The Impact of Social Policies on Reproductive Health, Maternal Employment, and Child Health: Evidence from India

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ABSTRACT

This dissertation examines the impact of supply-side interventions, such as community health workers (CHWs) and daycare provision on maternal and child health and labor outcomes in India. These interventions represent critical components of India's healthcare and social policies, aiming to address barriers to access, enhance healthcare utilization, and boost maternal employment among vulnerable populations.

Employing a comprehensive methodological approach, this study utilizes various analytical techniques, including difference-in-differences designs and two-way fixed effects models, which are considered the best practices for quasi-experimental analysis in the economics literature. Leveraging large-scale household surveys, administrative records, and census data, a novel dataset is created to disentangle the causal effects of these interventions on reproductive health behaviors, maternal labor force participation, and infant vaccinations.

The findings underscore the significant positive impact of supply-side interventions, exemplified by India's Accredited Social Health Activists (ASHAs) program, on reproductive health outcomes. Increased ASHA availability is associated with improved long-term utilization of reproductive healthcare services, including antenatal care, institutional deliveries, and contraceptive use. Additionally, public daycare facilities at the Anganwadi center also act as a supply-side measure in promoting maternal employment, particularly among economically vulnerable

populations engaged in agricultural and low-skilled manual work. Moreover, the analysis reveals the pivotal role of the three sets of Community Health Workers- the ASHAs, Anganwadis, and Auxiliary Nurses and Midwives in improving infant vaccinations. These findings underscore the importance of the human capital provided by mobile CHWs in addressing the complex health and social needs of marginalized communities, emphasizing the need to expand their scope of services. In conclusion, this dissertation highlights the critical role of community-based interventions in shaping maternal and child outcomes in India. By elucidating the differential impacts of these programs, the study provides valuable insights for policymakers aiming to enhance inter-generational human capital accumulation for mothers and their children. Leveraging supply-side policies to modify household behaviors, given the prevailing cultural practices, can effectively address the multifaceted needs of underserved populations, ultimately contributing to sustainable improvements in maternal and child outcomes in India and globally.

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DEDICATION

To my mother and her mother
Shibani Chatterji
July 6, 1932 - December 25, 2013

Thank you for making all the sacrifices so that I never had to

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They say it takes a village to raise a child. It has taken a densely populated city for me to reach this stage in my life. I would like to thank my parents, Sunita and Aloke Biswas, for their human capital investments even before I was born. Their unwavering confidence in all my endeavors has been the sole reason for my success. I would also like to thank my brother, Anshuman, who has always been one of the first to celebrate my achievements and has consistently been there for me through life's challenges. I am thankful to my grandparents, uncles, aunts, cousins, and nephew, and would like to especially thank Paruldevi Sanyal, my great-grandmother, for instilling in me the value of independence, both nationally and individually.

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Can Community Health Workers Affect Reproductive Health Decisions? Evidence from India

Abstract

Do supply-side interventions influence human behaviors? This paper examines the effect of India's Accredited Social Health Activists (ASHAs) on long-term reproductive health. I use large-scale survey and administrative data and exploit the variation in the number of ASHAs along with variations in the birth year, employing a difference-in-differences design. I find that the policy made women better off in terms of utilizing various reproductive healthcare services, such as antenatal care and institutional deliveries, along with an increase in contraceptive use in the long term. I find that an additional ASHA per 1,000 population is associated with a 2.04 to 4.1 percent increase in the utilization of reproductive health. This result is robust to an alternative specification with district-level ASHA utilization as the treatment. Results are heterogeneous across groups, with contraceptive use being driven by women who are richer, literate, and have less than three children during their peak reproductive ages. I find that ASHAs are associated with higher contraceptive use only in districts where utilizing the ASHA service is below the sample median, suggesting that performance incentives for the provision of family planning methods should be revised to meet the aim of lower fertility.

