries [4,21,25].

There are signs of the appropriate use of cesarean among women in the poorest strata, which might be due to initial progress made by the JSY program which has increased access to services for the poorest strata [12]. However, this might also indicate a negative impact of the JSY program: because more money is paid for cesarean deliveries, the higher odds might be driven by hospitals' motives toward profit rather than by needs given that doctors are paid more and might be more willing to perform one when not needed.

The present study has several limitations, mainly relating to data availability. First, it was not feasible to look at changes across time because the quality of the two previous DLHS surveys was not as high as that of the third. Second, only in-depth qualitative data would reveal what the real patient–doctor interaction was at the time that decisions about cesarean were made. Third, there is a self-selection issue regarding prepartum and postpartum complications because women who are at risk are more likely to have had cesarean deliveries.

Despite these limitations, the present results show that cesarean delivery in India is driven more by supply than by demand. The findings call for more in-depth research into this phenomenon, set within the cultural context of India [26], and in particular into the quest for greater involvement of midwives rather than doctors in safe deliveries. Furthermore, there is a need for the overall establishment of clear prepartum and intrapartum guidelines that respect the choices of women.

Conflict of interest

The author has no conflicts of interest.

References

[1] Althabe F, Belizán JM. Caesarean section: the paradox. Lancet 2006;368(9546):1472–3.

[2] Anderson GM. Making sense of rising caesarean section rates. BMJ 2004;329(7468):696–7.

[3] International Federation of Gynecology and Obstetrics. FIGO Statement on Caesarean Section. http://www.figo.org/files/figo-corp/docs/FIGO%20statement%20on%20Caesarean%20Section%20-%20FINAL%20VERSION.pdf. Published 2007. Accessed December 12, 2013.

[4] Leone T, Padmadas SS, Matthews Z. Community factors affecting rising caesarean section rates in developing countries: an analysis of six countries. Soc Sci Med 2008;67(8):1236–46.

[5] Lobel M, DeLuca RS. Psychosocial sequelae of cesarean delivery: review and analysis of their causes and implications. Soc Sci Med 2007;64(11):2272–84.

[6] Dhar RS, Nagpal J, Sinha S, Bhargava VL, Sachdeva A, Bhartia A. Direct cost of maternity-care services in South Delhi: a community survey. J Health Popul Nutr 2009;27(3):368–78.

[7] Sufang G, Padmadas SS, Fengmin Z, Brown JJ, Stones RW. Delivery settings and caesarean section rates in China. Bull World Health Organ 2007;85(10):755–62.

[8] Parkhurst JO, Rahman SA. Life saving or money wasting? Perceptions of caesarean sections among users of services in rural Bangladesh. Health Policy 2007;80(3):392–401.

[9] Ghosh S, James K. Levels and trends in caesarean births: cause for concern? Econ Polit Wkly 2010;45(5):19–22.

[10] Vital Statistics. SRS Bulletin. Sample Registration System: Registrar General, India. http://censusindia.gov.in/vital_statistics/SRS_Bulletins/SRS_Bulletin-October_2012.pdf. Published October 2012. Accessed April 14, 2014.

[11] Government of India. National Rural Health Mission (2005-2012): Mission Document. http://www.nird.org.in/brgf/doc/Rural%20HealthMission_Document.pdf. Published 2005. Accessed November 23, 2013.

[12] Santhya KG, Jejeebhoy SJ, Acharya R, Francis Zavier AJ. Effects of the Janani Suraksha Yojana on maternal and newborn care practices: Women's experiences in Rajasthan. http://www.popcouncil.org/uploads/pdfs/2011PGY_JSYRajasthan.pdf. Published 2011. Accessed November 23, 2013.

[13] Lim SS, Dandona L, Hoisington JA, James SL, Hogan MC, Gakidou E. India's Janani Suraksha Yojana, a conditional cash transfer programme to increase births in health facilities: an impact evaluation. Lancet 2010;375(9730):2009–23.

