Essays on Maternal and Child Healthcare

ABSTRACT

ESSAYS ON MATERNAL AND CHILD HEALTHCARE

By

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India accounts for two-thirds of global maternal deaths and the highest number of infant deaths annually. Given the poor performance of maternal and infant healthcare service indicators, India launched two maternal health programs- a conditional cash transfer program called *Janani Suraksha Yojna* (JSY) in 2005 and a free services program called *Janani Shishu Suraksha Karyakaram* (JSSK) in 2011. The programs aim to reduce maternal and infant mortality through the promotion of public institutional delivery. Both provide financial incentives to pregnant women through a reduced price effect on delivery care. Using the Indian District Household Surveys, I exploit the differences in individual eligibility rules across states to estimate the impact of the programs on healthcare utilization and measures of infant mortality. The results suggest that JSY and JSSK reduced home births and increased the use of public institutional care. While JSY also shifted women away from private to public facilities, JSSK increased the use of private care. I also find evidence that JSY reduces fetal and perinatal mortality but does not impact higher days mortality rates. Further, the spread of information about healthier pregnancies by health facilitators under the programs increases the use of antenatal services. On the one hand, JSY reduces the probability of women going

back for a postpartum checkup, and on the other, free maternal care services with zero postpartum care costs under JSSK increase their likelihood to return for a checkup. Also, I find heterogeneity in programs' impact with more educated and poorer women benefiting the most from them.

ESSAYS ON MATERNAL AND CHILD HEALTHCARE

By

Deepmala Pokhriyal

A Dissertation Submitted in Partial Fulfillment
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ACCEPTANCE

This dissertation was prepared under the direction of the candidate's Dissertation Committee. It has been approved and accepted by all members of that committee, and it has been accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy in Economics in the Andrew Young School of Policy Studies of Georgia State University.

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DEDICATION

To *Daaji*, my grandfather!

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Thank you!

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CHAPTER 1

Introduction to Maternal and Child Healthcare

More than 2.8 million pregnant women and newborns die annually worldwide. India accounts for one-fifth of the total deaths. Access to maternal care would make most of these deaths preventable (WHO et al., 2019). A lack of maternal care also increases the incidence of chronic diseases and has socioeconomic consequences for households and society alike (Reed et al., 2000; Carroli et al., 2001; Gray et al., 2006). Studies have identified the lack of financial resources as a primary factor for women to forgo healthcare services (Ensor and Cooper, 2004a; Bhatia and Gorter, 2007). Governments aim to increase the demand for maternal and child healthcare services by increasing the purchasing power of low-income groups (Kruk et al., 2007; Elmusharaf et al., 2015). In this paper, I evaluate the impact of financial incentives provided under two large-scale maternal healthcare programs in India on women's healthcare behavior.

In 2005, India launched *Janani Suraksha Yojna* (JSY) to incentivize women through a conditional cash transfer (CCT) to utilize public institutional delivery. JSY aims to reduce maternal and infant mortality by integrating cash assistance with delivery care. In 2011, India launched a free services program called *Janani Shishu Suraksha Karyakaram* (JSSK). JSSK eliminates out of pocket expenditures for pregnant women and aims to further improve institutional delivery and provide comprehensive care at zero cost. Using information from different administrative surveys, I study the programs' impacts on the utilization of institutional delivery and other maternal services and child mortality. The identification strategy relies on variations in individual's program eligibility rules across

states and time to study its effect using a difference-in-differences model. Additionally, I evaluate the impact of JSY eligibility on women's pregnancy timing using a discrete-time hazard model.

Research studies on financial assistance for maternal care carried out in several countries have produced mixed results. Cash transfer programs in El Salvador and Honduras increase institutional deliveries; however, they only improve the coverage of antenatal care and child check-ups in Honduras (Morris et al., 2004; De Brauw et al., 2011). Studies on the abolition of user fees for maternal services in Ghana report conflicting estimates on skilled birth care (Dzakpasu et al., 2012; Johnson et al., 2015). The use of healthcare vouchers to increase purchasing power in countries including Pakistan and Bangladesh result in a significant increase in institutional delivery (Schmidt et al., 2010; Agha, 2011).

The evidence from the literature for India suggests that financial incentives increase the quantity demanded of targeted maternal health services. However, many studies' definitions of treatment groups are questionable. Moreover, the literature lacks definitive evidence demonstrating the impact of financial incentives on health-related behaviors. Estimating the effect on the use of complementary health services is important because comprehensive healthcare services, and not any singled out service, best promote maternal and child health.

With this paper, I contribute to the literature on maternal and child healthcare in four ways. First, as per my knowledge, this paper provides novel evidence on the impact of JSY on a wide range of health outcomes using all the components of JSY eligibility. Nearly

all previous researchers have overlooked the expanding healthcare infrastructure in the country concurrent with the implementation of JSY. I use healthcare supply variables from various data sources to eliminate the confounding impact of supply changes on the outcomes. Second, this is the first paper to study the impact of JSY eligibility on women's pregnancy timing. Third, it is the first paper to study the impact of JSSK on utilization of healthcare services and child health outcomes. Fourth, I add to the extensive literature on demand-side financing maternal healthcare programs.

I hypothesize that cash transfers under JSY and free maternal healthcare services under JSSK change the relative prices of different healthcare-seeking options and alter women's decisions. From Chapter 1 on JSY, the results suggest that the program increases the utilization of public institutional delivery among eligible women by 23 percent. The increase comes from shifts away from home and private institutions. The decline in the use of private facilities is substantially larger than the decline in home births. JSY increases the use of any antenatal services by 5.4 percent, with first-trimester doctor visits up by 22 percent among eligible women. Unlike its positive impact on all the other healthcare utilization outcomes, JSY reduces eligible women's postpartum check-ups by 17.2 percent. Although the result seems counter-intuitive, I postulate that the free immediate care received at the health facility leads to women substituting expensive postpartum check-ups with the care received at the health facility.

The presence of immediate care at institutions reduces the risk of complications during childbirth, thus reducing stillbirths. JSY reduces the incidence of stillbirths among full-term births by 1.06 more live births per 1000 pregnancies. The program, however, does

not impact one-week and one-month mortality of newborns. Failure to counsel women postpartum under JSY may explain the program's ineffectiveness in reducing child mortality.

In Chapter 2 on JSSK, the results suggest that the free maternal healthcare program increases the utilization of delivery services at public healthcare facilities by JSY-eligible women. Unlike JSY, this increase is accompanied by an increase in the use of private healthcare. Wealthier women, utilizing public facilities, now shift to private providers with an increased demand for public institutions. This is due to the overcrowding of public health facilities as a result of their increased demand. Further, with zero cost of postnatal services under JSSK, the free services program increases the use of postnatal care.

In Chapter 3, I study whether JSY influences women's decisions regarding pregnancy. I find that the eligibility criteria increases the probability of postponing the first birth to at least 19 years of age. Since pregnancy-related complications are the main cause of death among teenage girls, my results suggest that JSY might impact teen maternal mortality.

The dissertation continues in four subsequent sections. The first chapter studies the effect of conditional cash transfers under JSY on women's delivery decisions, use of auxiliary maternal healthcare services and child mortality. In the second chapter, I study the effects of free maternal healthcare services on JSY-eligible population. In the third chapter, I present the analysis of the impact of JSY eligibility on woman's age at first birth. The last chapter discusses policy implications and concludes the dissertation.

CHAPTER 2

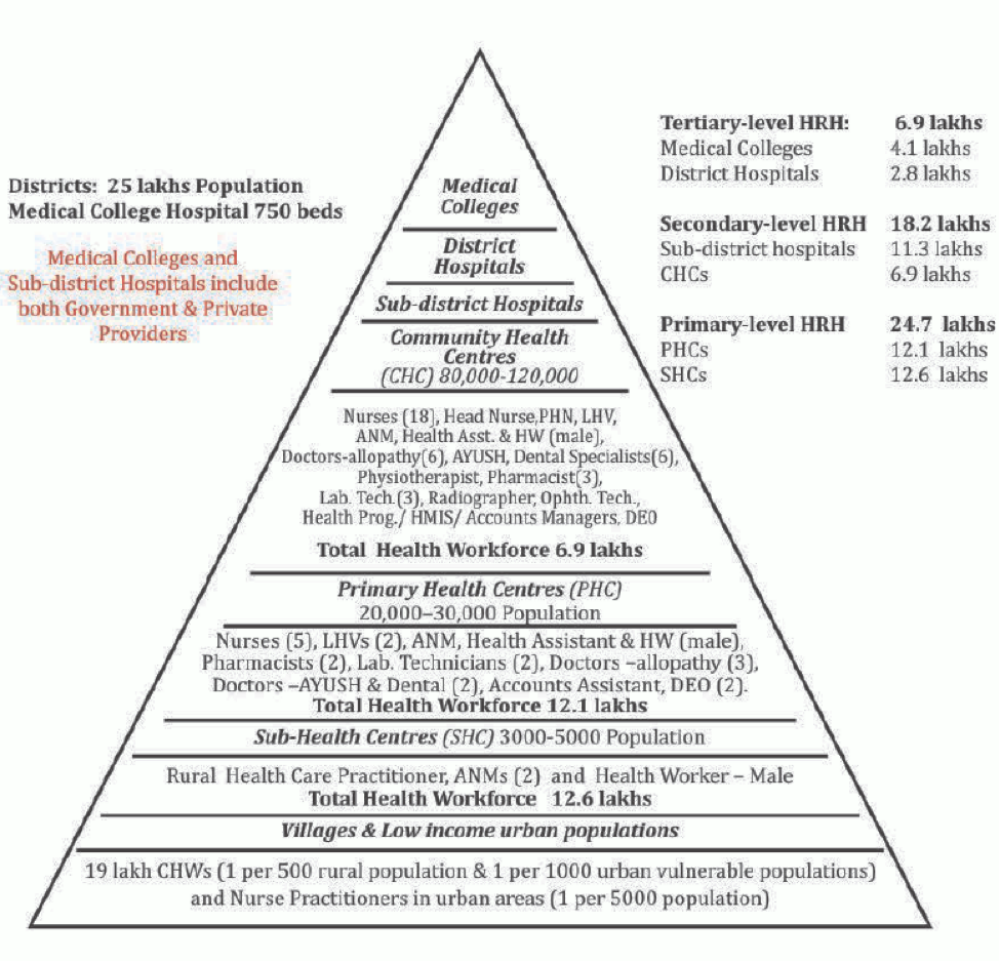
Conditional Cash Transfers and Maternal and Child Healthcare

2.1 Healthcare Landscape in India

In India, the national government acts as the primary provider of all healthcare services. A three-tier design with sub-centres (SCs) and primary health centers (PHCs) in villages at the lowest tier provide the first point of contact for individuals entering the healthcare system. Community health centers (CHCs) at the district level provide the next stage of care, and full-scale sub-district and district hospitals at the regional-level deal with the most serious problems (Figure 2.1). As of 2019, there are more than 200,000 PHCs and SCs in the country; a significant increase from 13,000 centers in 2004-05. Although each PHC covers an average radial distance of 3.78 miles, only 72 percent of them are equipped with a labor room (MoHFW, 2019). This suggests that India has an extensive but poorly supported health infrastructure.

Despite the growth in health infrastructure, access to healthcare services remains low. Around 57 percent of the rural population cannot afford healthcare services and treat themselves without any medical advice (MOSPI, 2019). Among all types of health services, maternal and child health services are the least demanded. Factors such as low levels of female literacy, the practice of early marriage and childbearing, and strong patriarchal norms further restrict women's access (Horton, 2010). More than 45 percent of women state financial constraints and lack of facilities as the primary reasons for not utilizing services during pregnancy (DLHS, III).

Figure 2.1 Health Infrastructure in India



Source: Human resources for health (2011). National Rural Health Mission, Ministry of Health and Family Welfare, Government of India.

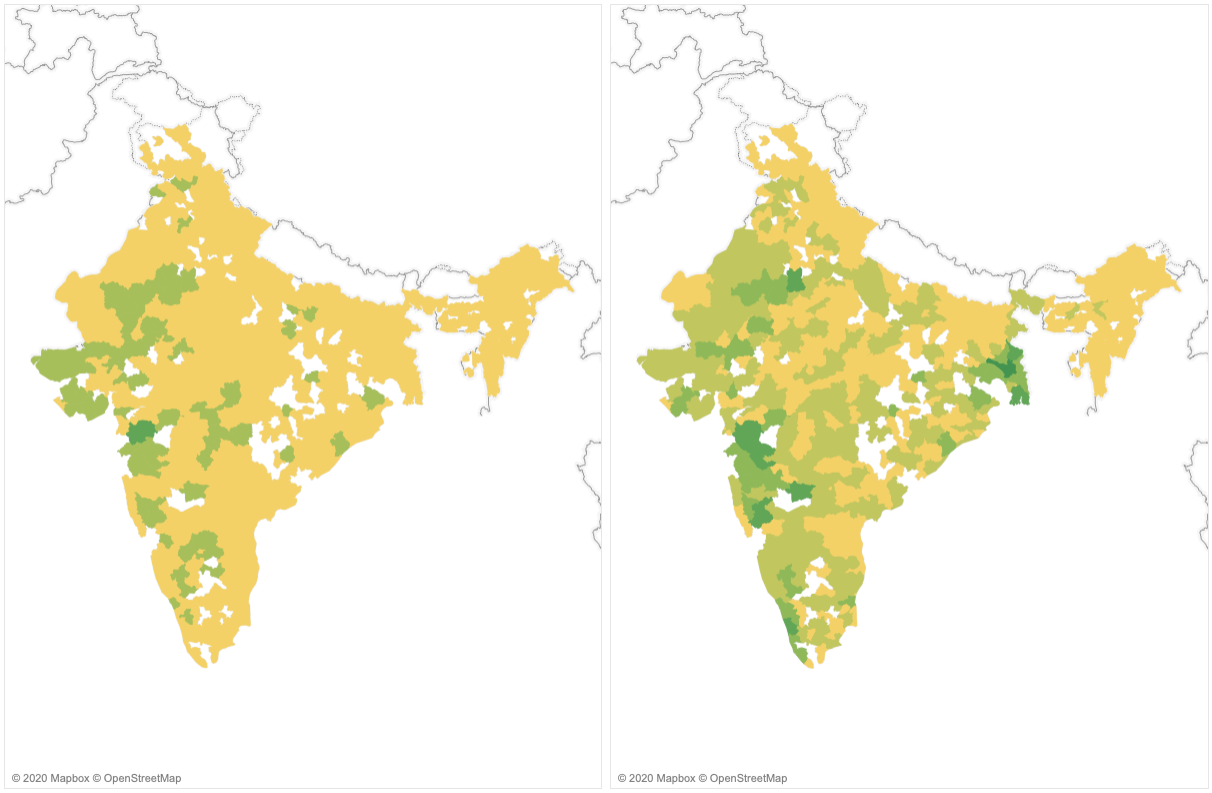
In the literature, 'good care' during pregnancy usually refers to adequate female health providers with good interpersonal behavior, emotional support to new mothers, counselling and competence. However, in developing countries, the issues defining 'good care' run deeper. Basic issues like lack of accessibility to institutions, affordability, cleanliness of the place of delivery, availability of trained medical personnel and medicine in case of complications and for pain management are the major deterrents for women seeking

formal maternal care. Due to the lack of 'good care', only 77 percent of all pregnancies reported end with a live birth (including spontaneous and induced abortions)(DLHS, III). It also leads to a high chance of a stillbirth during delivery. India has the highest number of stillbirths in the world with around 35.1 stillborn per 1000 births.

