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A Survey of Obstetric Healthcare Utilization in the Rural Western Indian Himalayas

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Abstract *Objectives* To determine the socio-economic factors affecting access to antepartum, intrapartum, and postpartum healthcare in the rural Western Indian Himalayas over the past 20 years. *Methods* Face-to-face surveys were conducted with 197 women in Chamoli District, Uttarakhand from October 2011 to May 2012. Participants who gave birth within the past 20 years were included in the final analysis (n = 158). Stratified odds ratios and analysis of variance were calculated. *Results* Among women who delivered in the prior 7 years, there was a nine-fold increase (95 % CI 4–20.8) in institutionalized births compared to women who delivered 8–20 years before the study. Among women who delivered 7 years prior to the study, low income increased the risk of home delivery (OR 3.07, 95 % CI 1.15–8.54). Low caste (OR 2.79, 95 % CI 1.04–7.72) and low level of education (OR 3.93 95 % CI 1.41–11.81) decreased the use of antepartum medications (vitamins and vaccines). Remote location among all participants was a risk factor for not seeking care for obstetric morbidities (OR 0.44 95 % CI 0.2–0.95). *Conclusions* The incidence of institutionalized delivery has increased over the past decade in rural Uttarakhand. Income, caste, education, and remote location correlated with poor access to antepartum and intrapartum healthcare. These correlations have increased in statistical significance over the past 20 years, except for location. This indicates that the Western Himalayas face similar challenges to obstetric service utilization as the north Indian plains and that several of these inequalities in healthcare access have become more pronounced in recent years.

Keywords Maternal health · India · Himalayas · Antepartum health · Institutionalized delivery

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Significance

Maternal mortality rate varies widely across India. Research in the plains states of north India has demonstrated that multiple factors including income, education, and caste affect access to obstetric services. Maternal healthcare has received less attention in the Western Himalayas than in the neighboring plains states. This survey of obstetric healthcare utilization in rural Uttarakhand demonstrates that income, education, distance to a healthcare facility and caste affect access to obstetric healthcare. These socio-economic inequalities have become more significant over the past 7 years, a trend also noted in the north Indian plains.

Introduction

Maternal mortality has been a focus of concern and intervention worldwide for almost half a century. From 1990 to 2010, maternal mortality decreased by 45 % ("WHO

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Maternal mortality," 2015). During that time, India witnessed a dramatic 66 % decrease in its maternal mortality ratio (MMR), with the MMR falling from 560 to 190 per 100,000 live births ("WHO Maternal mortality," 2015). During the same time period, India experienced an average GDP growth of 6.5 % per year ("Emerging economies: When giants slow down. The Economist," 2013). Despite India's interval advances, its MMR is not projected to decrease by 75 % between 1990 and 2015, and thus will not meet the United Nations Millennium Development Goal of 109 per 100,000 live births [11].

The Indian government has implemented numerous government programs to improve maternal health care over the past two decades. The largest program is the Reproductive and Child Health Programme, which subsidizes three antepartum care appointments, vaccinations, and vitamin supplements [18]. Beginning in 2005, the Government of India formed Janani Suraksha Yojana (JSY), a nationwide program that offers a monetary incentive for institutionalized deliveries, defined as giving birth in a medical facility [17, 22]. To address the shortage of health workers, the Accredited Social Health Activist (ASHA) Programme trains rural women to be community health workers (ASHAs) [22]. ASHAs distribute vitamins, provide health education and assist women to access resources such as JSY [10]. Despite these efforts, India's MMR is lagging nationally relative to the UN Millennium Development goal. MMR also varies dramatically among regions in India. Between 2007 and 2009, MMR by state ranged from 81 per 100,000 in the southern state of Kerala to 390 per 100,000 in the western state of Assam [18].

There are several possible reasons for this slow and unequal change in India. Frequently cited causes include poverty, low education, underdeveloped infrastructure, variance in health care costs, paucity of obstetricians, lack of medical technology, malnutrition, and adolescent pregnancy [15, 16, 18]. The cornerstone of national maternal health research has been the National Family Health Survey (NFHS), which collects representative household data on family, maternal and child health. The survey began in 1992 and has been subsequently conducted in 1998, 2005 and 2016. ("National Family Health Survey," 2015). Several analyses of NFHS data have found that location, media access, economic status, education, and birth order significantly influence the incidence of institutionalized deliveries. These studies are limited, as the NFHS does not capture health-seeking behavior or generational changes. Therefore primary data collection is necessary in states that have not improved under nationwide efforts to reduce maternal mortality.