[14] Rajan V, Manchanda VK, Nagarajan S. Quality of obstetric care in India: will we 'deliver' in time? India Health Beat 2010;3(5).

[15] International Institute for Population Sciences. National Family Health Survey (MCH and Family Planning), India, 1992–93. http://www.rchiips.org/nfhs/data/india1/iaintro.pdf. Published 1995. Accessed April 23 2014.

[16] International Institute for Population Sciences. India 1998–99: National Family Health Survey (NFHS-2). http://www.rchiips.org/nfhs/pub_nfhs-2.shtml. Published 2001. Accessed April 23 2014.

[17] International Institute for Population Sciences, Macro International. National Family Health Survey (NFHS-3), 2005–06: India: Volume I.

http://www.rchiips.org/nfhs/NFHS-3%20Data/VOL-1/Front%20Matter(15080K).pdf. Published 2007. Accessed April 23 2014.

[18] Arjun G. Caesarean section: evaluation, guidelines and recommendations. Indian J Med Ethics 2008;5(3):117–20.

[19] Mishra US. Who should decide on caesarean sections? BMJ 2004;328(7451):1320.

[20] Kambo I, Bedi N, Dhillon BS, Saxena NC. A critical appraisal of cesarean section rates at teaching hospitals in India. Int J Gynecol Obstet 2002;79(2):151–8.

[21] Hopkins K. Are Brazilian women really choosing to deliver by cesarean? Soc Sci Med 2000;51(5):725–40.

[22] Ministry of Health and Family Welfare, Government of India, International Institute for Population Sciences. District Level Household and Facility Survey 2007–08: Fact Sheets India. http://www.jsk.gov.in/dlhs3/India.pdf. Published 2010. Accessed November 23, 2013.

[23] Rustagi P. Significance of gender-related development indicators: an analysis of Indian states. Indian J Gend Stud 2004;11(3):291–343.

[24] Filmer D, Pritchett LH. Estimating wealth effects without expenditure data--or tears: an application to educational enrollments in states of India. Demography 2001;38(1):115–32.

[25] Béhague DP, Victora CG, Barros FC. Consumer demand for caesarean sections in Brazil: informed decision making, patient choice, or social inequality? A population based birth cohort study linking ethnographic and epidemiological methods. BMJ 2002;324(7343):942–5.

[26] Orfali K. Beyond numbers: the multiple cultural meanings of rising cesarean rates worldwide. Am J Bioeth 2012;12(7):54–6.

Figure 1 Rate of cesarean delivery in selected Indian states 1992–2006. Calculations were based on data from the National Family and Health Survey (NFHS) I [15], NFHS-2 [16], and NFHS-3 [17].

Figure 2 Rate of cesarean delivery by wealth quintile in selected Indian states, 2007–2008.

Figure 3 Rate of cesarean delivery by education in selected Indian states 2007–2008.

Figure 4 Rate of cesarean delivery by type of institution of birth in selected Indian states 2007–2008.