India also experiences inequality in the utilization of maternal health services. In 2005, only 13 percent of pregnant women in the poorest population quintile delivered in health facilities, as compared with 84 percent in the richest population quintile (IIPS, 2006). Although the gap has reduced over time and overall skilled birth attendance has increased, women in lowest quintile are still 32 percent less likely to deliver in health facilities (IIPS, 2017). The disparity is widespread across geographies; a few Indian states perform worse than Sub-Saharan African countries on maternal health indicators.

Over time, the government has reacted to the situation by developing different programs for increasing the supply and demand for maternal services. On the supply-side, huge investments in infrastructure are made for construction of new healthcare centers as well as mother and child wings in community hospitals (Figure 2.2). Working on demand-side programs, local government agencies have introduced interventions involving the transfer of resources to disadvantaged women. These aim to increase the purchasing power of target households and the bargaining power of women within these households (Ensor and Cooper, 2004b). India launched the National Rural Health Mission in 2005 to provide accessible, affordable and quality healthcare to its rural sections, especially their vulnerable populations.

Figure 2.2 Intensity of Healthcare Centres- 2005 (left) and 2010 (right)



Source: Dataset compiled using DLHS II and DLHS III
Notes: Healthcare centers include PHCs, SCs and CHCs. The growth in the number of centers is illustrated by yellow (lowest) to green (highest). The missing districts in the survey are white in color.

2.1.1 *Janani Suraksha Yojana*

Launched under the National Rural Health Mission in 2005, *Janani Suraksha Yojana* (JSY) integrates cash assistance with delivery care. The program provides financial incentives to pregnant women, encouraging them to deliver in health facilities through CCTs. JSY is one of the largest financial incentives based programs in the world (Lim et al., 2010). It targets to increase the demand for safe pregnancy and delivery services with the overall goal of reducing maternal and child mortality and morbidity. The program has a very

specific approach and provides a cash transfer conditioned on women delivering only in public health facilities.

With more than half of the births taking place at home (in 2005), JSY aims to introduce women to formal healthcare services through facilitators called Accredited Social Health Activists (ASHAs). The program recruits and trains ASHAs to work within their communities as health workers and educators to increase the use of formal healthcare services. Although ASHAs lack medical training to provide comprehensive maternal and child care, they are pivotal to the success of the program. ASHAs hold various responsibilities including identifying, registering and tracking pregnancies in their local areas. They also counsel women to seek healthcare services during pregnancy and provide information about local healthcare facilities.

India accounts for a substantial proportion of the world's maternal and child mortality (Kassebaum et al., 2013). The country averages for maternal healthcare indicators, however, mask the enormous differences across its states. For example, Kerala has a maternal mortality rate of 46 per 100,000 pregnancies, while states such as Orissa and Uttar Pradesh perform worse than the least developed countries with maternal mortality ratios falling between 190 and 220. Given these disparities, JSY focuses intensively on states with the poorest health indicators. Thus, JSY set different eligibility rules for different states. India designates ten states as low-performing (LP) and the remaining 25 as high performing (HP) based on their performance on various socioeconomic indicators. The states of Uttar Pradesh, Uttarakhand, Bihar, Jharkhand, Madhya Pradesh, Chhattisgarh, Assam, Rajasthan, Orissa, and Jammu and Kashmir are the LP states.

In the LP states, all women, irrespective of their background characteristics, are eligible for a conditional cash transfer under the program. To be eligible for cash benefits in the HP states, women must be at least 19 years, and possess a below poverty line (BPL) card, or belong to Scheduled Caste (SC) / Scheduled Tribe (ST)[1]. The cash assistance is limited to up to two births in the HP states (Table A2). By restricting the age of participation above 19 years and the number of children to at most two, JSY intends to reduce number of births and the incidence of early motherhood.

The cash amount given under the program varies by state and area of residence. Specifically, women in the LP states are offered Rs 1400 ($31) in rural areas and Rs 1000 ($22) in urban areas for delivery in public health facilities. Those in HP states receive Rs 700 ($16) in rural areas and Rs 600 ($13) in urban areas (Table A3). The program stipulates that cash be disbursed to the mother immediately at the institution itself or within a week of delivery.

It is important to note that the out of pocket expenses associated with an institutional delivery exceed the modest incentive provided under JSY. The payments only cover between 22 to 50 percent of the total costs of a public health facility delivery (Rahman and Pallikadavath, 2018). These cash payments are more akin to price reductions for delivery cost as compared to some extra cash income guaranteed under the program. Although JSY incentives provide partial financial risk-protection, it may trigger exposure to additional costs of ancillary services like referrals and transport services (Prinja et al.,

[1]In 2013, the Ministry of Health and Family Welfare relaxed the eligibility parameters for JSY. With the changes, women can now access JSY cash benefits irrespective of their age at first birth and number of children.

2015; Randive et al., 2013).

For their pivotal role in facilitating institutional delivery, ASHAs are also offered performance-based cash payments to promote other reproductive and child health behaviors. In addition to their monthly salaries, ASHAs are given payments between Rs 200 ($4) and Rs 600 ($13) for each registered woman utilizing public institutional delivery in the LP states. In the HP states, no additional payments are made out to the ASHAs. The cash transfers to ASHAs are expected to reduce absenteeism and improve the overall performance of healthcare workers themselves.

2.1.2 Past Evaluations of *Janani Suraksha Yojna*

JSY can be thought of as a quasi-experiment that can be used to study the impact of a demand-side financing program on the utilization of maternal and child healthcare services. Most studies have primarily been descriptive, documenting progress in the program's implementation in specific states and regions (Devadasan et al., 2008). Under the scope of causal evaluation, studies have examined the effects of JSY on outcomes such as institutional delivery and antenatal care (Powell-Jackson et al., 2015; Carvalho et al., 2014; Gopalan and Varatharajan, 2012; Gupta et al., 2012; Lim et al., 2010) and child mortality (Sengupta and Sinha, 2018; Lim et al., 2010). Studies have also estimated the indirect impacts of JSY on breastfeeding and pregnancy (Powell-Jackson et al., 2015; Nandi and Laxminarayan, 2016) as well as immunization (Carvalho et al., 2014).

The first formal impact evaluation of JSY was conducted by Lim et al. (2010) which employed three different identification strategies: individual matching, with versus without the implementation of JSY, and district-level difference-in-differences. One of the most critical limitations relates to individual matching based on the question of whether women did or did not receive JSY cash entitlement. In their study, individuals were defined as treated if they received JSY funds. This led to reverse causality in the treatment group as women only receive cash when they give birth in a public health facility. They found that JSY had a significant effect on increasing antenatal care and in-facility births[2].

With the same data as Lim et al. (2010), Powell-Jackson et al. (2015) used a different statistical approach to evaluate JSY. They exploited variation in the timing of implementation of JSY at the district-level and defined a treatment variable, 'exposure', as the fraction of women receiving JSY cash benefits relative to the total number of women giving birth in public health institutions. The decision to deliver at public institutions may depend on the institution's ability to pay cash benefits, thus increasing the likelihood of women using its services. This would overestimate the demand for public institutional delivery as measured by the 'exposure' variable.

The results suggested a significant but smaller impact of JSY on institutional delivery as compared to Lim et al. (2010). For neonatal mortality, Powell-Jackson et al. (2015) found a reduction of comparable magnitude to Lim et al. (2010) (-2.7 compared to -2.3 per 1,000 live births), although statistically insignificant.

[2]An in-facility birth includes all births in a medical institution under the overall supervision of trained and competent health personnel.

Most recently, Rahman and Pallikadavath (2018) evaluated the impact of JSY using propensity score matching and a fuzzy regression discontinuity model around second births with data between 2008 and 2015. The study finds a 16-22 percentage point increase in institutional deliveries. In 2011, a universal maternal healthcare program, *Janani Shishu Suraksha Karyakaram* (JSSK), was launched to provide free services to all pregnant women in public facilities. Since this paper fails to isolate the impact of JSY from JSSK, the total impact on institutional delivery is erroneously attributed to JSY.

Apart from the direct intended outcome of institutional delivery, studies have also estimated the impact of JSY on the utilization of auxiliary maternal and child healthcare services including antenatal and postnatal services, immunization, and breastfeeding. Unlike the consensus formed on the positive impact of the program on in-facility delivery, the results for other outcomes are conflicting and inconclusive. Powell-Jackson et al. (2015), for example, finds no impact of JSY on the utilization of antenatal care. In fact, they use this evidence to illustrate their parallel trends assumption. Further, that study finds an increase in breastfeeding and immunization rates while Carvalho et al. (2014) and Rahman and Pallikadavath (2018) find no effect of the program on exclusive breastfeeding practices and care-seeking behavior.

Studies evaluating the impact of JSY on woman's fertility decisions are sparse. Using a pregnancy indicator at the time of survey, Powell-Jackson et al. (2015) demonstrate the potential for financial incentives to increase pregnancies and thus, undermine JSY's own objective of reducing fertility. According to my knowledge, no study has yet studied the impact of JSY on woman's age at first birth.

There are various surveys and qualitative studies that comment on the perceptions of quality and satisfaction with JSY. A 2012 study found that only a third of the women interviewed in Jharkhand were attracted by the cash benefit under JSY (Srivastava et al., 2012). Another study (Vellakkal et al., 2017) finds that the trust in the skills of traditional birth-attendants and the notion of childbirth as a 'natural event' that requires no healthcare were the most prevalent impeding factors for home births.

My study's econometric approach is closest to Joshi and Sivaram (2014). Like them, I use data from District Level Household Surveys (DLHS). I additionally include time and state fixed effects to my regression model. Further, I expand on their treatment group to include all the components of JSY eligibility. I combine information on healthcare supply from various other data sources to control for the growing healthcare services in the country. I estimate the impact of JSY on an array of utilization and health outcomes in addition to their three outcome variables: three or more antenatal visits, delivery in a JSY facility and checkup within two weeks of delivery. I also evaluate the impact of the program on women's fertility decisions using a discrete-time hazard model. Using the eligibility cut-off age of 19 years, I study whether the program induces women to shift their pregnancy timing.

2.2 Data

This study uses data from Indian District Level Household Survey (DLHS), District Census Handbook (DCH), and Rural Health Statistics (RHS) and district-level aggregates from

Census India, 2011. DLHS is a large-scale, multi-round survey conducted in a representative sample of households throughout India since 1997 to assess the utilization of services provided by government facilities and people's perceptions about the quality of services. The survey provides state and national information for India on fertility, the practice of family planning, maternal and child health, reproductive health, nutrition, anaemia, utilization and quality of health and family planning services. I use three waves of DLHS data in my sample- II (2002-03), III (2008-09) and IV (2012-13). In addition to the standard questionnaire, DLHS-III provides additional information on JSY. Further, unlike other two rounds in which only currently married women ages 15-44 years were interviewed, DLHS-III interviewed ever-married women (ages 15-49) and never married women (ages 15-24).

The District Census Handbook (DCH) is a publication of the Census Organization and contains data on urban and rural areas for each district. It provides information on demographic and socio-economic characteristics of population at the lowest administrative unit, village (rural) and town (urban) of each district. DCH contains information on various types of infrastructure including education, medical resources, drinking water, communication and transport, post and telegraph, electricity, banking, and other facilities. From DCH, I use data on health infrastructure including presence of ASHA workers, an Anganwadi Centre[3], and a Maternity and Child Welfare Centre[4].

[3]Anganwadi centers are local government centers that provide pre-school non-formal education and food to local children.

[4]A maternity and child welfare centre provides antenatal and postnatal services for both mother and child. The services include regular check-up of pregnant women, provision of folic tablets, counseling, delivery, immunization of children with check-up, etc.

Published annually since 2005, Rural Health Statistics (RHS) provide infrastructural information on SCs, PHCs and CHCs. I create a district-level comprehensive health infrastructure dataset from nine rounds of RHS beginning in 2005. I merge RHS data with DHS and the district-level aggregates on population and area from the Census.

Implemented under the broader umbrella of the National Rural Mission, JSY was accompanied by changes to the existing infrastructure and an extensive investment in building newer health facilities. Between 2005 and 2013, the total investment by the government equalled nearly $17 billion to increase healthcare facilities as well as provisions available at existing facilities. As per my data, the average number of SCs and CHCs increased by 3-5 units per district between 2005 and 2010 (Figure 2.2). The construction of newer facilities reduced the distance to the nearest available health resources, making formal care more accessible (Figure B1). An increase in the number of alternatives influences women's decisions to utilize formal maternal care and confounds the impact of financial incentives provided by JSY. Since the rollout of JSY and the increase in supply of health facilities was simultaneous, I control for these supply changes. This helps isolate the impact of the program alone, holding the availability of health services constant.

I create a repeated cross-section of ever-married women with at least one pregnancy reported between 1999 and 2010. The details on healthcare utilization in my dataset are limited to the most recent birth of women and consequently, I restrict the sample to the latest birth in a woman's birth history. The final sample has 335,866 women observations spanning over 591 districts in 35 states. The identification comes from individual eligibility rules under JSY to receive cash benefits and the timing of the program.

I evaluate the impact of JSY on various direct and indirect outcomes. The direct utilization outcome is the woman's place of delivery. The questionnaire asks "*Where did your last delivery take place*?" with government facilities, private facilities, home and other as options[5]. Another direct outcome is the presence of a skilled health professional[6] in attendance during delivery. Other utilization outcomes include any antenatal care, number and timing of visits to the doctor, postnatal check-ups for the mother and child, immediate breastfeeding by the mother, and immunization.

The main health outcome is child mortality. To measure this, I examine four variations of child mortality: fetal mortality, neonatal mortality, first week mortality and infant mortality in the first month. Fetal mortality is the probability of infant death within 28 weeks of gestation. Neonatal mortality measures the probability of infant death within first 24 hours given a live birth. One week mortality is defined by the probability of death in the first week of birth given the child survived the first day of birth, and one month infant mortality measures death within the first month of birth given the infant survived the first week of birth[7]. Understanding the effect of institutional delivery on the incidence of maternal mortality is important but the lack of data on maternal deaths limits my ability to examine this outcome. However, I discuss the indirect effect of JSY on maternal mortality through its impact of various maternal services.

[5]There are 2,438 observations which report delivering child at 'Other'. I drop the observations with the choice of 'Other' as woman's place of delivery.

[6]Health professional maybe a doctor, nurse, certified midwife, auxiliary nurse midwife, or a lady health visitor.

[7]Since there are definitional variations in the concepts of stillbirths and one-day mortality which the mothers may not be aware of, I take the responses of women at face value and calculate our estimates. This suggests that the results must be interpreted with caution.