Keywords: maternal health, ASHA, incentives, social norms, India

JEL codes: O12, I38, I15, O15

1.1 Introduction

The risk of a mother dying during pregnancy is 200 times higher in low and middle-income countries (LMICs) compared to high-income countries (Arora 2005). While the global maternal mortality ratio has fallen by a third from 2000 to 2020, LMICs still account for 95% of all maternal deaths (WHO 2023). Most of these deaths can be prevented by appropriate primary care interventions, such as the presence of a skilled birth attendant and frequent checkups before and after delivery (Goodburn and Campbell 2001). Utilization of these healthcare services is impeded by accessibility constraints further exacerbated by lack of information, financial barriers, low levels of institutional trust and prevailing social norms in developing countries (Simkhada, Teijlingen et al. 2008, Dupas 2011). While the quality of care in facilities varies across regions, a birth attendant with midwifery skills is widely regarded as the foremost factor in reducing maternal mortality (Lawn, Cousens et al. 2005).

India bore the burden of the highest maternal mortality ratio in the world, with 540 pregnancy-related deaths for every 100,000 live births in 1999 (Abou Zahr, Wardlaw et al. 2004). To combat this, India pledged to reduce maternal mortality by three-quarters by 2015, as stipulated by Millennium Development Goals set by the UNDP. The National Rural Health Mission (NRHM) was founded in 2005 to address the needs of women and their children by providing conditional cash transfers to women opting for institutionalized births to incentivize safe delivery practices. The policy introduced a community health worker (CHW), known as the accredited social health activist (ASHA), to combat the infrastructural challenges in providing reproductive and child healthcare. They were expected to bridge the gap between the government and the community by facilitating institutionalized deliveries, administering immunization to mothers and children, and providing family planning workshops (NHM 2005).

ASHAs were introduced in 2005 to deliver reproductive health services in a way that was culturally sensitive and fostered community engagement (Ved, Scott et al. 2019). While the recommendation was to have one ASHA per 1,000 population, the numbers have surpassed this expectation since currently there is an ASHA in every village and urban center totaling over a million nation-wide (Shanthosh, Durbach et al. 2021). ASHAs are certified at training workshops held by medical staff at the primary health centers; they must be middle-school graduates and residents of the village they serve (NRHM 2005). ASHAs received wages on a piece-rate basis and were encouraged to offer other medical services for the community, earning their pay on the performance delivered. They would receive 600 rupees ($13) in rural areas and 400 rupees ($9) in urban areas for every institutional delivery they

facilitated.[1] They receive lower payment values for other healthcare services and ensure that the mothers receive cash transfers from the government for seeking supervised medical care (Dagur, Senauer et al. 2010).

In this paper, I examine the long-term impact of access to a large-scale community health intervention on women's reproductive health decisions, measured by the probability of antenatal care uptake, institutional deliveries, and contraceptive use. I use two nationally representative surveys on reproductive health utilization and administrative data on the number of community health workers in a district. My main empirical strategy relies on a difference-in-differences specification that utilizes geographical and time variation of community health workers before and after the program rollout. I examine the impact of an additional ASHA per 1,000 population, the recommended number of ASHAs (NHM 2005), during a given year post program implementation on reproductive health utilization. I find that ASHAs are associated with a higher probability of antenatal care visits by 3.77%, institutional deliveries by 4.1% and a greater likelihood of family planning practiced by 2.04%. I further explore the utilization of an ASHA service as an alternative treatment, also at the district-level, and find the same effect of the policy on all three outcomes. My results are robust to a placebo test employing random treatment as well as an event-study estimating trends in utilization of reproductive healthcare services. I find heterogenous effects of the policy with higher rates of family planning for women living in districts with lower than median ASHA utilization, suggesting that the financial incentives provided to the ASHAs might be competing with the program's aim to reduce fertility. I also find that women belonging to a higher socioeconomic status are more likely to adopt family planning, crowding-out the women who were originally targeted by the program.