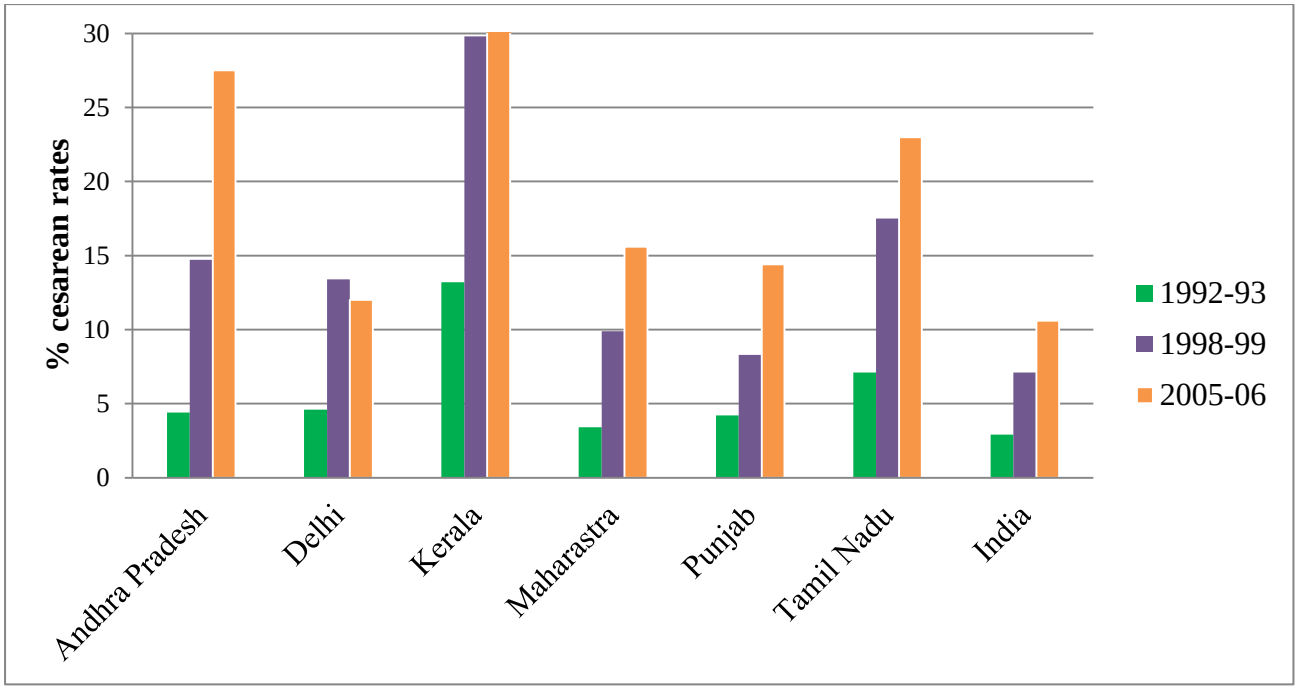
Table 1 Odds ratio of cesarean delivery in selected Indian states.[a]

Factor	State					
	Andhra Pradesh	Kerala	Tamil Nadu	Maharashtra	Punjab	Delhi
Age	1.049[b]	1.089[b]	1.075[b]	1.086[b]	1.038[b]	1.04[c]
Schooling						
No education	Ref					
Primary	1.012	1.855	1.079	0.931	0.919	0.910
Secondary	1.327[b]	1.613	1.045	0.987	1.239	1.030
Tertiary	1.193	1.930	1.178	1.259	1.273	0.994
Higher	1.866[b]	1.743	1.137	1.507[c]	1.299	1.114
Residence						
Urban	Ref					
Rural	0.947	0.893	0.903	0.896	0.828	0.999
Religion						
Hindu	Ref					
Muslim	1.041	0.623[b]	0.969	0.992	0.757	0.691[c]
Christian	0.715[b]	1.005	0.860	0.686	0.346	–[d]
Other	1.322	0	2.552	1.079	1.006	1.300
Caste						
Scheduled caste	Ref					
Scheduled tribe	0.897	0.914	0.966	0.966	1.060	1.920
No caste	0.970	0.714	1.046	0.961	0.285	1.058
Other	0.925	0.948	0.874	1.011	0.940	1.499[c]
Wealth quintile						
Poorest (1)	Ref					
Poor (2)	0.757[c]	1.008	1.091	0.912	0.998	0.767
Middle (3)	1.000	0.906	1.139	0.899	0.93	0.860
Rich (4)	1.160	0.741[d]	1.120	1.100	1.051	0.551[c]
Richest (5)	1.060	0.734[d]	1.116	1.003	0.706[e]	0.457[b]
Male neonate						
No	Ref					
Yes	1.019	1.143	1.013	1.204[c]	0.962	0.899
Parity						
1	Ref					
2	0.749[b]	0.797[c]	0.828[c]	0.677[b]	0.735[b]	0.877
≥3	0.351[b]	0.415[b]	0.314[b]	0.345[b]	0.384[b]	0.603[c]
Prenatal sign of complication						
No	Ref					
Yes	0.893	1.811[c]	1.790[b]	1.164	1.235	0.903
Prenatal visits						
<4	Ref					
≥4	1.161[c]	1.357	1.134[c]	1.070[d]	1.103[c]	0.999
Postpartum complications						
No	Ref					
Yes	1.333[b]	1.447[b]	1.395[b]	1.296[b]	2.293[b]	2.510[b]
Complication at delivery						
No	Ref					
Yes	1.112	6.143[b]	2.863[b]	1.100	1.624[b]	1.494[c]
Prenatal ultrasonography						
No	Ref					
Yes	1.482[b]	2.005[b]	1.353[b]	1.919[b]	1.350[b]	1.778[b]
Type of hospital						