The Indian government has identified eight empowered action group (EAG) states that are not yet meeting Indian socio-economic milestones: Bihar, Chhattisgarh, Madhya Pradesh, Jharkhand, Orissa, Rajasthan, Uttar Pradesh and Uttarakhand [1]. Of the EAG states, Uttarakhand is the only one in the Himalayan region. Uttarakhand separated from Uttar Pradesh in 2000 after a prolonged statehood movement based on economic stagnation, geographic differences, and cultural identity [12]. Uttarakhand's MMR is almost twice the national average at 359 deaths per 100,000 live births [18]. Similar barriers to maternal health care have been found in Uttarakhand as in other EAG states [3]. Health care resources are sparse in Uttarakhand, which has only 18 district hospitals [3]. Uttarakhand's government hospitals have positions for 240 Obstetrician/Gynecologists, of which only 60 were filled in 2014 [19]. Harsh terrain, unpredictable weather, and poor infrastructure provide unique challenges to healthcare development across the Himalayan region.

This study sought to describe obstetric service utilization over the past 20 years in rural Uttarakhand. Uttarakhand was chosen because it is the only EAG state in the Himalayan region. Although Uttarakhand has unique challenges to healthcare delivery, maternal healthcare in Uttarakhand has not gotten the academic attention that it has received in the north Indian plains states, such as Rajasthan and Madhya Pradesh.

Chamoli District in Uttarakhand was selected as the site of this study because it is Uttarakhand's largest district by area and has broad geographic and socio-economic diversity ("Chamoli District Web Site," 2015, "National Family Health Survey," 2015) In order to address the gaps in knowledge about access to antepartum, intrapartum and postpartum care, the following research questions were posed:

1. Have the proportion of institutionalized deliveries changed in rural Uttarakhand within the past 20 years?
2. Has use of antepartum medications (folic acid, prenatal vitamins, vaccines) changed in rural Uttarakhand over the past 20 years?
3. What are the risk factors for not having an institutionalized delivery in rural Uttarakhand, and have these factors changed in the past 20 years?
4. What are the risk factors for not using antepartum medications in rural Uttarakhand, and how have they changed over the past 20 years?
5. Are there risk factors associated with self-reported antepartum, intrapartum or post-partum morbidities in rural Uttarakhand?

Methods

In-person surveys were conducted with participants in three field sites: the villages of Joshimath (1874 m above sea level), Lata (2600 m above sea level), Mandal (800 m

above sea level) and Karnaprayag (1451 m above sea level). These villages were selected to represent rural Uttarakhand geographically and socially. Joshimath and Karnaprayag are located on the national highway. Lata and Mandal are removed from the national highway and also have relatively larger populations of Scheduled tribes (ST) and Scheduled castes (SC), respectively. ST and SC are groups that the Government of India defines as traditionally marginalized. Joshimath was the primary field site during the eight-month study. The closest hospitals in which institutionalized delivery is possible are 1 government hospital in Gopeshwar (15 km from Mandal) and 1 hospital in Rudraprayag (33 km from Karnaprayag). Although there are community health centers in Joshimath, Karnaprayag and Mandal, these centers were not staffed or supplied for deliveries. Distances from field sites to an institutionalized delivery site varied from 28 to 89 km.

Between October 2011 and May 2012, a convenience sample of women was selected. Eligibility criteria for women to be a survey respondent included current or prior pregnancy, age 18 or older, Hindi or Garhwali speaking, and having a residence within the field site areas. Random selection by census data was not possible, due to a lack of census records. The target number of recruited participants was 300, based upon expert opinion from Wildlife Institute of India faculty. Researchers approached 216 women in their homes or the pastures and fields surrounding villages, of whom 197 completed the surveys (91.2 %). One of the authors (EP) conducted all surveys face-to-face in participants' homes or fields and pastures with the assistance of local interpreters to translate between Hindi and the local language of Garhwali. Interpreters collected all consent and survey responses. Oral informed consent was obtained from all participants using a scripted consent form written in Hindi. Written consent was not feasible because of the low literacy rate among women in rural Uttarakhand. No participants were excluded due to low education or language barriers. Participants received no financial incentive for participation, and no identifying information was collected during surveys.