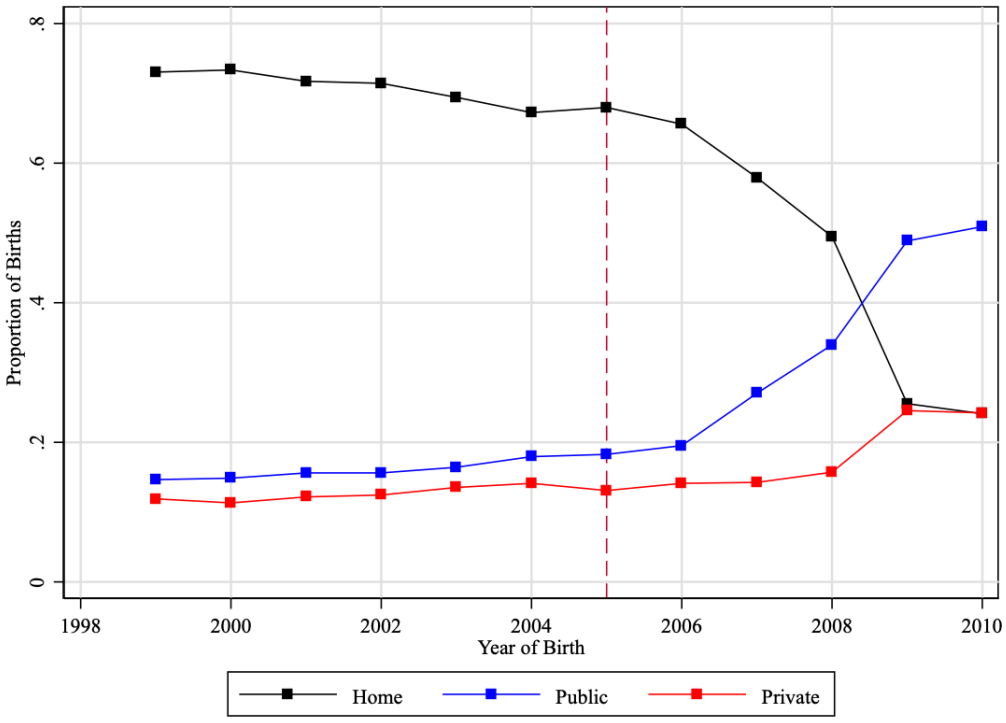
Table 2.1 Summary Statistics (1999-2010)

	Pre-JSY (1999-2004)	**Post-JSY** (2005-2010)	**Total** (1999-2010)
Controls			
Woman's Age	26.40	26.10	26.25
Woman's Age at First Birth	18.98	20.10	19.55
Poor	0.605	0.487	0.545
Caste-SC/ST	0.393	0.402	0.398
Caste-General	0.213	0.214	0.214
Religion-Hindu	0.776	0.755	0.765
No Education	0.561	0.472	0.516
Village- Health Worker	0.681	0.660	0.670
Village- Distance to Facility	3.096	2.774	2.920
Village-ASHA	0	0.665	0.338
District- CHC per sq km	0.157	0.169	0.163
Outcomes			
Delivery at Home	0.706	0.578	0.641
Delivery at Public Facility	0.162	0.263	0.213
Skilled Health Professional	0.318	0.434	0.377
Fetal Deaths*	31.11	29.30	30.30
Neonatal Deaths**	20.04	19.76	19.99
Any Antenatal Care	0.670	0.717	0.693
Atleast 4 Antenatal Visits	0.386	0.446	0.417
First Trimester Antenatal Care	0.305	0.384	0.345
Postnatal Care	0.368	0.411	0.405
Immunization	0.721	0.764	0.758
Breastfeeding	0.302	0.419	0.360
Observations	**165,638**	**170,228**	**335,866**

Notes: The sample consists of all 35 states and 591 districts from three rounds of the District Level Households Survey (DLHS).
* Fetal Death Rate is the number of deaths within the gestation period per 1000 pregnancies.
** Neonatal deaths is the number of deaths within the first month of birth per 1000 live births.
Antenatal care includes checkup during pregnancy, tetanus injections and intake of iron supplements.
The full forms include: SC/ST - Scheduled Caste/ Scheduled Tribe, ASHA - Accredited Social Health Activists, and CHC- Community Health Centers.

Table 2.2 presents summary statistics for the variables used in the analysis. On average, women increased their participation in formal healthcare between 1999 and 2010. The use of auxiliary health services, i.e. antenatal and postnatal care services, increased between 1999 and 2010. More than 70 percent of women sought antenatal care during pregnancy and modestly increased their use of postnatal care services. The likelihood of home births fell from 70.6 to 57.8 percent while the use of public health institutions increased from 16.2 to 26.3 percent (Figure B5). Figure 2.3 shows the changes in the choice of place of delivery over time. Table A5 provides details on the descriptive statistics .

Figure 2.3 Choices of Place of Delivery



Source: Dataset compiled using DLHS II and DLHS III Notes: The dotted line represents the implementation of JSY in 2005.

2.3 Methodology

I use repeated cross-sectional data for the most recent births of ever-married women with at least one pregnancy between 1999 and 2010. My methodology consists of a generalized difference-in-differences approach. I exploit variations in the individual eligibility rules across states and the time of implementation of the program. To be eligible for cash benefits, a woman must either live in a LP state, or be a poor woman above the age of 19 years in a HP state, or belong to Scheduled Caste (SC) / Scheduled Tribe (ST). To receive the cash transfer, the woman has to be eligible under JSY and use a public health facility to deliver her child. Around 72 percent of my total sample stands eligible for JSY benefits (Figure B2).

Consider woman i living in village v in district d at survey time t with at least one pregnancy in her birth history. The main specification can be written in the following form:

$$\begin{aligned} Y_{idt} = \beta_0 + \beta_1 Eligible_{id}^{JSY} + \beta_2 Post_t + \beta_3 (Post_t X Eligible_{id}^{JSY}) \\ + \beta_4 X_{idt} + \beta_5 \gamma_d + \beta_7 \gamma_t + \epsilon_{idt} \end{aligned} \tag{2.1}$$

where t= 1999, 2000, 2001,..., 2010. The treatment variable, $Eligible_{id}^{JSY}$, is an indicator variable for woman fulfilling the eligibility criteria under JSY(=1)[8]. The post-treatment variable, $Post_t$, is a time indicator for the implementation of JSY (=1 if t$\geq$ 2005)[9]. β_1

[8]We do not use the actual receipts of JSY cash transfers as our treatment variable like some of the previous studies. As discussed earlier, using a dummy variable for JSY cash transfers as treatment would give us inaccurate estimates because of reverse causality between the choice of place of delivery and cash benefits.

[9]In theory, the JSY program was initiated simultaneously across the country; in practice, implementation was delayed in places, due to various political and administrative challenges. For example, in the state of

measures the baseline difference between eligible and non-eligible women prior to the implementation of JSY. β_2 measures the average change in the outcome of interest post the program's implementation. γ_d and γ_t are the district and time fixed effects, respectively; they account for the impacts of district-invariant and time-level characteristics, respectively, that could cause changes in the outcome of interest rather than the program. I cluster errors at the village level to correct for the loss of independent variation within the villages.

β_3 provides the intent-to-treat effect. It measures the impact of JSY eligibility on the treatment population after controlling for the pre-program differences and other confounding factors, X_{idt}. I use individual, village and district-level controls. The individual-level controls include the respondents' age in years, own and husband's years of education (no education, primary (5 years), high school (10 years), secondary (12 years) or college and above (13+ years)), religion (Hindu, Muslim, Sikh, Christian or Other), caste (General, Scheduled Caste, Scheduled Tribe or Other Backward Class), region (urban or rural) and a wealth index. The village-level controls include the presence of an ASHA, any health worker, distance to nearest health facility and its accessibility around the year. The district-level controls are the number of CHCs, PHCs and SCs per 1,000 people and per 100 square kilometers.

It is important to note that since changes to the healthcare infrastructure at various administrative levels coincided with the implementation of the program, controlling for the varying supply of healthcare resources is key to my estimation strategy. Not accounting for

Uttar Pradesh, issues including political instability, the large population, and the lack of infrastructure and staff in the field, delayed implementation of the program. That being said, I do not have any information about the timing of the lags in program implementation and would assume the official launch time of April 2005.(Dagur and Switlick-Prose, 2010)

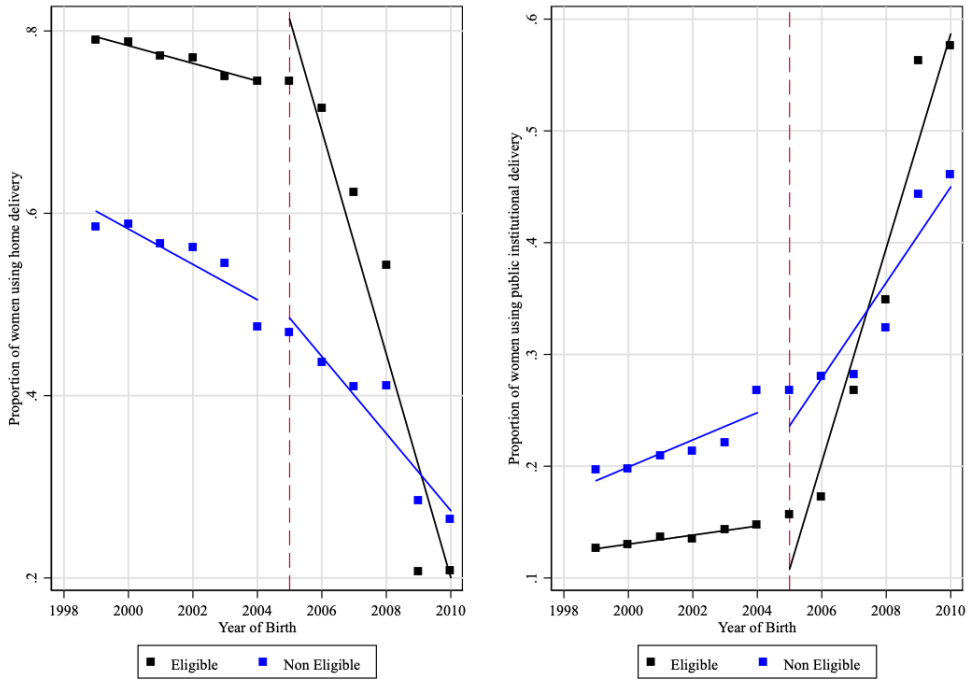
these changes would result in the erroneous identification of a portion of the change in healthcare utilization, given by β_3, as being due to the program rather than due to the increase in accessibility to healthcare resources.

Equation (1) should satisfy the assumption of parallel trends for β_3 to have a causal interpretation of identifying the treatment effect of JSY eligibility on the outcomes. It states that the treatment group have similar trends to the control group in the absence of treatment. In this case, the utilization of health outcomes for eligible women should have the same trends as ineligible women. Figure 2.4 illustrates the trends for the outcomes of choice of place of delivery. On an average, with eligible women more likely to give a home birth, the choice of giving birth at home has fallen over time . After the implementation of JSY, home births amongst the eligible group rapidly decreased as compared to their ineligible counterparts[10]

I expect the estimate of β_3 to be positive measuring the outcome of utilization of public institutional delivery. The cash transfer guaranteed under JSY pays for a portion of the expenditure incurred during pregnancy at government health institutions; it effectively reduces the delivery costs only in those institutions. Given this change in prices of delivery care at government hospitals relative to that at private hospitals and home, women would shift from both these places of delivery to public institutions. Thus, my hypothesis suggests that JSY increases the utilization of public institutional delivery while reducing the use of other alternatives.

[10]I perform a sensitivity analysis on the pre-event years to further confirm the parallel trends assumption. (Table B7). The results show insignificant treatment effects which suggests that the parallel trends assumption holds.

Figure 2.4 Trends of Outcome Averages for Treatment and Control Groups



Notes: The figure provides evidence of the assumption of parallel trends. The dotted points are the averages for each year for the outcomes of public institutional delivery and home births, respectively. The lines are fitted over the pre- and post-JSY years.

Compared to the average cost of Rs 1433 ($18) for delivery at a government hospital, the prices for private and home delivery are Rs 22,364 ($300) and Rs 800 ($10) respectively[11] (MOSPI, 2019). With JSY, the cost of delivery at public institution are reduced. A change in the relative prices of different healthcare seeking options would change a woman's behavior to shift to public institutional delivery. This suggests that women choosing home births and private facilities are more likely to shift to public institutional delivery after JSY cash transfers began. Since the private and public

[11]The per capita income at current prices for India was Rs 25,956 ($340) in 2004-05.

institutions are substitutes, I expect to find a decrease in the utilization of private services after JSY was implemented.

Since the program incentivizes women to shift to institutional delivery and introduces them to formal care, the use of antenatal and postnatal services should increase. Thus, for other health utilization outcomes, I posit JSY to increase the use of auxiliary services. More women are expected to seek checkups during pregnancy and in earlier trimesters along with postpartum checkups.

With institutional delivery, women are in close proximity to immediate obstetric care. It reduces the risk of complications during childbirth for both, mother and the child, thereby increasing their likelihood of survival. The program eligibility may also reduce fetal and neonatal deaths.

2.4 Results

The results presented in this section explain the impact of JSY on the choice of place of delivery, utilization of antenatal and postnatal care, and child mortality. Additionally, I evaluate the heterogeneous impact of the program on these outcomes by cohort-wise exposure to JSY, wealth, education and tribal composition of population. The estimations control for observed individual and household characteristics, and time-varying village- and district-level healthcare characteristics. The specifications include district and time fixed effects with clustering at the district level. Panel A provides the estimates for the complete sample of states while Panel B is a sub-sample analysis of HP states.

2.4.1 Place of Delivery

Table 2.2 reports the estimates of the impact of JSY from equation (1) on the outcome of choices of place of delivery. Columns (1)-(3) measure the impact of JSY on home births, public institutional delivery, and private institutional delivery, respectively.

Table 2.2 Impact of JSY on Place of Delivery

	(1) Home	(2) Public	(3) Private
Panel A: All States			
Eligible	0.00658	0.0330***	-0.0394***
	(0.004)	(0.004)	(0.003)
Eligible x Post JSY	-0.0179***	0.0373***	-0.0184***
	(0.004)	(0.004)	(0.003)
Mean	0.612	0.229	0.152
Observations	277126	277126	277126
R^2	0.328	0.184	0.239
Panel B: High Performing States			
Eligible	0.0137*	0.0442***	-0.0583***
	(0.005)	(0.006)	(0.005)
Eligible x Post JSY	-0.00282	0.00593	-0.00202
	(0.005)	(0.006)	(0.005)
Mean	0.441	0.317	0.234
Observations	114558	114558	114558
R^2	0.332	0.159	0.271

Notes: The table presents estimates of β_3 from from equation (1). The columns represent birth at home (1), public health institution (2), and private health institution (3). Eligible is a binary variable that equals one if the woman is eligible for JSY benefits and zero, otherwise. Post JSY is a time dummy variable that equals one for the years after 2005 and zero, otherwise. Controls include age, education, wealth, caste and religion of woman, place of residence, husband's education, child's birth order, presence of health worker and ASHA in village, and number of PHCs, SCs, CHCs in district, and distance to the nearest health facility. District and time fixed effects are included. Panel A is based on a sample of 35 states and 595 districts while Panel B is based on 25 states and 292 districts. Robust standard errors are clustered at the district level with significance levels at the 10, 5, and 1 percent.