While demand-side interventions, such as conditional cash transfers and expansion of health insurance, has been targeted by LMICs to increase the utilization of healthcare services, out-of-pocket expenses incurred by these populations limit the effectiveness of such programs (Escobar, Griffin et al. 2010, Modugu, Kumar et al. 2012). Supply-side interventions, on the other hand, have been associated with a higher likelihood of improving healthcare utilization by changing household behaviors (Rocha and Soares 2010, Miller, Pinto et al. 2013, Tsaneva and Gunes 2023). In the realm of reproductive and child health, community-based interventions have successfully reduced maternal and child mortality in LMICs by dispensing drugs and medical advice, encouraging families to practice safe birthing along with

[1]These are the official numbers decided by the NRHM in 2005, however the media reports that ASHAs earn $68-$82 per month by performing a wide variety of tasks, which now includes COVID-19 screening and contact tracing. [Reuters (2020). 'Think about us': India's underpaid women health workers to gov't. Al Jazeera. New Delhi, India.]

family planning, and instilling the importance of early childhood nutrition (Salehi-Isfahani, Abbasi-Shavazi et al. 2010, Björkman Nyqvist, Guariso et al. 2019, Herrera-Almanza and Rosales-Rueda 2020, Björkman Nyqvist, Leight et al. 2023, Herrera-Almanza and Rosales-Rueda 2023).

Studies have shown that mothers who are older, have higher levels of education, greater household income, lower fertility rates and an urban residence are more likely to opt for reproductive health services (Gabrysch and Campbell 2009). This was also the case in India, where the 40% increase in assisted deliveries during 2005-2015, was concentrated among women from a higher socioeconomic status and was absent among rural women, most of whom were constrained by mobility and finances in utilizing health institutions (Patel, Marbaniang et al. 2021). Furthermore, restrictive social norms in a patrilocal society where the decision to seek reproductive healthcare is dictated by the husband compounded the barriers to access health services (Anukriti, Herrera-Almanza et al. 2020). My contribution to this growing research on the significance of CHWs on reproductive health is three-fold. First, I examine the role of supply-side policies in changing social norms in the context of low levels of female empowerment, where the majority of births occurred at home in unsafe conditions (Prasad and Dasgupta 2013). Second, I examine the efficacy of a large-scale intervention that mobilizes over a million CHWs serving one of the largest economies in the world (Shanthosh, Durbach et al. 2021). Finally, by incorporating administrative data along with survey data, I create a novel dataset that causally estimates the long-term impact of CHWs on reproductive health. While meaningful localized and qualitative studies have been conducted (Husain 2011, Gopalan, Mohanty et al. 2012, Saprii, Richards et al. 2015, Wagner, Porth et al. 2018, Agarwal, Curtis et al. 2019, Paul and Pandey 2020), I investigate the long-term impact, at a national level, by using the number of CHWs in each district, over time, as a measure of effectiveness of the program.

The rest of the paper is organized as follows: section 2 talks about the background of the National Health Mission, which introduced the ASHAs, along with a conceptual model on how ASHAs might affect reproductive health decisions. Section 3 discusses the data used and sample construction and section 4 presents the difference-in-differences strategy. Section 5 displays the results, and section 6 concludes.

1.2 Contextual Framework

1.2.1 India's National Health Mission

The National Rural Health Mission (NRHM) was formed in 2005 to meet the health requirements of the rural poor, particularly women and children, by providing access to institutional services. While there was an urban counterpart, the National Urban Health Mission is not as widely discussed since over 70% of the population of India live in villages (Census 2011). The program identified 18 states as high focus, based on low levels of institutional care-seeking in these states: these are the states of Uttar Pradesh, Bihar, Rajasthan, Madhya Pradesh, Orissa, Uttaranchal, Jharkhand, Chhattisgarh, Assam, Sikkim, Arunachal Pradesh, Manipur, Meghalaya, Tripura, Nagaland, Mizoram, Himachal Pradesh, and Jammu and Kashmir, while the remaining 17 states were classified as non-focus states (NHM 2005).