Closed-ended questions collected demographic information: age, education, income, occupation, husband's occupation and education, village, and age of marriage; as well as obstetric health history: number of pregnancies, home births, institutionalized deliveries, morbidities (premature births, neonatal deaths, antepartum/postpartum bleeding, antepartum/postpartum pain, antepartum/postpartum fever). Open-ended questions asked the participants to recall the medications that were taken during pregnancy, delivery and during the postpartum period. Information about intrapartum complications was collected through open-ended questions. Responses were collected for every pregnancy in multiparous participants.

Researchers also asked open-ended questions to understand attitudes and opinions towards institutionalized and traditional health care. The results of these open-ended questions were not included in this analysis.

The study was conducted in partnership with the Wildlife Institute of India, and the Government of Uttarakhand approved the study design and data collection. The University of Michigan Institutional Review Board determined the subsequent data analysis of the de-identified data to be exempt from review (HUM 00080340).

In order to analyze changes in obstetric health-seeking behavior, only women who had been pregnant and had delivered within 20 years prior to the study were included in the final analysis (n = 158).

Histograms of the number of institutionalized deliveries by youngest child's age demonstrated an increase in institutionalized deliveries 7 years prior to the study. The "recent delivery group" included women whose youngest child was 7-years-old or younger (n = 81). The "historical delivery group" included women whose youngest child was 8–20 years old (n = 77).

We quantify education by self-reported years of education. In the recent delivery group, we define "low education" as those who did not receive secondary education. In the historical delivery group, we define "low education" as no formal education. These classifications are based on the first quartile of the years of education in each group (Table 1). We define "low income" as $\leq$2500 rupees/-month, which is the 25th percentile of the average reported income of all participants. We defined "remote location from an institutionalized delivery center" as being greater than or equal to the median distance from an institutionalized delivery site (66 km) in both groups. "Low caste" includes women belonging to Scheduled castes or tribes. "Antepartum medications" are defined as iron, calcium, tonic (liquid iron and folic acid) or vaccinations.

Women who had both home births and institutionalized deliveries (n = 13) were not able to consistently recall the birth order of these deliveries. Therefore, women who recalled that $\geq$50 % of their deliveries were institutionalized were analyzed as having had an institutional delivery. As a sensitivity analysis, the 13 participants who reported both home birth and institutionalized deliveries were eliminated from the analysis.

Stratified odds ratios, associated confidence intervals, and analysis of variance were computed where appropriate using OpenEpi ("Dean AG, Sullivan KM, Soe MM". OpenEpi).

Results

Participant characteristics are shown in Table 1. The majority of participants were of the Rajput caste (n = 83, 52 %). SC were less well represented than in similar

Table 1 Demographics of participants included in statistical analysis (n = 158)

	Women who delivered within 0–7 years of study	Women who delivered within 8–20 years of study
Number of participants	81	77
Age (years)	27.6 ± 5	38.8 ± 6.6
Education level (years)	10 (25 %: 7, 75 %: 12)	5 (25 %: 0, 75 %: 8)
Marital status	Married: 81	Married: 77
Age married (years)	20.4 ± 3.14	19.4 ± 4.4
Caste		
Brahmin	6	8
Rajput	38	45
SC	20	11
ST	13	13
Other	4	0
Monthly income (rupees)	7500 (25 %: 2,500, 75 %: 7500)	2500 (25 %: 2500, 75 %: 7500)
Distance to institutional delivery site (kilometers)	66 (25 %: 32, 75 %: 73)	66 (25 %: 30, 75 %: 74)
Number of children	2.2 ± 1.2	2.9 ± 1.1
Age of youngest child (years)	3.23 ± 2.3	13.1 ± 3.9
Religion	Hindu: 81	Hindu: 77
Percent of participants who gave birth at home the majority of deliveries	44.4 % (n = 36)	86 % (n = 66)

All values are reported as mean ± SD OR median with interquartile range

studies in the plains states of north India (n = 31, 19.6 %), but Uttarakhand has a relatively small SC population [13]. ST members were 16.5 % (n = 26) of the participants. The majority of women (56 %) in the recent delivery (7 or fewer years prior to the study) group had an institutional delivery, while the majority (86 %) of the historical delivery (8–20 years prior to the study) group delivered in the home (Table 1).