Private	Ref					
Public	0.304 [b]	0.691 [b]	0.397 [b]	0.618 [b]	0.752 [b]	0.675 [b]
Other	0.014 [b]			0.015 [b]	0.016 [b]	0.066 [b]
Family-planning program						
No	Ref					
Yes	1.198	0.565 [e]	1.740	0.981	0.253 [c]	0.587
Institutional delivery program						
No	Ref					
Yes	0.788	1.074	0.650 [c]	0.987	0.856	0.839
Prenatal program						
No	Ref					
Yes	1.004	2.902 [c]	1.056	0.638	1.699	0.408
Constant	0.089 [b]	0.002 [b]	0.021 [b]	0.016 [b]	0.105 [c]	0.193
σ^2	0.392	0.322	0.146	0.224	0.372	0.188
ρ	0.045 [b]	0.031 [b]	0.006 [b]	0.015 [b]	0.040 [b]	0.011

[a] Random effects model, where σ is the standard deviation and ρ is the proportion of total variance due to the district level.
[b] $P<0.001$.
[c] $0.001<P<0.05$.
[d] Numbers too small to calculate P value.
[e] $0.05<P<0.10$.

Figure 1: Cesarean section rates in selected Indian states 1992-2006



Source: National Family and Health Survey (NFHS) I, II, III, author's calculations

Figure 2 Rate of cesarean delivery by wealth quintile in selected Indian states, 2007–2008.