The estimates in column (1) report that JSY eligibility leads to a statistically significant 1.79 percentage point decrease in the likelihood of a home birth. Given the 61 out of 100 eligible women delivered at home in the sample before JSY was implemented, this is a 3 percent decline. This shift away from home births is absorbed by public health institutions. Column (2) reports that JSY eligibility leads to a increase in the utilization of public institutional delivery by 3.73 percentage points (16.3 percent). JSY also reduces the utilization of private institutional delivery. As column (3) suggests, eligible women are 1.84 percentage points (12 percent) less likely to seek delivery care at private healthcare facilities. The results suggest that the increase in public facility delivery comes from the decline in both home and private facility births. The change in relative prices of different healthcare-seeking options leads to the increase in public institutional delivery. The substitution away from the private sector accounts for higher proportion of the effect of the JSY on public facility births. To understand the results, it is important to consider the two components of JSY: financial incentive (cash transfers)[12] and information[13]. Women choosing home births are either affected by one or both the components. They give birth at home because either they face financial restrictions to use formal healthcare or they lack medical literacy or both. Others utilizing institutional delivery, public or private, are affected only by the financial component as they behave as informed individuals already. The relatively small decline in home births in the presence of JSY means that these women

[12]The decision to have or not to have an institutional delivery is constrained by the financial costs of delivery care. The cash transfers under JSY only reduce the cost of delivery care at a public healthcare facility by 22-50 percent.

[13]Through ASHAs, JSY provides information about the importance of institutional delivery and counsels for healthier pregnancy practices.

are either strongly limited by financial costs or are bounded by beliefs and cultural practices[14]. For women using institutional services, the change in relative prices at the two types of institutions results in substitution away from the private sector to the public sector. The large shift away from private facilities suggests that for medically literate women, JSY cash transfers serve as a strong incentive to use institutional delivery services at public facilities. Overall, in comparison to the shift from private to public facility delivery, the combined financial incentives and information provided under JSY are relatively insufficient to shift women away from home births to institutional care.

For the sub-sample of HP states in Panel B, the estimates provide no evidence of impact of JSY on institutional delivery. The insignificant results are due to two potential reasons. *First,* the information component of JSY is weak in HP states as ASHAs are not offered financial incentives to counsel women. This suggests that women giving home births are less likely to understand their importance of formal care and shift to facility delivery. *Second,* the cash incentive provided under JSY in HP states is lower than that in LP states. Given the higher cost of delivery care in HP states[15], the effective prices reduction with cash transfers are quite small to alter women's behavior.

[14]In certain parts of India, pregnancy is viewed as a normal physiologic phenomenon that does not require any intervention by health care professionals. Only in the event of a problem will pregnant women seek medical advice, usually first from women from older generations.

[15]HP states are relatively better performing states on all socio-economic parameters and their growth is reflected in their price levels. Thus, the cost of going to a medical facility is higher in HP states than LP states. For example, the cost of institutional delivery is as high as $130 in Kerala and Karnataka as compared to $20 in some LP states.

2.4.2 Antenatal Care

Table 2.3 presents the results of equation (1) on the outcomes of antenatal care. Column (1) estimates the impact of JSY on a dummy variable measuring any type antenatal care used by women[16], column (2) on at least four visits to the doctor during pregnancy, and column (3) on at least one visit before the second trimester.

The estimate in column (1) provides evidence of an increase in the use of antenatal services. JSY increases the use of any antenatal care during pregnancy by 3.63 percentage points (or 5 percent). The estimate is significant at the 1 percent level. Columns (2) and (3) suggest the program also increases the likelihood of having at least four prenatal care visits and these visits being early in the pregnancy; the estimates suggest that JSY is associated with a 7.79 percentage point increase in the probability of eligible women going for a minimum of four visits and a 6.73 percentage point increase in these visits occurring before the second trimester.

The results can be explained by the interaction of women with formal healthcare system under the program (Table 2.4). Column (1) shows that eligible women who had an ASHA worker in their locality under the program increased the use of any antenatal care by 4.05 percentage point. Since ASHAs register women for the program during pregnancy, it becomes likely for them to initiate using the required healthcare services early in this period. This results in an early exposure to antenatal services and thus, an increase in the use of these services. However, as the program does not impact total institutional delivery

[16]Antenatal care includes visits to the doctor during pregnancy, tetanus shots, and intake of iron supplements.

Table 2.3 Impact of JSY on Antenatal Care

	(1) Any ANC	(2) Visits	(3) Timing
Panel A: All States			
Eligible	-0.00710*	-0.000305	-0.0303***
	(0.003)	(0.004)	(0.004)
Eligible x Post JSY	0.0363***	0.00779*	0.0673***
	(0.003)	(0.004)	(0.004)
Mean	0.719	0.441	0.620
Observations	277093	268913	286429
R^2	0.235	0.307	0.211
Panel B: High Performing States			
Eligible	0.0146***	-0.0164**	0.0120*
	(0.004)	(0.005)	(0.005)
Eligible x Post JSY	0.00611	0.00740	0.00478
	(0.004)	(0.006)	(0.005)
Mean	0.848	0.648	0.759
Observations	114543	100830	118251
R^2	0.239	0.271	0.175

Notes: The table presents estimates of β_3 from from equation (1). The columns represent any antenatal care (1), at least four antenatal visits (2), and visit during first trimester (3). Eligible is a binary variable that equals one if the woman is eligible for JSY benefits and zero otherwise. Post JSY is a time dummy variable that equals one for the years after 2005 and zero otherwise. I use controls including age, education, wealth, caste and religion of woman, place of residence, education of husband, birth order of children, presence of health worker and ASHA in village, and distance to the nearest health facility. District and time fixed effects are included. Panel A is based on a sample of 35 states and 595 districts while Panel B is based on 25 states and 292 districts. Robust standard errors are clustered at the district level with significance levels at the 10, 5, and 1 percent.

in HP states, the effect is not reflected in the use of antenatal services as well. As shown in columns (4) to (6), the presence of ASHAs in LP states under JSY results in an increased utilization of antenatal services compared to HP states. Since ASHA workers do not receive any additional compensation for their work in HP states, there is less incentive for them to be efficient in their duties of providing information to expecting mothers.

Table 2.4 Impact of ASHAs on Antenatal Care

	(1) Any ANC	(2) Visits	(3) Timing	(4) Any ANC	(5) Visits	(6) Timing
Eligible	0.00137	0.00393	-0.00973**			
	(0.003)	(0.003)	(0.003)			
ASHA	0.00390	0.0150***	-0.00256	-0.00225	0.0183***	-0.00927**
	(0.003)	(0.004)	(0.004)	(0.003)	(0.004)	(0.003)
Eligible * ASHA	0.0405***	0.00102	0.0575***			
	(0.004)	(0.004)	(0.004)			
LP State * ASHA				0.0573***	-0.00388	0.0781***
				(0.004)	(0.004)	(0.004)
Mean	0.848	0.648	0.759	0.848	0.648	0.759
Observations	277048	268868	283163	277048	268868	283163
R^2	0.237	0.309	0.223	0.237	0.309	0.223

Notes: The columns represent any antenatal care (1,4), at least four antenatal visits (2,5), and visit during first trimester (3,6). Eligible is a binary variable that equals one if the woman is eligible for JSY benefits and zero otherwise. ASHA is an indicator variable for the presence of ASHA workers in the village. LP state is a state dummy that equals one if the state is a low-performing state and zero otherwise. I use controls including age, education, wealth, caste and religion of woman, place of residence, education of husband, birth order of children, presence of health worker and ASHA in village, and distance to the nearest health facility. District and time fixed effects are included. Robust standard errors are clustered at the district level with significance levels at the 10, 5, and 1 percent.

Additionally, these results have important implications for maternal mortality. It is estimated that pregnant women with anemia are twice as likely to die during or shortly after pregnancy compared to those without the condition (Daru et al., 2018). Thus, given that there is an increase in ANC services and particularly, iron intake, it could indirectly impact maternal mortality.

2.4.3 Postnatal Care

Table 2.5 presents the estimates for the impact of JSY on postnatal services. Columns (1)-(3) show results for the outcomes of postnatal checkup within the first two weeks of delivery, breastfeeding within one hour of birth, and immunization, respectively.

Table 2.5 Impact of JSY on Postnatal Care

	(1) Check-up	(2) Bf	(3) Imz
Panel A: All States			
Eligible	0.0277***	-0.0331***	-0.0258***
	(0.004)	(0.004)	(0.003)
Eligible x Post JSY	-0.0633***	0.0454***	0.0378***
	(0.004)	(0.004)	(0.003)
Mean	0.322	0.377	0.710
Observations	267508	272175	274900
R^2	0.250	0.218	0.181
Panel B: High Performing States			
Eligible	-0.0168**	0.0149*	0.000369
	(0.006)	(0.006)	(0.004)
Eligible x Post JSY	-0.0163	0.00307	-0.120***
	(0.009)	(0.010)	(0.009)
Mean	0.446	0.504	0.801
Observations	106546	112930	113797
R^2	0.285	0.134	0.180

Notes: The table presents estimates of β_3 from from equation (1). The columns represent postnatal checkup of mother within 14 days of delivery (1), breastfeeding within first hour of birth (2), and infant immunization (3). Eligible is a binary variable that equals one if the woman is eligible for JSY benefits and zero otherwise. Post JSY is a time dummy variable that equals one for the years after 2005 and zero otherwise. I use controls including age, education, wealth, caste and religion of woman, place of residence, education of husband, birth order of children, presence of health worker and ASHA in village, and distance to the nearest health facility. District and time fixed effects are included. Panel A is based on a sample of 35 states and 595 districts while Panel B is based on 25 states and 292 districts. Robust standard errors are clustered at the district level with significance levels at the 10, 5, and 1 percent.

Column (1) suggests that JSY eligibility lowers women's probability of going back for a postpartum checkup within the next two weeks. Post JSY, eligible women reduced their postpartum checkups by 6.33 percentage point (or 19.6 percent). The result seems counter-intuitive given the positive effect of JSY on all other maternal services. The reduced utilization could be explained by women substituting postpartum care with the care received during their hospital stay for delivery. Since going back to the health facility has associated financial and time costs, women may seem reluctant to utilize the service. Thus, the analysis indicates that immediate delivery care and postnatal care are substitutes. Studies have found that postnatal checks are important for preventing maternal deaths (Kikuchi et al., 2015). Reduction in the use of checkups has severe consequences for the well-being of women.

Columns (2) and (3) suggest that the JSY increases the practice of early breastfeeding by mothers within the first hour of birth by 4.54 percentage point and infant immunization by 3.78 percentage points. The results suggest that the increase in the use of cost-less changes could be due to the mother's interaction with formal care institutions and professionals during her visits.

2.4.4 Child Mortality

Table 2.6 presents the impact of JSY on measures of child mortality. Column (1) estimates the impact on fetal mortality, column (2) on neonatal mortality, column (3) on first week mortality and column (4) on first month infant mortality. The results must be taken with

reservations as these are extremely sensitive indicators of mortality due to under-reporting and misreporting of the stillbirths[17], and even neonatal mortality[18].

Table 2.6 Impact of JSY on Child Mortality

	(1) Fetal	(2) Neonatal	(3) Week	(4) Infant
Panel A: All States				
Eligible x Post JSY	-0.00106*	-0.00039	0.00024	-0.000177
	(0.001)	(0.001)	(0.000)	(0.000)
Mean per 1000	37.5	15.0	9.18	3.06
Observations	271117	270056	268953	268709
R^2	0.00399	0.00613	0.00816	0.00634
Panel B: High Performing States				
Eligible x Post JSY	-0.00254**	-0.00147	-0.00046	-0.000983
	(0.001)	(0.001)	(0.000)	(0.001)
Mean per 1000	35.3	13.2	6.87	3.84
Observations	113740	112403	112063	111988
R^2	0.00352	0.00429	0.00622	0.00506

Notes: The table presents estimates of β_3 from from equation (1). The columns represent fetal mortality (1), neonatal mortality (2), week mortality (3) and infant mortality (4). Eligible is a binary variable that equals one if the woman is eligible for JSY benefits and zero otherwise. Post JSY is a time dummy variable that equals one for the time period after 2005 and zero otherwise. Controls include age, education,wealth, caste and religion of woman, place of residence, education of husband, birth order of children, presence of health worker and ASHA in village, and distance to the nearest health facility. Panel A is based on a sample of 35 states and 595 districts while Panel B is based on 25 states and 292 districts. Robust standard errors are clustered at the district level with significance levels at the 10, 5, and 1 percent.

The results suggest that, on average, the mortality rate for infants born to eligible women is higher than for infants born to the ineligible women. Column (1) suggests that the program significantly reduces the incidence of stillbirths among births to eligible

[17]Stillbirths are fetal deaths in pregnancies lasting seven or more months.

[18]Neonatal or one-day mortality is the death of an infant within 24 hours of birth and could be confused with a reported stillbirth.

women. Post JSY, fetal mortality reduces by 1.06 live births per 1000 pregnancies. This likely follows from the increase in the utilization of institutional delivery. With immediate obstetric care available at the delivery centers, women are less likely to have an unsuccessful delivery and thus, reducing stillbirths.

Columns (2)-(4) provide no evidence of association between JSY and reduction in child mortality for live births. Although the results are statistically insignificant, the confidence intervals around the estimates show a modest effect of JSY on the measures of child mortality. I find that JSY reduces one-month mortality by 0.18 infants per 1000 live births. Although statistically insignificant, the result has economic significance. Given the mean mortality of 3.06 deaths in the first month per 1000 infants surviving the first week, JSY reduces infant mortality by 6 percent. One plausible explanation could be that the overall increase in institutional births is not sufficiently large enough to translate into better child health outcomes (Hulton et al., 2007).

2.4.5 Heterogeneous Impact of JSY

The results in the previous sub-section showed the average effects of the program on various outcomes for the eligible group. However, there are wide in-group differences in characteristics, especially in program exposure, education, wealth and area of residence. I expect heterogeneity in the impact of JSY given these differences. If program targeting is efficient, then the marginalized women within the sample of eligible women should experience relatively larger gains from the program. I estimate impact heterogeneity using

the following specification:

$$\begin{aligned} Y_{idt} =& \beta_0 + \beta_1 Eligible_{id}^{JSY} + \beta_2 Post_t + \beta_3 Characteristic_i + \beta_4 (Post_t \times Eligible_{id}^{JSY}) \\ &+ \beta_5 (Post_t \times Characteristic_i) + \beta_6 (Characteristic_i \times Eligible_{id}^{JSY}) \\ &+ \beta_7 (Characteristic_i \times Eligible_{id}^{JSY} \times Post_t) + \beta_8 X_{idt} + \beta_9 \gamma_d + \beta_{10} \delta_t + \epsilon_{idt} \end{aligned} \tag{2.2}$$

where $Characteristic_i$ represents the indicator dummy for the heterogeneous variable of interest. β_7 measures the intended impact of JSY on a sub-group of eligible women.