The ASHA program is pivotal to the success of the NRHM and was introduced nation-wide on a priority basis to achieve the aim of higher levels of institutional deliveries, immunizations, and family planning. The National Health Mission initially stipulated that there must be one ASHA per 1,000 population in high focus states, but was amended to include all states and union territories in 2011 based on the success of the program (NHM 2011). The placement of ASHAs was not random and can be seen in Column 1 in table 1.1 to be highly correlated with district-level characteristics since the program targeted regions that had lower rates of institutional care-seeking. ASHAs serve as a liaison between the community and the public health system, particularly by establishing a connection between the auxiliary nurse midwife and the village. ASHAs are married (divorced or widowed) residents of the community, between the ages of 25 to 45, with a minimum of eight years of schooling. ASHAs receive a minimum of 23 days of training in five installments or modules and have monthly meetings at the primary health center and sub health centers to monitor their performance and ensure that they are up to date on the best practices in reproductive healthcare provision (National Health Systems Resource Centre 2014).[2]

At the time of policy implementation, ASHAs were recognized as "honorary volunteers" with an expected workload of 2-3 hours, four days a week and would receive 600 rupees ($13) in rural areas and 400 rupees ($9) in urban areas for every

[2]ASHA trainings include modules on understanding the general health needs of the village, providing safe delivery services, making households aware of family planning and HIV/AIDs prevention, educating new mothers on infant nutrition and providing immunizations [National Health Mission (2005). Induction Training Module for ASHAs. New Delhi, India].

institutional delivery facilitated by them (NHM 2005).[3] A study interviewing ASHAs in Bihar, Chhattisgarh, Rajasthan and Uttar Pradesh found that on average ASHAs work 25-28 hours a week, six days a week, and earn 1,000 rupees ($15) per month (Bajpai and Dholakia 2011).

Along with the introduction of the ASHA program, the NRHM sought to expand the number of sub health centers (SHCs) so that each village has access to a health clinic. Before the initiation of the ASHAs, a single SHC served 5,000 people (approximately 5 to 6 villages) and was staffed by a one female health worker, trained as a midwife, and one male health worker (Chokshi et al., 2016).[4] Although the government tried to build new hospitals, there were limited medical staff to run these facilities. Hence, they sought workers at the village-level who would bridge the gap between the traditional ayurvedic methods of healing and the techniques of western medical interventions. In a review on the NHM, Husain (2011) states that while there were major infrastructural deficiencies due to a lack of facilities, the progress in reproductive and child healthcare in India was brought about by community-level mobilization of healthcare workers, particularly ASHAs.

To ensure that households cooperated with the changes in healthcare provision, the Janani Suraksha Yojna (JSY) or the safe motherhood intervention was implemented in 2005 by the National Health Mission. While the Maternity Benefit Act, 1961 was already in place at the time, it was poorly enforced and regulated since the number of weeks of paid maternity leave that a mother would be entitled to was at the discretion of the employer (Bala 2012). Hence, the JSY is recognized as the first national-level maternity benefit scheme providing cash transfers to women when they gave births in an institution or at home in the presence of a skilled birth attendant (NHM 2005). At the time of policy implementation, only women above the age of 19 years who were either below the poverty line or belonging to a lower caste (scheduled castes or tribes) were eligible for this policy, for their first two live births. These restrictions were relaxed in 2011 when the National Health Mission implemented the Janani Shishu Suraksha Karyakram (JSSK) or the universal safe motherhood and child intervention. Along with relaxing the restriction on the age of first births and birth order, the NHM stated that all costs of institutional birth, check-ups before and after delivery, and transport to and from hospitals would be included in the JSY cash transfer. A special provision was made for sick newborns and

[3]This is approximately 3 to 5 times the minimum wage for manual labor of 120 rupees that was guaranteed by NREGS at the time (Joshi and Sivaram 2014).

[4]After the sub-center was the primary health centers (PHC), serving 30-40 villages with mid-level trained staff around the clock. Then the community health centers (CHC) providing specialized care including surgical interventions, serving 100 villages. Finally, there is the district hospital for complicated surgical interventions serving 1,000 villages (Chokshi et al 2016).

infants, such that all costs of their treatment would also be transferred to the mothers (NHM 2005).