In bivariate analyses, women in the historical delivery group had a significantly increased likelihood of delivering at home (OR 9.17, 95 % confidence interval [CI] 4–20.8) as compared to women in the recent delivery group (Table 2). Among women in the recent delivery group, the only significant risk factor after sensitivity analysis for a home delivery was low income (OR 3.07, 95 % CI 1.15–8.54) (Table 2). Sensitivity analysis demonstrated that the effect of caste on institutionalized delivery in the recent delivery group and the effect of education on institutionalized delivery among all participants were not significant (results not shown).

Risk factors for not taking antepartum medications among the recent delivery group included being ST or SC (OR 2.79, 95 % CI 1.04–7.72) and having a low education (OR 3.93 95 % CI 1.41–11.81) (Table 3). Low education was a risk factor for not taking antepartum medications among the historical delivery group (OR 3.16 95 % CI 1.18–9.02) as well (Table 3).

The only significant risk factor for not seeking care for a self-reported obstetric morbidity was remote location among all participants (OR 0.44 95 % CI 0.2–0.95) (Table 4).

Discussion

The results of this study demonstrate that socio-economic factors impact access to antepartum and intrapartum health services in rural Uttarakhand, a finding consistent with previous studies from non-Himalayan Indian states [9, 15]. Socio-economic factors did not significantly alter postpartum care. In this study, income was the greatest contributing factor to intrapartum care access. Sensitivity analysis demonstrated that caste was not a significant risk factor for home birth, which is consistent with Uttarakhand's relatively small SC population. Although, distance to obstetric services did affect treatment for obstetric morbidities, it did not affect institutionalized deliveries. Kesterton et al. also found this in Uttar Pradesh, but it is surprising given that Uttarakhand's mountainous topography and underdeveloped transportation infrastructure might impede travel to hospitals [1, 8]. Odds of home birth were nine times higher in the historical delivery group when compared to the recent group. This is consistent with Uttarakhand's improving MMR and nationwide maternal health initiatives.

Low income was a risk factor for home birth among the recent delivery group, but not the historical delivery group. A possible explanation for this is that health services have

Table 2 Odds of delivering at home for the majority of deliveries

	All participants[a]	Women who delivered within 0–7 years[a]	Women who delivered within 8–20 years[a]
		1 (reference)	9.17 (4, 20.8)
Low income women	3.51 (1.69, 7.54)	3.07 (1.15, 8.54)	1.75 (0.41, 7.93)
Low caste women (ST, SC)	1.7 (0.83, 3.58)	2.51 (1.01, 6.32)[b]	1.74 (0.35, 13.09)
Low education women	8.7 (3.8, 21.71)[b]	2.16 (0.86, 5.54)	–[c]
Remote women	2.45 (1.21, 5.01)	2.4 (0.96, 6.33)	2.17 (0.52, 11.14)

[a] Odds ratio (95 % confidence interval)

[b] Not significant after sensitivity analysis

[c] All low-education women in the historical delivery subgroup had home deliveries

Table 3 Odds of not using antenatal medications

	All participants[a]	Women who delivered within 0–7 years[a]	Women who delivered within 8–20 years[a]
Low income women	3.39 (1.25, 9.67)	0.85 (0.33, 2.12)	1.73 (0.91, 3.31)
Low caste women	1.28 (0.66, 2.49)	2.79 (1.04, 7.72)	0.77 (0.29, 2.06)
Low education women	2.81 (1.45, 5.53)	3.93 (1.41, 11.81)	3.16 (1.18, 9.02)
Remote women	1.76 (0.92, 3.39)	2.1 (0.78, 5.65)	1.43 (0.57, 3.58)

[a] Odds ratio (95 % confidence interval)

Table 4 Odds of using hospitalized medicine for a self-reported obstetric morbidity

	All participants[a]	Women who delivered within 0–7 years[a]	Women who delivered within 8–20 years[a]
Low income women	0.61 (0.28, 1.33)	0.78 (0.24, 2.46)	0.53 (0.15, 1.7)
Low caste women	1.7 (0.78, 3.76)	0.82 (0.26, 2.63)	3.01 (0.92, 10.66)
Low education women	1.43 (0.66, 3.12)	2.66 (0.8, 9.44)	0.75 (0.21, 2.5)
Remote women	0.44 (0.2, 0.95)	2.19 (0.68, 7.22)	0.45 (0.13, 1.47)

[a] Odds ratio (95 % confidence interval)

become available over the past 20 years, but these services have not become accessible to the lower economic strata. Pathak et al. [16] observed this trend in antepartum healthcare in their analysis of the Uttar Pradesh National Family Health Survey between 2005 and 2006.