Table 2.7 presents results for the impact of JSY on different cohorts of eligible women. Here, the program effects are not characterized as a single effect, but as a distribution of cohort-specific effects. The cohorts represent different age groups women belonged to as of when JSY was introduced with 20-24 years old as the baseline. Thus, the estimates measure the effect of JSY on eligible women of a cohort with respect to those who were aged 20-24 years in 2005.

Column (1) suggests that the program reduced home births for women who were introduced to the program as teens relative to those introduced at 20-24 years of age. These women shifted to public institutional delivery by 1.50 percentage points. As per column (4), the utilization of antenatal care is also the most significant for the same cohort. Since women initiate taking fertility and reproductive decisions as early as their teen years, the program seems effective in altering their decisions to utilize institutional care.

Table 2.8 presents the results for the heterogeneous impact of JSY on choice of place of delivery by tribal composition (1-3), women's education (4-6) and wealth (7-9). The estimates suggest that, post JSY, eligible women living in tribal states are 5.78 percentage

points more likely to deliver at homes as compared other states. The program significantly impacts women's decision to utilize institutional delivery with at least primary education and belonging to non-poor households more over their counterparts. JSY reduced home births for educated women by 2.02 percentage points. However, the program does not help women belonging to poor households; they are 2.78 percentage points more likely to deliver at homes after the implementation of JSY as compared to relatively richer households.

The results provide evidence of JSY disproportionately impacting to the targeted groups. The program fails to impact the poorest women population. The financial constraints for using formal care are strictest for poorer women and thus, the price reduction provided by the cash incentives under JSY would not enough to alter their decisions. This suggests that additional financial assistance could be the key to see an increase in the demand for institutional care by the most vulnerable groups.

Table 2.7 Cohort Effects of JSY on Outcomes

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Place of Delivery			Antenatal Care			Postnatal Care		
	Home	Govt	Private	Any ANC	Visits	Timing	PNC	BF	Imz
Eligible	-0.0101*	0.0648***	-0.0539***	0.0307***	0.00876*	-0.0151**	-0.00724	0.00738	0.00670
	(0.00421)	(0.00432)	(0.00368)	(0.00342)	(0.00432)	(0.00461)	(0.00446)	(0.00472)	(0.00388)
Eligible x Very Low	0.0192***	-0.0303***	0.0122**	-0.0524***	-0.00255	-0.00189	0.0123*	-0.0376***	-0.0425***
	(0.00532)	(0.00526)	(0.00451)	(0.00494)	(0.00565)	(0.00580)	(0.00548)	(0.00602)	(0.00500)
Eligible x Low	0.00787	-0.0161***	0.00726	-0.0164***	0.00170	0.00324	0.00840	-0.0259***	-0.0135**
	(0.00473)	(0.00475)	(0.00421)	(0.00399)	(0.00491)	(0.00520)	(0.00495)	(0.00530)	(0.00431)
Eligible x High	-0.0199***	0.0150*	0.00382	0.0166***	0.00582	0.0108	-0.0110	0.0197**	0.00939
	(0.00555)	(0.00583)	(0.00518)	(0.00432)	(0.00564)	(0.00612)	(0.00606)	(0.00627)	(0.00525)
Eligible x Very High	-0.00679	-0.0307	0.0325*	0.00283	-0.00733	-0.00182	-0.0192	-0.0289	0.0156
	(0.0157)	(0.0176)	(0.0142)	(0.0120)	(0.0165)	(0.0177)	(0.0178)	(0.0180)	(0.0152)
Mean	0.612	0.229	0.152	0.719	0.441	0.620	0.322	0.377	0.710
Observations	240446	240446	240446	240415	233045	244797	232978	239071	239631
R^2	0.332	0.187	0.239	0.237	0.315	0.212	0.267	0.220	0.187

Notes: The table presents estimates from equation (2). The columns represent places of delivery (1-3), antenatal care (4-6) and postnatal care (7-9). Eligible is a binary variable that equals one if the woman is eligible for JSY benefits and zero otherwise. The different cohorts include: Very low exposure (30 years or more when JSY launched), low (25-29 years), mid (20-24 years), high (15-19 years) and very high (less than 14 years). Controls include age, education,wealth, caste and religion of woman, place of residence, education of husband, birth order of children, presence of health worker and ASHA in village, and distance to the nearest health facility. District and time fixed effects are included. Robust standard errors are clustered at the district level with significance levels at the 10, 5, and 1 percent.

Table 2.8 Heterogeneous Impact of JSY on Place of Delivery

	(1) Home	(2) Govt	(3) Pvt	(4) Home	(5) Govt	(6) Pvt	(7) Home	(8) Govt	(9) Pvt
Eligible	0.00200	0.0350***	-0.0368***	-0.0161**	0.0169***	-0.000895	0.0213***	0.0464***	-0.0667***
	(0.004)	(0.004)	(0.003)	(0.005)	(0.005)	(0.004)	(0.005)	(0.004)	(0.004)
Eligible x Post JSY	-0.0177***	0.0385***	-0.0196***	-0.00771	0.0307***	-0.0203***	-0.0334***	0.0324***	0.00127
	(0.004)	(0.004)	(0.004)	(0.006)	(0.005)	(0.004)	(0.005)	(0.005)	(0.004)
Eligible x Post JSY x Tribal	0.0578***	-0.0660***	0.00451						
	(0.015)	(0.015)	(0.007)						
Eligible x Post JSY x Primary Educ				-0.0202**	0.0113	0.00663			
				(0.007)	(0.007)	(0.006)			
Eligible x Post JSY x Poor							0.0278***	-0.00735	-0.0193**
							(0.008)	(0.008)	(0.006)
Mean	0.612	0.229	0.152	0.612	0.229	0.152	0.612	0.228	0.152
N	277126	277126	277126	277126	277126	277126	276950	276950	276950
R^2	0.327	0.183	0.237	0.327	0.183	0.238	0.327	0.183	0.238

Notes: The table presents estimates from equation (2). The columns represent heterogeneous estimates of impact of JSY on place of delivery on different characteristics. Eligible is a binary variable that equals one if the woman is eligible for JSY benefits and zero, otherwise. Post JSY is an indicator dummy for the implementation of JSY. *Tribal* is a dummy for states with mostly tribal population (more than 60 percent is tribal), *Primary Educ* is a dummy for women with more than primary education (more than grade 5), and *Poor* is a dummy for women living below the poverty line. Controls include age, education,wealth, caste and religion of woman, place of residence, education of husband, birth order of children, presence of health worker and ASHA in village, and distance to the nearest health facility. District and time fixed effects are included. Robust standard errors are clustered at the district level with significance levels at the 10, 5, and 1 percent.

CHAPTER 3

Universal Maternal Program and Maternal and Child Healthcare

In this chapter, I study the effects of an universal maternal healthcare program on women's healthcare utilization and child mortality.

3.1 Introduction

Given the high out of pocket expenses for utilizing maternal care services, the government of India launched *Janani Shishu Suraksha Karyakaram* (JSSK) in 2011 as an initiative to ensure better care to pregnant women and children. JSSK provides free services to all pregnant women including normal deliveries and cesarean operations in public health institutions. Further, the program extends the free health services to sick newborns (up to 30 days after birth) in both rural and urban areas (Table A4). JSSK aims to motivate women with financial constraints to access health services and is estimated to benefit more than 12 million pregnant women (MoHFW, 2015).

The program has yet to be studied in its full capacity as the existing papers only look at the local-level impact of JSSK on the utilization of services. The two studies (Tyagi et al., 2016; Salve et al., 2017) use interviews with mothers in public hospitals and record reviews at local institutions to estimate the impact of JSSK on institutional delivery. Since these are merely observational studies at a local level, the results cannot be used as evidence for the evaluation of the program. Tripathi et al. (2014) assessed the impact of JSSK on OOP expenditure during the perinatal period in Chandigarh and found that

expenditures for delivery decreased. However, there was no significant difference in catastrophic health expenditures. My paper would be the first to use JSSK as a quasi-experiment to study the impact of maternal healthcare programs on the utilization of services.

3.2 Data

To study the effects of JSSK on women's healthcare decisions, I use data from the following two sources: District Level Household Survey (DLHS) and the District Census Handbook (DCH). DLHS is a household survey conducted by the Government of India and covers over 600 districts in India. The total number of households representing a district varies from 1000 to 1500 households per wave. The DLHS provides comprehensive information on family planning, maternal and child health, reproductive health of ever-married women and adolescent girls, utilization of maternal and child healthcare services. In addition, it also provides information on newborn care, post-natal care within 48 hours, role of ASHAs in enhancing the reproductive and child health care and coverage of JSY. We use three waves of DLHS data-II (2002-03), III (2008-09) and IV (2012-13). Since DLHS-IV only reports data for the high performing states, I restrict my analysis to these states.

The District Census Handbook (DCH) is a publication of the Census Organization, and it contains data on urban and rural areas for each district. It provides information on demographic and socio-economic characteristics of population at the lowest administrative unit i.e. of each village and town of the district. DCH contains information on various

infrastructure facilities available in the village and town including education, medical resources, drinking water, communication and transport, electricity, banking, and other miscellaneous facilities. We use data on health infrastructure from DCH.

From the above data sources, I create a pooled cross-sectional database of all married women who have had at least one pregnancy for the time period 1999-2013.I restrict the data to the most recent birth of each woman. It is important to note that JSY was not discontinued after the implementation of JSSK and thus, women received benefits under both programs simultaneously after 2011. This meant that in post JSSK-regime, JSY-eligible women received free maternal care under JSSK, plus a cash transfer under JSY for utilizing public institutional delivery and JSY-ineligible women received free maternal care services only. Given the timing of the programs, we restrict our sample till 2010 for the estimation of the impact of JSY. For the estimation of the added impact of the introduction of JSSK over JSY conditional cash benefits on the utilization of healthcare services, we use our full timeline from 1999 to 2013. However, post 2011, data is only available for the high performing states. Thus, unlike JSY, our analysis for JSSK which was implemented in 2011, is restricted to HP states.

My main utilization outcome is whether the woman gave birth in a health facility which is calculated using the information on the place of delivery from the woman's record of most recent birth. I also analyze the impact of the program's on different types of health institution (private or public) and attendance of a health worker during delivery. My other utilization outcomes of interest are antenatal and postnatal check-up of the mother and child, immediate breastfeeding by the mother and immunization.

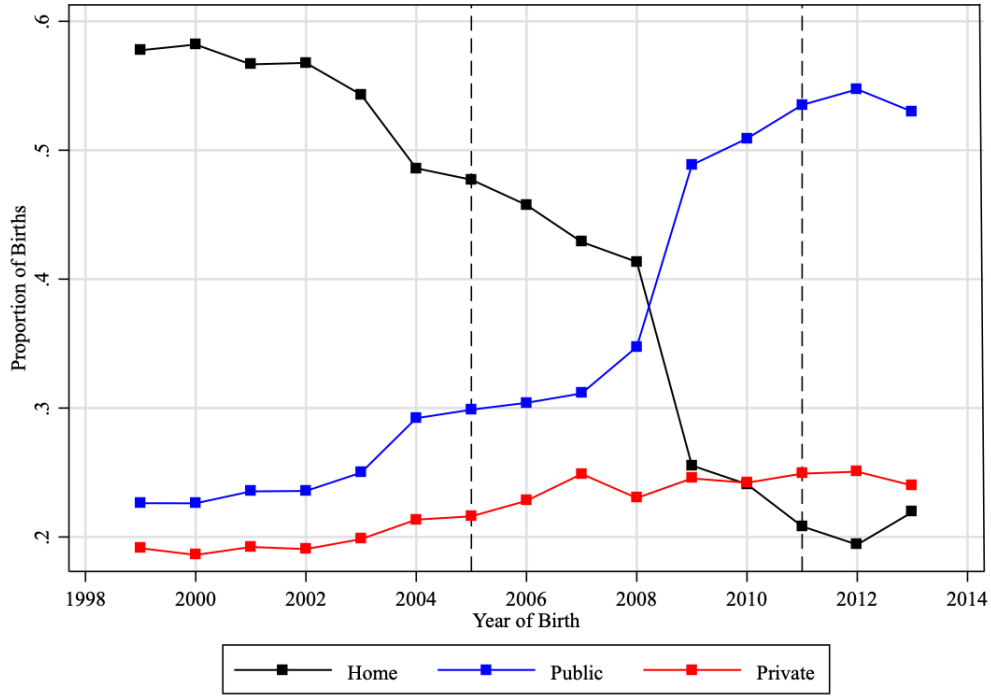
My main health outcome is child mortality. To measure this, I use four different variations: fetal mortality, neonatal mortality, perinatal mortality and infant mortality. Fetal mortality is the number of deaths within 28 weeks of gestation per 1000 pregnancies and perinatal mortality is the number of deaths within 28 weeks of gestation or first month of birth per 1000 pregnancies. Neonatal mortality measures the number of deaths within the first month of birth per 1000 live births while infant mortality measures the number of deaths within the first year of birth given the infant survives the first month of birth[1]. I will not estimate the impact of the programs on maternal mortality rates. Although I believe that it is very important to study whether a change in institutional delivery reduces the incidence of mortality among women, the lack of data on maternal deaths limits our research in this regard. The changes in the choice of place of delivery over time is shown in Figure 3.1. The summary statistics are presented in Table 3.2.

3.3 Methodology

JSSK was rolled out across the country simultaneously and had no eligibility conditions. Thus, there is a lack of variability to estimate the program's impact on the utilization of healthcare services. In this paper, I can only estimate the additional impact of JSY in the presence of universal maternal healthcare under JSSK. The idea is that with only JSY benefits available to the eligible women before 2011, the cash transfers under JSY had a price reduction effect on the utilization of healthcare services and were used to cover some

[1]Since there are definitional variations in the concepts of stillbirths and one-day mortality which the mothers may not be aware of, we take the responses of women at face value and calculate our estimates. This suggests that the results must be interpreted with caution

Figure 3.1 Choices of Place of Delivery for High Performing States



Source: Dataset compiled using DLHS II, III and IV. Notes: The dotted line represents the implementation of JSY in 2005 and JSSK in 2011.

of the delivery costs. However, with the implementation of JSSK, JSY-eligible women now have access to free care and an additional income equivalent to the cash transfer amount. Since the same cash transfer has a differential impact on the eligible women, I expect differences in the impact of JSY with and without JSSK.

We use a similar estimation strategy as before and use the data from high-performing states between 2000 and 2013. Using the following, I estimate the additional impact of free maternal healthcare services over a conditional cash transfer on the utilization of services and health outcomes.