1.2.2 Impact of ASHAs on Reproductive Health

While the ASHAs were introduced to the reproductive healthcare landscape to directly reduce the incidence of maternal and child mortality, by promoting safe births and providing immunizations and family planning workshops, they were also expected to indirectly affect the culture surrounding the distrust of trained medical professionals in India (Sharma, Lal Gautam et al. 2019, Marathe, Hunter et al. 2020, Kharel 2022). Globally, community health workers (CHWs) have achieved this task through social mobilization by combining traditional practices with modern medicines (Tulenko, Mgedal et al. 2013, Organization 2016, Schneider, Okello et al. 2016). The Brazilian Family Health Program, implemented by CHWs, was associated with lower fertility and higher female labor supply (Rocha and Soares 2010). In Madagascar, Herrera-Almanza and Rosales-Rueda (2020) find that CHWs were able to increase women's usage of modern contraceptives leading to a decline in their fertility. Similar results were found by a policy in rural Iran and a field experiment in Bangladesh where CHWs were deployed to decrease fertility by educating women on family planning methods (Phillips, Stinson et al. 1982, Salehi-Isfahani, Abbasi-Shavazi et al. 2010). A field experiment in northern Nigeria finds evidence of an increase in antenatal and postnatal care usage in areas exposed to CHWs who operated as educators and as providers of safe delivery practices (Björkman Nyqvist, Leight et al. 2023).

In India, the Janini Suraksha Yojana (JSY) or the safe motherhood intervention, which coincides with implementation of the ASHA program was accompanied with higher rates of institutional deliveries, but these were concentrated among women from a higher socioeconomic status (Lim, Dandona et al. 2010, Powell-Jackson, Mazumdar et al. 2015, Carvalho and Rokicki 2019). Another unintended consequence of the demand-side intervention was an increase in fertility, however women only opted for institutional deliveries for their first two live births, after which they were no longer eligible for the JSY cash transfer (Nandi and Laxminarayan 2016, Rahman and Pallikadavath 2018). A district-level analysis revealed that changes in ASHA placement did not affect institutional deliveries but did improve family planning (Wagner, Porth et al. 2018). On the other hand, the utilization of community health services, including ASHAs, was found to increase antenatal care and provide safer deliveries (Agarwal, Curtis et al. 2019, Nadella, Subramanian et al. 2021).

Field experiments in Zambia and Rwanda revealed that financial incentives determine the performance of workers engaged in the delivery of public health services (Basinga, Gertler et al. 2011, Ashraf, Bandiera et al. 2014). Since ASHAs received cash transfers for each reproductive health service performed, an ASHA might be incentivized to improve her performance on the service that brings the highest remuneration. If an ASHA receives higher wages for facilitating deliveries, then she might be more likely to forgo family planning counselling so that fertility levels stay the same. However, if provision of family planning is more lucrative than delivery care, then fertility levels will likely decline. At the same time, an ASHA might not be swayed by pecuniary motives and might be inclined to assist a woman in her village since she has volunteered to advocate for reproductive rights and agency by educating households and shifting cultural practices, so families are more receptive to the idea of utilizing institutional care. Hence, the effect of an ASHA on promoting safer births by improving access to antenatal care and deliveries while also decreasing fertility through the provision of family planning and changing social norms is a priori ambiguous.

1.3 Data Description and Sample Construction

Administrative data on the number of ASHAs at public and private institutions along with the number of JSY cash transfer beneficiaries is collected by the Ministry of Health and Family Welfare's Health Management Information Systems (HMIS) (Government of India 2021). While the National Health Mission was enacted in 2005, district-level information on the number of community health workers was only collected by the Indian government from March 2008 until February 2017. Hence, the two other nationally representative household surveys that are frequently used for studying reproductive health outcomes in India (the third waves of both DLHS and NFHS), cannot be used in this analysis due to unavailability of administrative data during the period right after the policy implementation. The HMIS sample consists of 737 districts since 97 new districts were created by bifurcating existing districts from the 2011 population census (Census 2011). I combine 93 districts that were created by splitting a single district and drop 4 districts that were created by splitting multiple districts to obtain a district-level ASHA intensity for 640 districts in NFHS-4. Then, I further combine 45 districts that were bifurcated from a single district and drop 2 districts that were created from multiple districts to match the 593 districts at the baseline, in DLHS-2. There are 2 districts that have no information on the number of ASHAs during the study period, so I further restrict the sample to 591 districts. By matching the districts to the baseline, I can compare the same geographical area before and after the policy implementation.