Among the recent delivery group, low caste and low-income participants were at greater odds of not utilizing antepartum medications. We did not expect there to be significant determinants of access to antepartum supplements or vaccines. India has well established systems for distributing government subsidized antepartum medications, such as the ASHA programme [6]. The results of this study indicate that antepartum supplementation is not being distributed equally in rural Uttarakhand. Lim et al. [10] demonstrated that JSY reimbursements are underutilized in Uttarakhand as compared to other EAG states. Future studies should explore local knowledge and utilization of government programs in Uttarakhand. This is especially important as the 2013 monsoon season caused extensive flooding in Uttarakhand, further damaging health and transportation infrastructures.

This study was limited in its scope. Surveys were collected from a small geographic area that may not be representative of other parts of Uttarakhand. Interpreters had significant household responsibilities and were sometimes unable to work. Data accuracy was limited by self-reporting and a lack of medical record confirmation. Recall bias may have altered responses, especially those from the historical delivery group. The study design depended on self-report by living women, so any obstetric complications associated with increased rate of mortality may skew interpretation of the results of this study. This could possibly lead to the incorrect assumption that women remote from institutions are no more likely to attempt home delivery than women living closer, when in actuality remote women who attempted home delivery might be at higher risk of maternal mortality and therefore could not be included in this analysis; however, a prospective study to capture this type of data would be time- and resource-prohibitive.

Given the extensive government programs in India, socio-economic factors would ideally not determine obstetric and antepartum healthcare behavior. This study indicates not only that such disparities exist, but also that they may have become even more marked in recent years. Future studies are needed to examine utilization of government programs and local attitudes towards government assistance. Interventional studies have demonstrated that strengthening community resources, government organization, and knowledge of health services are crucial to improving maternal health [7, 20]. Both local and government interventions are vital to decrease the burden of maternal mortality in poor, rural communities across the world. The Western Himalayan geography requires creative and efficient solutions that will engage women in healthcare regardless of socio-economic status.

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Compliance with ethical standards

Conflict of interest The authors have no conflicts of interest.