Table 3.1 Summary Statistics for High Performing States (1999-2013)

	Not Eligible	**JSY Eligible**	**Total**
		Controls	
Woman's Age	26.904	24.314	25.955
Wealth Index	0.508	0.429	0.479
Poor	0.288	0.572	0.392
Caste- SC	0.106	0.378	0.206
Caste-ST	0.192	0.397	0.267
Religion- Hindu	0.663	0.648	0.657
No Education	0.322	0.298	0.313
Village- ASHA	0.334	0.419	0.365
		Outcomes	
Delivery at Public Institution	0.304	0.422	0.347
Delivery at Home	0.433	0.398	0.420
Skilled Health Professional	0.775	0.785	0.779
Neonatal Death	0	0	0
Fetal Death	0	0	0
Any Antenatal Care	0.836	0.848	0.840
Breastfeeding within Hour	0.501	0.536	0.514
Observations	**105,288**	**61,010**	**166,298**

Notes: The sample consists of only 25 states from three rounds of the DLHS
* Fetal Death Rate is the number of deaths within the gestation period per 1000 pregnancies.
** Neonatal mortality is the number of deaths within the first month of birth per 1000 live births.
Antenatal care includes checkup during pregnancy, tetanus injections and intake of iron.
The full forms include: SC/ST - Scheduled Caste/ Scheduled Tribe, ASHA - Accredited Social Health Activists.

$$Outcome_{idt} = \alpha_0 + \alpha_1 Eligible_{id}^{JSY} + \alpha_2 Post_t^{JSY} + \alpha_3 Post_t^{JSY} * Eligible_{id}^{JSY} + \alpha_4 Post_t^{JSSK} + \alpha_5 Post_t^{JSSK} * Eligible_{id}^{JSY} + \alpha_6 X_{idt} + \alpha_7 \gamma_d + \alpha_8 \delta_t + \epsilon_{idt} \quad (3.1)$$

where $Post_t^{JSSK}$ represent a dummy for time after the implementation of JSSK in 2011. α_4 estimates the overall change in the outcome after JSSK was implemented in 2011.

The coefficient of interest, α_5, estimates the change in the outcome for individuals who now get free maternal healthcare and were already eligible for JSY cash benefits. We use the same set of controls along with district and time fixed effects as used for equation (1).

3.4 Results

3.4.1 Choice of Place of Delivery

After the implementation of JSSK in 2011, all services related to maternal health care were available free of cost to pregnant women at public health institutions. The results from specification (2) for the choice of place of delivery are provided in Table 3.4. From column (1), I find that, unlike JSY, JSSK significantly increases the utilization of institutional delivery in HP states. The results show a 9.6 percent decrease in home births for JSY eligible women after the implementation of JSSK. The decline can be attributed to the free delivery services provided under JSSK along with the cash receipts under JSY. From the estimates on JSY, I find that the JSY exclusively fails to reduce home births in HP states due to two potential reasons. One being the low cash incentive of the program and the other being traditions and customs. However, with JSSK which provides services free of cost, I find a significant impact on the movement of women towards institutional delivery. The low amount of money under JSY in HP states could be the main reason for the cash incentive program's failure in HP states. Another important feature of the results is that the increase in the use of institutional care from JSSK in HP states is greater in magnitude than the increase by JSY in the whole country.

Table 3.2 Impact of JSY and JSSK on Choice of Place of Delivery

	(1) Home	(2) Govt	(3) Pvt	(4) Doc
Eligible	0.0140**	0.0160**	-0.0304***	-0.0139**
	(0.00533)	(0.00588)	(0.00503)	(0.00533)
Eligible* Post JSY	-0.00133	-0.00149	0.00325	-0.00271
	(0.00501)	(0.00522)	(0.00446)	(0.00503)
Eligible* Post JSSK	-0.0410***	0.0289***	0.0121*	0.0435***
	(0.00526)	(0.00682)	(0.00576)	(0.00518)
Mean	0.426	0.345	0.224	0.599
Observations	145640	145640	145640	144703
R^2	0.342	0.174	0.251	0.332

Notes: The coefficients are reported from specification (2). The columns represent birth at home (1), birth at public health institution (2), birth at private health institution (3) and presence of health professional at birth (4). Eligible is a binary variable that equals one if the woman is eligible for JSY benefits and zero otherwise. Post JSY is a time dummy variable that equals one for the time period after 2005 and zero otherwise. Controls include the characters tics of the woman, household and village. We include age, education,wealth, caste and religion of woman, place of residence, education of husband, birth order of children, presence of health worker and ASHA in village, and distance to the nearest health facility. District and time fixed effects are included.Panel A is based on a sample of 25 states and 301 districts. Robust standard errors are clustered at the district level with significance levels at the 10, 5, and 1 percent.

The decline in home births is accompanied by an increase in the use of public and private institutional delivery. While I estimate an overall increase of 8 percent in the use of public health institutions for delivery care, private facilities also witness an increase of 5 percent at the same time. The increase in the use of private healthcare services after JSSK is due to wealthier women shifting away from public facilities after an increased demand for public healthcare services. In other words, the now crowded government hospitals and other institutions could result in some women moving away to other types of formal care institutions, thereby increasing the use of private care.

3.4.2 Child Mortality

The estimates of the impact of the two programs on child mortality are given in Table 3.3. The results from column (1) suggest that JSY reduced the probability of fetal deaths by 0.85 pp in the HP states. However, I do not find any significant impact of JSSK on fetal mortality. The results are similar for other measures of child mortality. Given that the delivery care services under JSSK are free and I find a significant increase in the uptake of institutional delivery, the null results are surprising.

Table 3.3 Impact of JSY and JSSK on Child Mortality

	(1) Fetal	(2) Neonatal	(3) Perinatal	(4) Infant
Eligible	0.00407* (0.00187)	0.00235 (0.00128)	0.00629** (0.00223)	0.000449 (0.000355)
Eligible* Post JSY	-0.00850*** (0.00180)	-0.00148 (0.00125)	-0.00966*** (0.00214)	-0.000353 (0.000322)
Eligible* Post JSSK	-0.000335 (0.00243)	-0.000938 (0.00145)	-0.00139 (0.00277)	-0.000112 (0.000213)
Mean	0.029	0.011	0.039	0.001
Observations	149818	145881	149818	145936
R^2	0.032	0.029	0.043	0.017

Notes: The coefficients are reported from specification (2). The columns represent fetal mortality (1), neonatal mortality (2), perinatal mortality (3) and infant mortality (4). Eligible is a binary variable that equals one if the woman is eligible for JSY benefits and zero otherwise. Post JSY is a time dummy variable that equals one for the time period after 2005 and zero otherwise. Controls include the characters tics of the woman, household and village. We include age, education,wealth, caste and religion of woman, place of residence, education of husband, birth order of children, presence of health worker and ASHA in village, and distance to the nearest health facility. District and time fixed effects are included. Panel A is based on a sample of 25 states and 301 districts. Robust standard errors are clustered at the district level with significance levels at the 10, 5, and 1 percent.

3.4.3 Antenatal Care

The results for the impact of JSY and JSSK on ANC are given in Table 3.4. The implementation of JSSK significantly increases the use of any ANC compared to JSY. The increase in the use of care results from the incentive of free drugs and consumables provided at public health institutions during the gestation period with JSSK. JSY does not provide any financial incentive for the use of ANC services. I estimate that the utilization of any ANC service increases by 3.22 pp and the use of recommended care increases by 4.06 pp after the implementation of JSSK. Further, the program induces 9 percent more women to go for ANC checkups in the first trimester of their pregnancy. The use of ANC is indicative of better continuum of care for mothers and their newborns. I expect these results to indirectly impact maternal and child mortality as well.

3.4.4 Postnatal Care

Table 3.5 presents the results for the impact of the two programs on utilization of postnatal services. I find that the free services provided under JSSK increase the utilization of all postnatal services. Following from the results on the use of institutional delivery, I estimate that, unlike JSY, JSSK increases the probability of newborns receiving their first checkup within the first 48 hours of birth. The reason for the increase is the use of institutional delivery in HP states which makes the checkup of newborns very likely during the mother's stay in the hospital. Further, with JSSK, there are no costs associated with newborns' examinations at the facility and thus, the null financial cost of checkups also increases the

Table 3.4 Impact of JSY and JSSK on Antenatal Care

	(1) Any Antenatal Care	(2) At least Three Visits	(3) Iron Supplements	(4) Visit in 1st Trimester	(5) Rec ANC
Eligible	-0.0117***	-0.0377***	-0.00614	-0.0643***	-0.0344***
	(0.00350)	(0.00533)	(0.00475)	(0.00590)	(0.00575)
Eligible* Post JSY	0.00462	0.0150**	0.0317***	0.0298***	0.00936
	(0.00368)	(0.00512)	(0.00460)	(0.00551)	(0.00539)
Eligible* Post JSSK	0.0322***	0.0202***	-0.00617	0.0459***	0.0406***
	(0.00458)	(0.00613)	(0.00607)	(0.00666)	(0.00656)
Mean	0.837	0.633	0.760	0.508	0.534
Observations	146894	144689	137446	149832	146964
R^2	0.227	0.230	0.170	0.158	0.202

Notes: The coefficients are reported from specification (2). The columns represent fetal any antenatal care received during pregnancy (1), going for at least three ANC visits (2), taking at least 100 iron tablets or supplements during pregnancy (3), visiting the doctor in the first trimester (4) and receiving recommended ANC (5). Eligible is a binary variable that equals one if the woman is eligible for JSY benefits and zero otherwise. Post JSY is a time dummy variable that equals one for the time period after 2005 and zero otherwise. Controls include the characters tics of the woman, household and village. We include age, education,wealth, caste and religion of woman, place of residence, education of husband, birth order of children, presence of health worker and ASHA in village, and distance to the nearest health facility. District and time fixed effects are included. Panel A is based on a sample of 25 states and 301 districts. Robust standard errors are clustered at the district level with significance levels at the 10, 5, and 1 percent.

incidence of postnatal care of infants.

From column (2), I find an 8 percent (or 3.84 pp) increase in the probability of women seeking postpartum care within the first 14 days of giving birth. My analysis in the previous section suggested that JSY reduced the incidence of women returning to the health facility for a checkup. Instead, they substituted their postpartum checkup with the care received during their stay at the hospital for delivery. JSY only covers some portion of delivery costs and provides no incentive to women to return for follow-ups at the hospital. With the introduction of JSSK, postpartum checkups are provided free of cost which

reduces the effective price of PNC services to zero. With no associated financial costs for checkups, women tend to visit the doctor for a postpartum checkup.

Table 3.5 Impact of JSY and JSSK on Postnatal Care

	(1) PNC-Child	(2) PNC-Mother	(3) Breastfeeding	(4) Immunization
Eligible	0.0105	0.0654***	0.0226***	-0.00837
	(0.00995)	(0.00569)	(0.00616)	(0.00439)
Eligible* Post JSY	-0.00976	-0.104***	-0.00929	-0.00459
	(0.00917)	(0.00535)	(0.00575)	(0.00431)
Eligible* Post JSSK	0.0265***	0.0384***	0.0173*	0.0351***
	(0.00646)	(0.00646)	(0.00697)	(0.00555)
Mean	0.637	0.482	0.515	0.820
Observations	106084	138555	144944	145881
R^2	0.237	0.281	0.123	0.163

Notes: The coefficients are reported from specification (2). The columns represent checkup of child within first 48 hours (1), checkup of woman within first 14 days (2), breastfeeding within first hour of birth (3) and immunization of child (4). Eligible is a binary variable that equals one if the woman is eligible for JSY benefits and zero otherwise. Post JSY is a time dummy variable that equals one for the time period after 2005 and zero otherwise. Controls include the characteristics of the woman, household and village. We include age, education,wealth, caste and religion of woman, place of residence, education of husband, birth order of children, presence of health worker and ASHA in village, and distance to the nearest health facility. District and time fixed effects are included. Panel A is based on a sample of 25 states and 301 districts. Robust standard errors are clustered at the district level with significance levels at the 10, 5, and 1 percent.

3.4.5 Heterogeneous Impact of JSY and JSSK

For JSSK, the heterogeneity estimation is given by a similar specification as JSY and the results are presented in Table 3.6 and 3.7.

$$\begin{aligned} Outcome_{idt} =& \beta_0 + \beta_1 Eligible_{id}^{JSY} + \beta_2 Post_t + \beta_3 Characteristic_i + \beta_4 Post_t * Eligible_{id}^{JSY} \\ &+ \beta_5 Post_t * Characteristic_i + \beta_6 Characteristic_i * Eligible_{id}^{JSY} \\ &+ \beta_7 Characteristic_i * Eligible_{id}^{JSY} * Post_t + \beta_8 Post_t^{JSSK} \\ &+ \beta_9 Post_t^{JSSK} * Eligible_{id}^{JSY} + \beta_{10} Post_t^{JSSK} * Characteristic_i \\ &+ \beta_{11} Characteristic_i * Eligible_{id}^{JSY} * Post_t^{JSSK} \\ &+ \beta_{12} X_{idt} + \beta_{13} \gamma_d + \beta_{14} \delta_t + \epsilon_{idt} \end{aligned} \tag{3.2}$$

The significantly negative estimates, β_{10}, for the interaction effect of women's education and wealth with JSSK suggest that the impact of free services under JSSK on JSY non-eligible women was greater for more-educated and poor women. This indicates that the probability of home births reduced by 9.18 pp for women with more than primary education and by 7 pp for women in the bottom two wealth percentiles. I do not find any significant heterogeneity in the impact of JSSK on JSY eligible women except for their choice to utilize private institutional delivery. The results from Table 3.7 show that poorer eligible women reduced the use of private delivery care by 3.26 pp after the implementation of JSSK. The results also show that the JSSK had no significant heterogeneous impact on the child mortality measures.