To construct the ASHA variable, I add the number of ASHAs receiving a JSY cash transfer, as a performance incentive, in public and private health institutions and match the administrative data on the year of birth of the child and the year of the survey after policy implementation. The number of ASHAs present in a particular district during the child's birth year are considered for the antenatal care and delivery outcomes while the number of ASHAs in 2015 and 2016 in the same districts are used for the family planning or contraceptive use sample since these years coincide with the post-program survey data used. Then I calculate the maximum number of ASHAs in a district, among public and private hospitals, during a given year and normalize this by the population in the district (Census 2011). Finally, I multiply this number by a thousand, since the NHM recommends that there must be one ASHA for every 1,000 population, to create a district-wide yearly intensity of the number of community health workers in a district. As over 99% of districts in the sample have less than 20 ASHAs per 1,000 population, I restrict the sample to these districts during a given year since the outliers could be a result of data manipulation. Since none of the districts in the sample have consistently inflated their number of ASHAs during the entire period, the final sample still consists of 591 districts to match the baseline number of districts.[5] Figure 1.1 displays the number of ASHAs in 2011-12, which indicates that the NHM policy has universal coverage, as few districts have no ASHAs.

The household datasets used for this analysis are the District Level Household and Facility Survey (DLHS) and the National Family Health Survey (NFHS) (IIPS 2017). Both surveys are nationally representative repeated cross-sections containing individual information on reproductive healthcare utilization and are collected by the International Institute for Population Sciences (IIPS) in Mumbai. These surveys also contain demographic variables such as education, income level, ownership of household assets, religion and caste, along with geographical information on the district and type of residence. I use the second wave of the DLHS, which collects information on healthcare usage by women for their most recent birth between 1999 and 2004, prior to the enactment of the National Health Mission in 2005. In order to assess the long-term impact of the National Health Mission on reproductive health, I use the fourth wave of NFHS, which records the use of healthcare services by women for their most recent birth between 2011 and 2016. The sample for antenatal care and institutional deliveries are further restricted to single births, as multiple births are associated with a higher probability of institutional care-seeking due to the greater risks associated with these types of pregnancies (Kumar and Usha 2022).

[5]I find that the number of ASHAs appear to be highly inflated during the 2014 general elections, particularly in the states of Jharkhand, Jammu and Kashmir, and Assam. These states were won over by the current ruling party in India and evidence of electoral manipulation was found for subsequent elections (Das,2023).

While the reproductive age of women is 15-49 years (WHO 2020), the sample is restricted to women aged 15-44 years to match both survey periods. The final sample of mothers, post-policy implementation, consists of approximately 178,000 women and is used to examine antenatal care usage and institutional deliveries. The family planning sample is only restricted to sexually active women and contains around 2,500 additional women who have either given birth to multiple children, or have given birth over three years before the survey was conducted. In the pre-period, there are nearly 195,000 mothers who have given birth to a single child, between 1999 and 2004, and are used as the baseline for the analysis of antenatal care usage and institutional deliveries. In the family planning sample, there are an additional 11,000 women who are currently living with their husbands, but for the majority of these women, their last birth was multiple, and some had given birth three years before the survey was conducted. The final sample of mothers consists of approximately 365,000 women who have had single births either during or three years before each survey is conducted. While the family planning sample consists of 15,000 additional women who do not meet these criteria and were not included in the antenatal care and delivery surveys but are currently cohabiting with their sexual partners.