References

1. Arokiasamy, P., & Gautam, A. (2008). Neonatal mortality in the empowered action group states of India: Trends and determinants. *Journal of Biosocial Science, 40*(02), 183–201. doi:10.1017/S0021932007002623.
2. Chamoli District Web Site. (2011). updated 2016/03/16, Retrieved March 16, 2014, from http://chamoli.nic.in/pages/display/55-geography.
3. Chimankar, D., & Sahoo, H. (2011). Factors influencing the utilization of maternal health care services in Uttarakhand, *5*(3), 209–216. Retrieved from http://indianmedicine.eldoc.ub.rug.nl/root/C4/84c/.
4. Dean, A. G., Sullivan, K. M., & Soe, M. M. OpenEpi: Open Source Epidemiologic Statistics for Public Health, Version. www.OpenEpi.com, updated 2015/05/04 (n.d.). Retrieved March 16, 2014, from http://openepi.com/v37/Menu/OE_Menu.htm.
5. Emerging economies: When giants slow down. *The Economist*. (2013). Retrieved September 3, 2014, from http://www.economist.com/news/briefing/21582257-most-dramatic-and-disruptive-period-emerging-market-growth-world-has-ever-seen.
6. Gopalan, S. S., Mohanty, S., & Das, A. (2012). Assessing community health workers' performance motivation: a mixed-methods approach on India's Accredited Social Health Activists (ASHA) programme. *BMJ Open*, *2*(5), e001557. doi:10.1136/bmjopen-2012-001557.
7. Jokhio, A. H., Winter, H. R., & Cheng, K. K. (2005). An intervention involving traditional birth attendants and perinatal and maternal mortality in Pakistan. *The New England Journal of Medicine, 352*(20), 2091–2099. doi:10.1056/NEJMsa042830.
8. Kesterton, A., & Cleland, J. (2010). Institutional delivery in rural India: the relative importance of accessibility and economic status. *BMC Pregnancy and Childbirth, 10*(1), 30. doi:10.1186/1471-2393-10-30.
9. Kumar, R., Sharma, A. K., Barik, S., & Kumar, V. (1989). Maternal mortality inquiry in a rural community of North India. *International Journal of Gynecology & Obstetrics, 29*(4), 313–319. doi:10.1016/0020-7292(89)90355-X.
10. Lim, S. S., Dandona, L., Hoisington, J. A., James, S. L., Hogan, M. C., & Gakidou, E. (2010). India's Janani Suraksha Yojana, a conditional cash transfer programme to increase births in health facilities: An impact evaluation. *The Lancet, 375*(9730), 2009–2023. doi:10.1016/S0140-6736(10)60744-1.
11. Lozano, R., Wang, H., & Foreman, K. (2011). Progress towards Millennium Development Goals 4 and 5 on maternal and child mortality: An updated systematic analysis. *The Lancet, 378*(9797), 1139–1165. doi:10.1016/S0140-6736(11)61337-8.
12. Mawdsley, E. (1997). Nonsecessionist regionalism in India: the Uttarakhand separate State movement. *Environment and Planning A*. Retrieved from http://www.envplan.com/epa/fulltext/a29/a292217.pdf.
13. Mawdsley, E. (1999). A new Himalayan state in India: Popular perceptions of regionalism, politics, and development. *Mountain Research and Development*. Retrieved from http://scholar.google.com/scholar?hl=en&q=mawdsley+new+himalayan+stat&btnG=&as_sdt=1,23&as_sdtp=#0.
14. National Family Health Survey. (2009). *The fact sheets used were from 2005–2006*. Retrieved September 3, 2014, from http://www.rchiips.org/nfhs/.
15. Pallikadavath, S., Foss, M., & Stones, R. (2004). Antenatal care: Provision and inequality in rural north India. *Social Science and Medicine, 59*(6), 1147–1158. doi:10.1016/j.socscimed.2003.11.045.
16. Pathak, P. K., Singh, A., & Subramanian, S. V. (2010). Economic inequalities in maternal health care: Prenatal care and skilled birth attendance in India, 1992–2006. *PLoS ONE, 5*(10), e13593. doi:10.1371/journal.pone.0013593.
17. Paul, V., & Sachdev, H. (2011). Reproductive health, and child health and nutrition in India: Meeting the challenge. *The Lancet, 377*(9762), 332–349. doi:10.1016/S0140-6736(10)61492-4.
18. Rai, R. K. R., & Tulchinsky, T. H. (2012). Addressing the Sluggish Progress in Reducing Maternal Mortality in India. *Asia-Pacific Journal of Public Health/Asia-Pacific Academic Consortium for Public Health*, 1010539512436883. doi:10.1177/1010539512436883.
19. Siddiqui, S. (2014). "Uttarakhand faces acute shortage of gynaecologists." *Times of India.* 3 Oct. 2014: Available at: http://timesofindia.indiatimes.com/City/Dehradun/Ukhand-faces-acute-shortage-of-gynaecologists/articleshow/44238982.cms. Accessed 4 Oct 2014.
20. Sutherland, T., & Bishai, D. (2009). Cost-effectiveness of misoprostol and prenatal iron supplementation as maternal mortality interventions in home births in rural India. *International Journal of Gynecology & Obstetrics, 104*(3), 189–193. doi:10.1016/j.ijgo.2008.10.011.
21. WHO. Maternal Mortality. (n.d.). updated 2015/11. Retrieved from http://www.who.int/mediacentre/factsheets/fs348/en/. Accessed 13 Mar 2013.
22. Zavier, A. J. F., & Santhya, K. G. (2013). How conditional cash transfers to promote institutional delivery can also influence postpartum contraception: Evidence from Rajasthan, India. *International Journal of Gynaecology and Obstetrics: The Official Organ of the International Federation of Gynaecology and Obstetrics, 123*(Suppl), e43–e46. doi:10.1016/j.ijgo.2013.08.003.