Table 3.6 Heterogeneous Impact of JSY and JSSK on Outcomes by Education

	(1) Home	(2) Govt	(3) Pvt	(4) Doc	(5) Fetal	(6) Neonatal	(7) Perinatal	(8) Infant
Eligible* Post JSY	0.0342***	-0.00946	-0.0247***	-0.0332***	-0.00340	-0.00564*	-0.00872*	0.000233
	(0.00888)	(0.00819)	(0.00674)	(0.00909)	(0.00296)	(0.00246)	(0.00375)	(0.000520)
Eligible* Post JSSK	-0.0221	0.00501	0.0172	0.0191	-0.000966	0.00409	0.00299	-0.000421
	(0.0119)	(0.0131)	(0.00942)	(0.0119)	(0.00448)	(0.00316)	(0.00535)	(0.000320)
Education	-0.145***	0.0429***	0.102***	0.140***	-0.00249	-0.00305*	-0.00535*	-0.000476
	(0.00650)	(0.00604)	(0.00575)	(0.00660)	(0.00189)	(0.00140)	(0.00234)	(0.000358)
Eligible* Education	0.0378***	0.0589***	-0.0972***	-0.0312***	-0.000123	-0.000286	-0.000341	0.000162
	(0.00827)	(0.00782)	(0.00671)	(0.00844)	(0.00238)	(0.00175)	(0.00293)	(0.000479)
Post JSY* Education	0.0220**	-0.0302***	0.00806	-0.0203*	0.00789**	-0.00261	0.00502	0.000999*
	(0.00829)	(0.00803)	(0.00741)	(0.00839)	(0.00290)	(0.00227)	(0.00359)	(0.000475)
Eligible* Post JSY* Education	-0.0374***	0.0282**	0.00974	0.0305**	-0.00427	0.00685*	0.00249	-0.000601
	(0.0108)	(0.0106)	(0.00886)	(0.0109)	(0.00368)	(0.00284)	(0.00454)	(0.000609)
Post JSSK* Education	0.0918***	-0.0651***	-0.0265**	-0.101***	-0.000500	0.00545	0.00499	-0.000447
	(0.0108)	(0.0127)	(0.0100)	(0.0107)	(0.00443)	(0.00293)	(0.00518)	(0.000321)
Eligible* Post JSSK* Education	-0.0228	0.00672	0.0160	0.0283*	-0.0000331	-0.00749*	-0.00746	0.000358
	(0.0132)	(0.0154)	(0.0117)	(0.0131)	(0.00530)	(0.00356)	(0.00624)	(0.000406)
Observations	145630	145630	145630	144693	149818	145881	149818	145936
R^2	0.345	0.177	0.262	0.336	0.032	0.029	0.043	0.017

Notes: The coefficients are reported from specification (4). Eligible is a binary variable that equals one if the woman is eligible for JSY benefits and zero otherwise. Post JSY is a time dummy variable that equals one for the time period after 2005 and zero otherwise. Post JSSK is a time dummy variable that equals one for the time period after 2011 and zero otherwise. Controls include the characteristics of the woman, household and village. We include age, education,wealth, caste and religion of woman, place of residence, education of husband, birth order of children, presence of health worker and ASHA in village, and distance to the nearest health facility. District and time fixed effects are included. Robust standard errors are clustered at the district level with significance levels at the 10, 5, and 1 percent.

Table 3.7 Heterogeneous Impact of JSY and JSSK on Outcomes by Wealth

	(1) Home	(2) Govt	(3) Pvt	(4) Doc	(5) Fetal	(6) Neonatal	(7) Perinatal	(8) Infant
Eligible* Post JSY	-0.00414	0.0240***	-0.0197***	-0.000918	-0.00778***	0.000621	-0.00693**	0.000133
	(0.00544)	(0.00576)	(0.00489)	(0.00545)	(0.00197)	(0.00139)	(0.00235)	(0.000367)
Eligible* Post JSSK	-0.0438***	0.0229**	0.0210**	0.0465***	-0.00119	-0.00176	-0.00303	-0.000332
	(0.00569)	(0.00764)	(0.00663)	(0.00558)	(0.00273)	(0.00163)	(0.00311)	(0.000265)
Wealth	0.268***	0.00489	-0.273***	-0.259***	0.0290***	0.00909*	0.0369***	0.00296*
	(0.0158)	(0.0150)	(0.0111)	(0.0167)	(0.00538)	(0.00372)	(0.00647)	(0.00127)
Eligible* Wealth	-0.0559***	-0.00686	0.0608***	0.0373*	-0.00206	0.00369	0.00161	0.000166
	(0.0170)	(0.0158)	(0.0109)	(0.0179)	(0.00560)	(0.00389)	(0.00677)	(0.00144)
Post JSY* Wealth	0.00618	0.0444**	-0.0504***	-0.0114	-0.0187**	-0.00341	-0.0211**	-0.00256
	(0.0170)	(0.0161)	(0.0113)	(0.0179)	(0.00574)	(0.00435)	(0.00711)	(0.00135)
Eligible* Post JSY* Wealth	0.0718***	-0.0830***	0.0132	-0.0535**	0.0123	-0.00916	0.00301	-0.000583
	(0.0195)	(0.0186)	(0.0127)	(0.0203)	(0.00662)	(0.00495)	(0.00815)	(0.00154)
Post JSSK* Wealth	-0.0691***	0.00680	0.0623***	0.0800***	0.000493	-0.000971	-0.000829	0.000186
	(0.0137)	(0.0156)	(0.0110)	(0.0136)	(0.00505)	(0.00377)	(0.00616)	(0.000425)
Eligible* Post JSSK* Wealth	0.0200	0.0126	-0.0326**	-0.0277	-0.00224	0.00347	0.00140	0.000450
	(0.0159)	(0.0179)	(0.0124)	(0.0159)	(0.00596)	(0.00436)	(0.00723)	(0.000474)
Observations	145630	145630	145630	144693	149818	145881	149818	145936
R^2	0.347	0.177	0.265	0.338	0.032	0.030	0.044	0.018

Notes: Eligible is a binary variable that equals one if the woman is eligible for JSY benefits and zero otherwise. Post JSY is a time dummy variable that equals one for the time period after 2005 and zero otherwise. Post JSSK is a time dummy variable that equals one for the time period after 2011 and zero otherwise. We include age, education,wealth, caste and religion of woman, place of residence, education of husband, birth order of children, presence of health worker and ASHA in village, and distance to the nearest health facility. District and time fixed effects are included. Robust standard errors are clustered at the district level with significance levels at the 10, 5, and 1 percent.

CHAPTER 4

Maternal Healthcare Programs and Fertility Choices

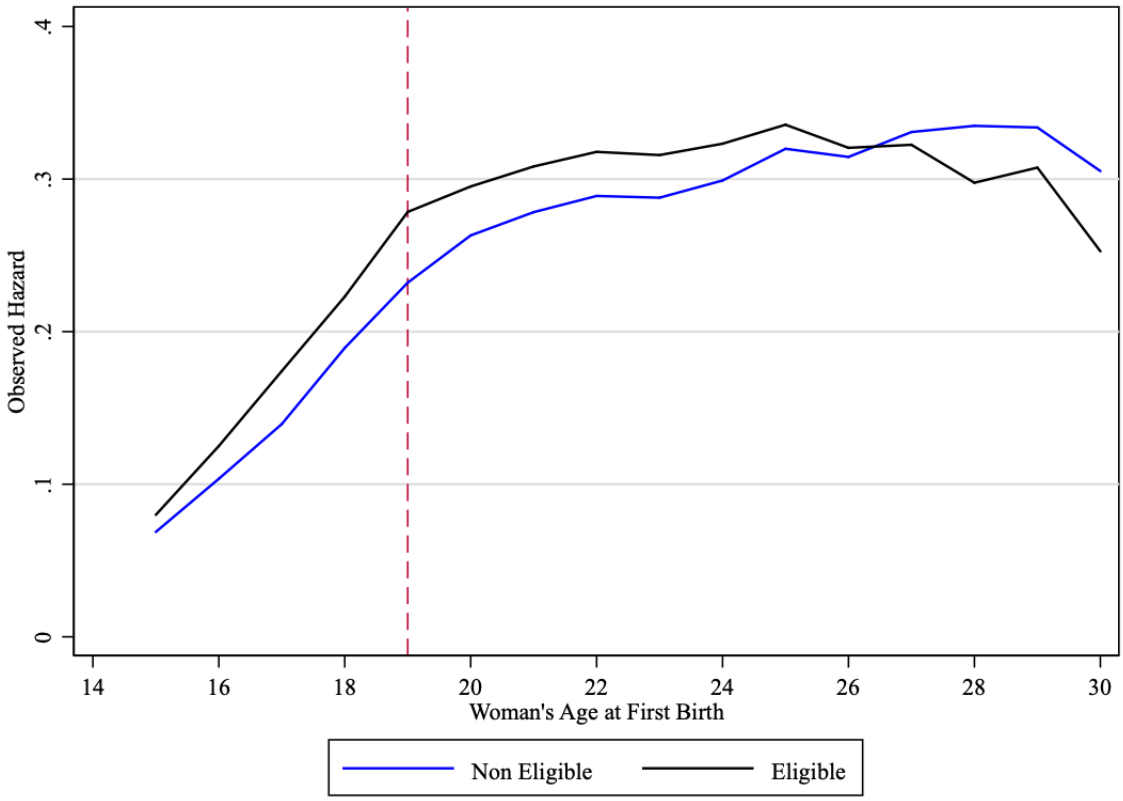
4.1 JSY and Fertility Choices

In this chapter, I study the impact of the eligibility criteria for cash transfers under JSY on woman's pregnancy timing. As per the guidelines, all pregnant women delivering in a public health institution are eligible for cash benefits in the LP states. In HP states, poor women who are at least 19 years old or belonging to SC/ST caste with at most two live births are eligible for cash transfers. The eligibility criteria incentivizes women to increase their age at first birth and reduce the overall fertility rate. Since the cash benefits are available to women above 19 years of age, I expect the program to discourage early-age childbirths and postpone pregnancies.

Early age childbirths have significant biological effects on adolescent mothers and their infants and endanger their health (Gibbs et al., 2012; Fall et al., 2015; Yu et al., 2016). In India, pregnancy-related complications are the biggest contributors of mortality for girls between the ages of 15 and 19 (Nove et al., 2014; WHO et al., 2019). Women who have children in their early reproductive years tend to have higher fertility rates as well. Since fertility choices and pregnancy timings are critical to women's health, evaluation of JSY on these outcomes becomes more relevant.

Most Indian women marry by the age of 19. Further, they have their first pregnancy with in the first year of marriage with the median age of 19.6 years. More than two-thirds of women aged 15–49 years have their first child before the age of 21. There are significant

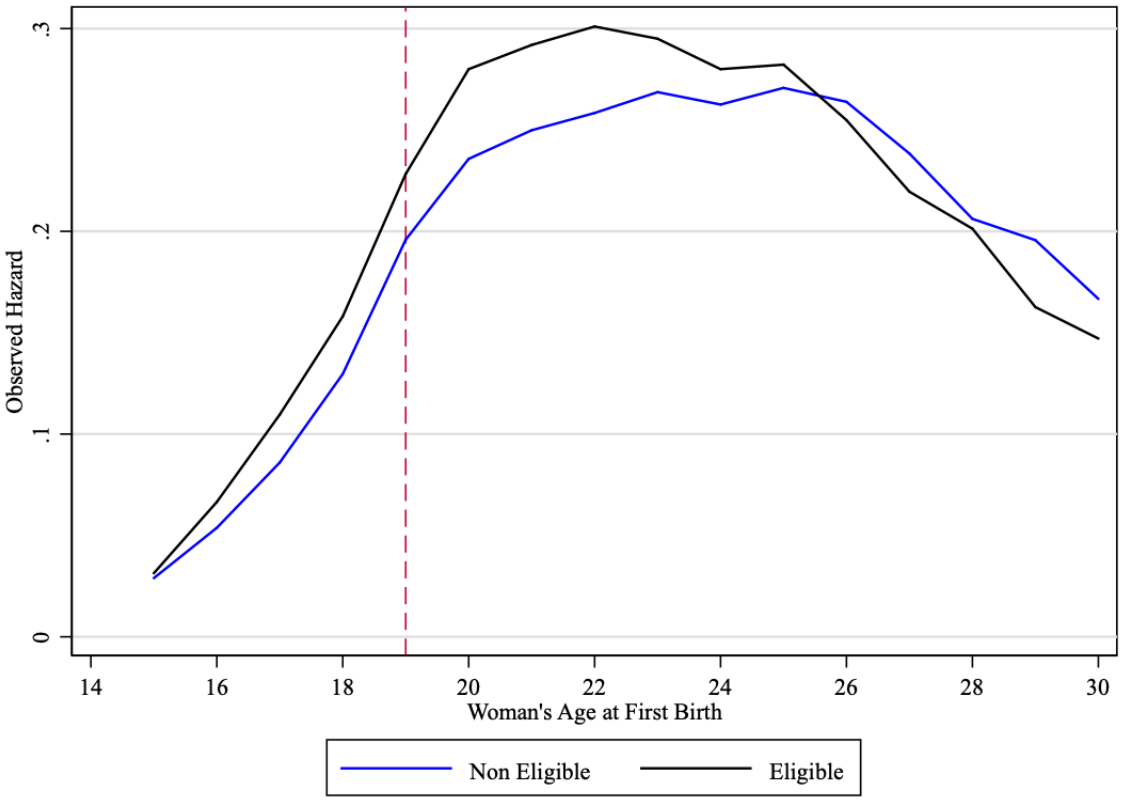
Figure 4.1 Observed Birth Hazard (Pre-JSY (1999-2004))



Notes: The hazard curve shows the observed proportion of eligible women — among those who have not reported earlier child birth — who report a first birth at each age period before (a) and after (b) the program was implemented. The figure uses data from DLHS between 1999-2010.

differences in these statistics by women's wealth and education. For example, there is a 3-year difference in the age at first birth between women with no education (18.4 years) and those with more than 12 years of education (21.4 years). Over their reproductive ages, women in India tend to have an average of 2.9 children. Unlike the age at first birth, there are no significant differences in fertility rates by wealth status or education.

Figure 4.2 Observed Birth Hazard (Post-JSY (2005-2010))



Notes: The hazard curve shows the observed proportion of eligible women — among those who have not reported earlier child birth — who report a first birth at each age period before (a) and after (b) the program was implemented. The figure uses data from DLHS between 1999-2010.

Figure 4.1 shows the pre-reform empirical hazard of giving birth at different ages at the baseline and depicts age-time periods with the least and the highest risk of having a first birth. The curve has an inverted-U shape indicating a non-constant probability of first birth at different ages. The observed hazard of a first birth for eligible women shows a steep rise after the age of 15 years up to 19 years, and followed by a constant rate for another six years. The hazard tails off after a steep decline from 25 years onward. After

the implementation of JSY, as shown in Figure 4.2, the probability of giving birth for the eligible population shifts by another year at the peak. Post the implementation of JSY, around 27 percent of eligible women, who have not already given birth, report their first birth at the age of 20.

4.2 Methodology

First, I estimate the impact of JSY on women's first birth timing. For the analysis, I do not use the same concept of JSY eligibility as previously used in the paper. These eligibility rules, by themselves, have a component of age at first birth, built into them. Therefore, I use the concept of *potential eligibility*[1] for estimating the impact of JSY on woman's age at first birth. Thus, potentially, women who live below the poverty line or belong to SC/ ST communities are eligible for JSY cash benefits, given that she has her first child after the age of 19. The simple OLS estimation equation is given by the following:

$$\begin{aligned} Y_i =& \beta_1 + \beta_2 PotentialEligible_i^{JSY} + \beta_3 PostJSY_t \\ &+ \beta_4 (PotentialEligible_i^{JSY} \times PostJSY_t) + \beta_5 X_{ivdt} \\ &+ \gamma_d + \gamma_t + \epsilon_{ivdt} \end{aligned} \tag{4.1}$$

where Y_i is the outcome dummy variable that equals one if woman $i's$ age at first birth is at least 19 years. β_4 measures the impact of JSY potential eligibility on the decision to have the first child after the cut-off age of 19 years.

[1]Potential eligibility is defined by the exogenous components of the eligibility criteria, namely belonging to either SC/ST caste or living below the poverty line.