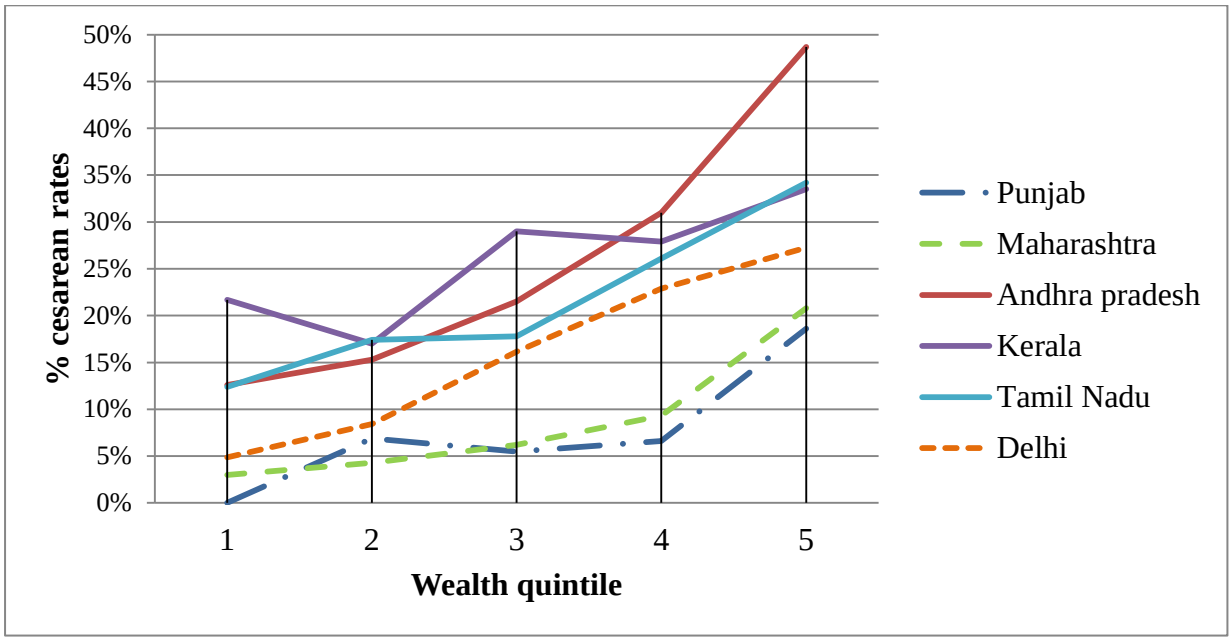


Figure 3 Cesarean section by education India selected states 2007-8

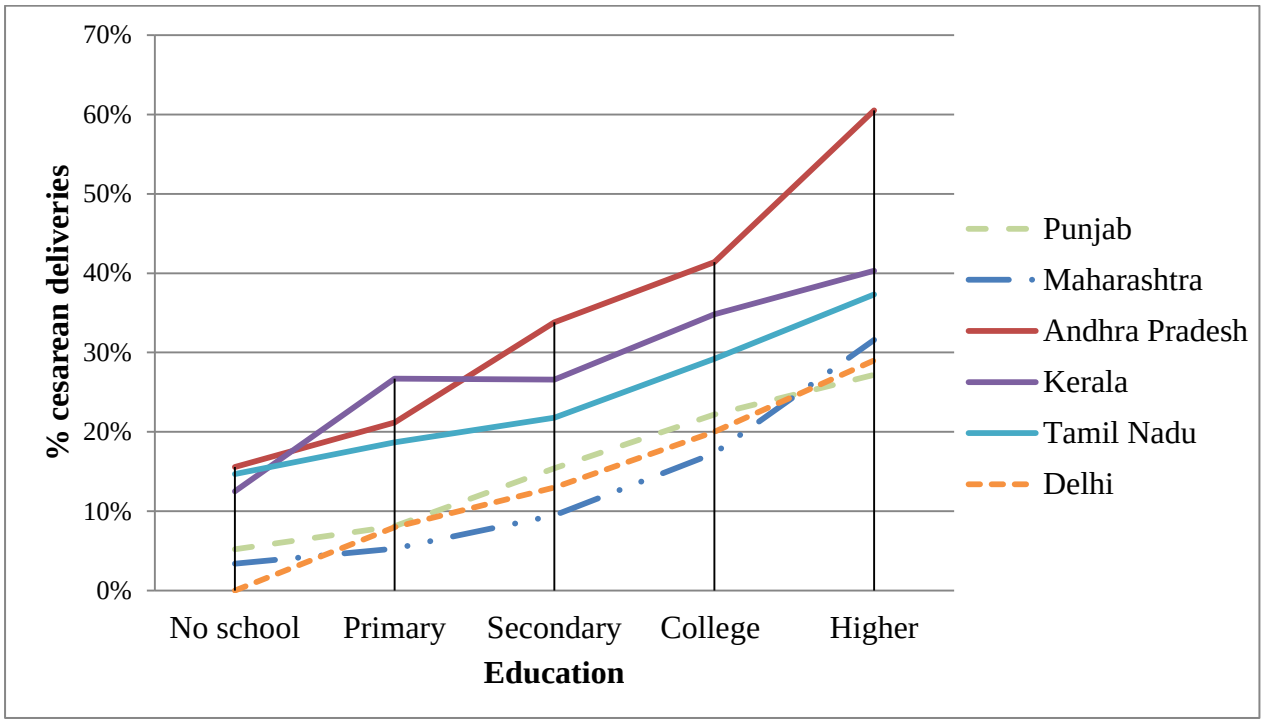


Figure 4 Cesarean section rates by type of institution of birth India 2007-08