Table 1.2 presents the baseline summary statistics. Prior to NHM implementation, approximately a third of the births took place in either a hospital, a clinic, or a dispensary. The mean antenatal care usage was high, with nearly three-quarters of mothers having attended at least one checkup before birth. Family planning methods or contraceptives were being used by nearly half the sample. The average woman in the sample had roughly three children and was 26 years old. An average index of hospital usage revealed that only 9% of women had visited a health clinic, dispensary, or a hospital, with the most common (nearly a quarter) visits being to the district hospital. Only half the sample were able to read and write and just above half were considered "poor" based on a standard of living index. Over 70% lived in villages, and 75% were lower caste and identified as Hindus.

The ASHA variables are constructed using the administrative data, which provides the number of ASHAs in a district receiving a performance incentive for providing reproductive healthcare. Since ASHAs existed only after the NHM was implemented, all mothers in the pre-period are classified as having no community health workers. In the post-period, there are 8,881 ASHAs, on average, which when normalized by the population, averages 5 ASHAs per 1,000 population both at the year of the child’s birth and the year of the 2015-16 survey. The average population in a district is around 2 million, with a large variation across districts. Finally, the ASHA Utilization variable is defined as a woman having used an ASHA service at least once either for her reproductive health or her child's health. I add the ASHA

utilization variable in a district to obtain a district-level ASHA usage index, which is then normalized by the population of women in the district and multiplied by 1,000 in order to correspond to the number of ASHAs from the administrative data. On average a district uses an ASHA service around 334 times per 1,000 survey respondents. Since the ASHA program was implemented along with the demand-side cash transfer policy by the NHM, I use this as a control for institutional deliveries as the efficacy of ASHAs might be confounded by the provision of monetary incentive given for institutional births. On average, 32,000 women received the JSY cash transfer for giving birth in a hospital.

1.4 Empirical Methodology

1.4.1 Main Model

Consider an empirical strategy that relates program participation in the National Health Mission (NHM) to reproductive health outcomes for a woman:

$$\mathrm{Health}_{\mathrm{it}} = \alpha + \beta \mathrm{NHM}_{\mathrm{it}} + \gamma \mathrm{X'}_{\mathrm{it}} + \eta_{\mathrm{t}} + \eta_{\mathrm{d}} + \epsilon_{\mathrm{it}} \qquad (1)$$

Where *Health*$_{it}$ is a binary dependent variable that equals 1 if a mother *i* seeks reproductive healthcare in time *t* and 0 otherwise. *NHM* is a binary variable that indicates participation in the conditional cash transfer policies implemented between 2005 and 2011. The model also contains a vector of individual characteristics, year fixed effects to account for macro-level shocks, and district fixed effects to account for time-invariant district characteristics that affect both the utilization of hospitals and social norms around reproductive health programs. Since NHM was differentially adopted by states that had a lower rate of institutional health-seeking during the start of the policy, participation in the program constitutes a selection issue, and I would expect the estimate of β to be biased.

To circumvent this issue, I apply a measure of program availability by examining the number of community health workers, implemented by the NHM policy, in a district during a given year. I estimate a model of the form:

$$\mathrm{Health}_{\mathrm{iydt}} = \alpha + \beta_1 \mathrm{ASHA}_{\mathrm{iyd}} + \gamma_1 \mathrm{X'}_{\mathrm{it}} + \gamma_2 \mathrm{X'}_{\mathrm{dt}} + \eta_{\mathrm{t}} + \eta_{\mathrm{d}} + \epsilon_{\mathrm{iydt}} \qquad (2)$$

Where $Health_{iydt}$ is again the binary dependent variable for reproductive health utilization of a mother *i* giving birth in year (or being surveyed in year) *y* in a district *d* at time *t*. Three dependent variables are considered to measure reproductive healthcare utilization: antenatal care uptake, institutional deliveries, and practicing family planning. X'_{it} are individual controls such as literacy, income, age, religion, caste, type of residence, birth order, hospital utilization, and her year of birth.