4.2.1 Discrete-Time Hazard Model

To formally estimate the impact of JSY on a woman's decision to postpone pregnancy, I use a discrete-time hazard model (Appendix **??**). Since the question involves decision-making (of whether to have a child) at every age of the reproductive cycle, a hazard approach analyzing the probability of birth over time is appropriate. Apart from taking into account the sequential nature of decisions, the discrete-time hazard model also helps to examine heterogeneous impacts at different ages.

Given the duration data collected in our sample is in discrete periods, i.e. by yearly age, the analysis is conducted using the standard discrete dependent variable logit model. Further, since I analyze the occurrence of only one outcome—women's age at first birth—the method is considered a single-risk discrete-time hazard model. Restricting women's age between 15 and 30 years for her first birth, data for every woman, i, is duplicated for each $a = 15, 16, .., 30$. The dependent variable takes the value of one if the woman reports first birth at age $a = a_i$ and zero for each $a < a_i$. Once the first birth is reported, woman's information for $a > a_i$ are removed[2]. The estimation is given by the following equation:

$$\begin{aligned} Logit\lambda_i(a_j) = \boldsymbol{\alpha}(\mathbf{BirthTime}) + \delta_1(Eligible_i^{JSY}) + \sum_{t=2000}^{2010} \Gamma_t(Time_t) \\ + \sum_{t=2000}^{2010} \gamma_t(Eligible_i^{JSY} \times Time_t) + \boldsymbol{\zeta}(\mathbf{BirthTime} \times Eligible_i^{JSY}) \\ + \sum_{t=2000}^{2010} \eta_t(\mathbf{BirthTime} * Time_t * Eligible_i^{JSY}) + \mathbf{X}\boldsymbol{\beta} + \gamma_d + \epsilon_{ij} \end{aligned} \tag{4.2}$$

[2]For example, if the woman reported her first birth at the age of 19, the dependant variable would be equal to zero for $a = 15, 16, 17, 18$, one for $a = 19$ and missing for $a = 20, 21, .., 29, 30$.

where $\boldsymbol{\alpha}(\mathbf{BirthTime}) = (\alpha_1 D15 + \alpha_2 D16 + ... + \alpha_{16} D30)$ and $D15$ to $D30$ are age-time dummies for woman's potential first birth age. $\lambda_i(t_j)$ is a dummy indicator for woman i failing in time t, i.e. $\lambda_i(t_j) = 1$ when the woman gives birth at time t given no reported earlier child birth. $Eligible_i^{JSY}$ is an indicator for JSY- potentially eligible women while $Time_t$ are year dummies.

4.3 Results

I run equation (3.2) using the sample of all women at least 19 years and above[3]. The results are presented in Table 4.1. Column (3) suggests that, prior to JSY, potentially eligible women were more likely to have their first birth in their teen years. As compared to ineligible women, they were 3.14 percentage points more likely to have their first birth before 19 years of age. The program facilitates postponement of their pregnancy decision. Following JSY, potentially eligible women become 2.40 percentage point more likely to have their first birth after the cut-off age of 19 years. This suggests that women solely eligible for JSY benefits by their exogenic characteristics (income and caste characteristics) significantly postpone their fertility decisions to be able to participate in the program and receive cash benefits.

Next, I run equation (3.2) for each age between 15 and 30 years, i.e. t={15,16,...29,30}[4]. This estimates the impact of JSY eligibility rules on woman's decision

[3]To evaluate whether the woman decided to give birth at the age of 19, she must at least be 19 years. Restricting the sample to all women above 19 years eliminates the bias generated by women who are yet to be 19 years old.

[4]As we know, the probability of giving birth at different ages is not constant. Thus, it is expected that the program's impact on woman's decision of first birth at different ages would be heterogeneous.

Table 4.1 Impact of JSY on Age at First Birth

	(1) $\geq 19 years$	(2) $\geq 19 years$	(3) $\geq 19 years$	(4) $\geq 19 years$
Eligible	0.163***	0.213***		
	(0.0036)	(0.0044)		
Eligible* Post JSY	0.0190***	0.00745		
	(0.0038)	(0.0051)		
Potential Eligible			-0.0312***	-0.0324***
			(0.0036)	(0.0055)
Potential Eligible* Post JSY			0.0240***	0.0302***
			(0.0037)	(0.0051)
States Included	All	HPS	All	HPS
Mean	0.660	0.716	0.660	0.716
Observations	272597	112972	272597	112972
R^2	0.198	0.262	0.188	0.229

Notes: Potential Eligible is a binary variable that equals one if the woman lives below the poverty line or belongs to SC/ST caste. The outcome is an indicator variable which equals one if woman's age of first birth is above the cut-off age of 19 years, and zero otherwise. The sample includes women who are at least 19 years old. District and time fixed effects are included. Robust standard errors are clustered at the district level with significance levels at the 10, 5, and 1 percent.

to give birth at different ages. Table 4.2 presents the results for the effect of potential JSY eligibility on woman's decision to have the first child at any age between 15 and 30 years. Here, the sample for estimation includes all women who are at least 30 years old[5]. The coefficients on *PotentialEligible* from columns (1) and (2) suggest that potentially eligible women are significantly more likely to have their first births in the early teen years as compared to their same age ineligible counterparts. However, after the implementation of JSY, these women tend to significantly postpone their birthing decision by at least an year.

[5]2To evaluate whether the woman decided to give birth at the age of 19, she must at least be 19 years. Restricting the sample to all women above 19 years eliminates the exogenous censoring generated by women who are yet to be 19 years old.

Table 4.2 Impact of JSY Eligibility on Woman's Age at First Birth

	(1) 15	(2) 16	(3) 17	(4) 18	(5) 19	(6) 20	(7) 21	(8) 22
Potential Eligible	0.00789**	0.0139***	0.00295	-0.00397	0.000464	-0.00649	-0.0250***	-0.0108*
	(0.00246)	(0.00336)	(0.00423)	(0.00483)	(0.00540)	(0.00566)	(0.00541)	(0.00515)
Potential Eligible* Post JSY	-0.00951***	-0.0172***	-0.00771	0.00315	0.00700	0.0131*	0.0217***	0.0132*
	(0.00228)	(0.00327)	(0.00416)	(0.00485)	(0.00551)	(0.00594)	(0.00582)	(0.00556)
Observations	71018	69181	67720	66083	64521	63472	62781	64042
R^2	0.044	0.059	0.069	0.068	0.054	0.045	0.036	0.033

	(9) 23	(10) 24	(11) 25	(12) 26	(13) 27	(14) 28	(15) 29	(16) 30
Potential Eligible	-0.00525	-0.00396	0.00244	-0.00188	0.00228	0.000554	0.00381	0.00230
	(0.00454)	(0.00405)	(0.00371)	(0.00348)	(0.00312)	(0.00263)	(0.00233)	(0.00185)
Potential Eligible* Post JSY	-0.00346	0.00735	-0.00305	0.00710	0.00287	0.00377	-0.00498	-0.00453
	(0.00513)	(0.00457)	(0.00429)	(0.00399)	(0.00358)	(0.00309)	(0.00278)	(0.00235)
Observations	64801	66053	67009	67418	68210	68732	69190	69548
R^2	0.035	0.044	0.056	0.053	0.059	0.060	0.066	0.060

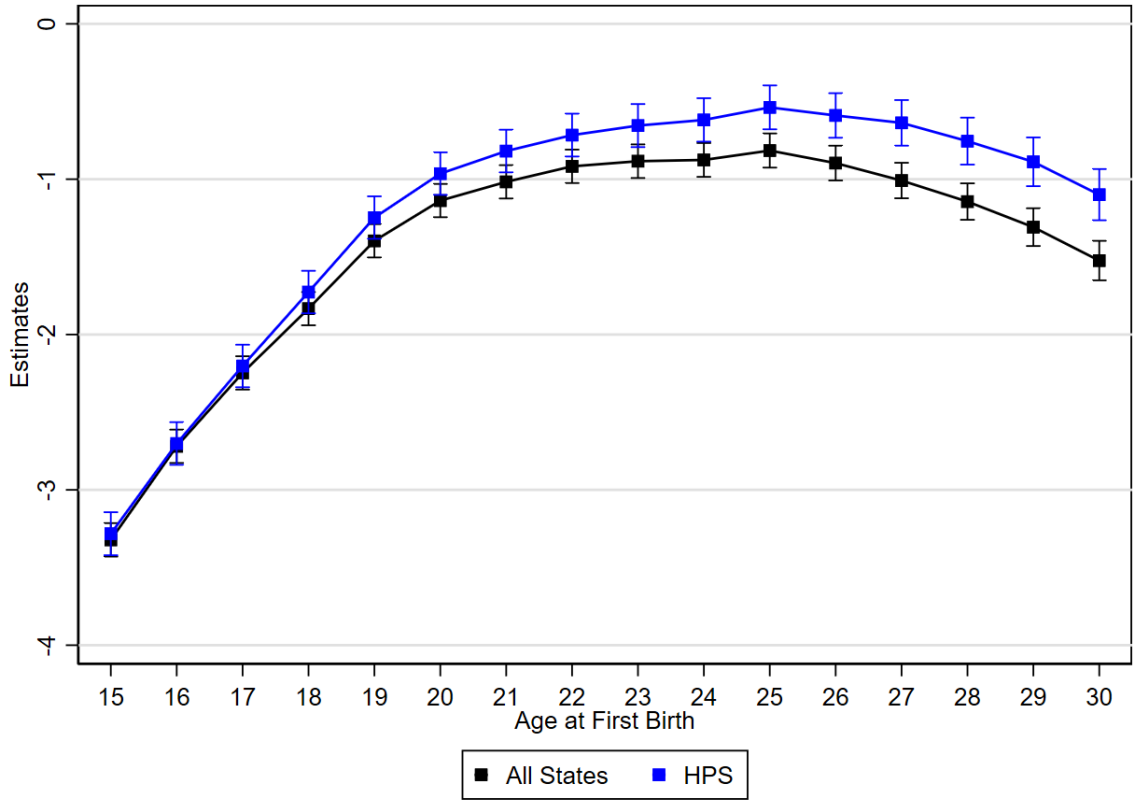
Notes: Potential Eligible is a binary variable that equals one if the woman lives below the poverty line or belongs to SC/ST caste. District and time fixed effects are included. Robust standard errors are clustered at the district level with significance levels at the 10, 5, and 1 percent.

The two sets of estimates (Tables 4.1 & 4.2) present two critical results on the impact of JSY: first, potentially eligible women do indeed postpone having their first child to after the cut-off age of 19 years when they can receive the cash benefits under JSY. Women postponing their decision to reap JSY benefits are the ones who would have given birth a little shy of 19 years, suggesting that the cash incentive is only worth a few months of postponement for women. Second, the program also reduces the extent of early-teen pregnancies for potentially eligible women. Although these women do not seem to change behavior in response to the cash incentive, the reduction in pregnancies in early teens could be due to information dissemination brought about by the program. Studies show that husbands' and household's domination of decision-making is significantly associated with women who are younger and less educated (Mullany et al., 2005). Thus, the reason for women to merely shift their first pregnancy by a year or so in their teens while not taking advantage of the cash benefits may be due to the fact that pregnancy decisions are collective decisions by households with limited authority of women[6] (Mistry et al., 2009).

I approach hazard modeling— estimating Equation (4)— by beginning with a simple baseline function. The baseline is estimated using a simple discrete-time hazard model with a standard logistic regression model that includes **BirthTime** and no intercept. Figure 4.3 depicts the hazard estimates of a simple baseline function for the different age indicator variables for effect of time on the hazard of giving birth. The baseline hazard curve for first birth rises from age 15 to 25, and then appears to decline afterwards.

[6]The concept of women's autonomy is associated with her power and agency within a household. Greater autonomy suggests that the woman has the power to take decisions for the benefit of her health. Studies have evaluated the effect of women's autonomy on fertility and family planning (Abadian, 1996; Saleem and Bobak, 2005).

Figure 4.3 Odds Ratio of Giving Birth at Different Ages



Notes: The odds ratio are estimates from a simple discrete-time hazard model using a standard logistic regression model that includes only a set of age dummy variables and no intercept. The dashed lines are confidence intervals within 95 percent for the estimates.

Column (1) from Table 4.3 present the estimates for the interaction of the age indicators with a time-invariant dummy variable indicating whether the women is potentially eligible for JSY. It indicates that as compared to ineligible women, the odds for eligible women to give birth at every time period are higher till the age of 19. For example, potentially eligible women are 1.52 times as likely to have a birth at the age of 16 as non-eligible women and the odds reduce to 0.66 at the age of 24.

Table 4.3: Impact of JSY on Age at First Birth using Discrete Time Hazard Model

	(1) Coef	(2) Coef	(3) Coef	(4) Coef
Potential Eligible* Age 15	1.707***	2.015***	1.835***	2.107***
	(0.0402)	(0.0519)	(0.0715)	(0.0904)
Potential Eligible* Age 16	1.527***	1.645***	1.532***	1.689***
	(0.0272)	(0.0332)	(0.0448)	(0.0561)
Potential Eligible* Age 17	1.369***	1.417***	1.418***	1.468***
	(0.0206)	(0.0249)	(0.0348)	(0.0423)
Potential Eligible* Age 18	1.186***	1.166***	1.210***	1.251***
	(0.0162)	(0.0194)	(0.0265)	(0.0330)
Potential Eligible* Age 19	1.008	0.930***	1.055*	0.959
	(0.0133)	(0.0154)	(0.0219)	(0.0250)
Potential Eligible* Age 20	0.969*	0.835***	0.999	0.871***
	(0.0136)	(0.0152)	(0.0217)	(0.0243)
Potential Eligible* Age 21	0.841***	0.723***	0.894***	0.794***
	(0.0133)	(0.0151)	(0.0214)	(0.0249)
Potential Eligible* Age 22	0.786***	0.698***	0.790***	0.707***
	(0.0143)	(0.0170)	(0.0214)	(0.0255)
Potential Eligible* Age 23	0.719***	0.649***	0.715***	0.617***
	(0.0154)	(0.0188)	(0.0222)	(0.0260)
Potential Eligible* Age 24	0.663***	0.627***	0.707***	0.648***
	(0.0169)	(0.0219)	(0.0255)	(0.0318)
Potential Eligible* Age 25	0.669***	0.682***	0.672***	0.648***
	(0.0201)	(0.0281)	(0.0278)	(0.0368)
Potential Eligible* Age 26	0.589***	0.616***	0.643***	0.633***
	(0.0214)	(0.0331)	(0.0317)	(0.0447)
Potential Eligible* Age 27	0.631***	0.800***	0.665***	0.786**
	(0.0278)	(0.0517)	(0.0390)	(0.0654)
Potential Eligible* Age 28	0.685***	0.912	0.745***	0.949
	(0.0359)	(0.0722)	(0.0522)	(0.0954)
Potential Eligible* Age 29	0.657***	1.008	0.679***	0.908
	(0.0409)	(0.0948)	(0.0558)	(0.110)
Potential Eligible* Age 30	0.726***	1.134	0.791*	1.027
	(0.0536)	(0.130)	(0.0773)	(0.151)

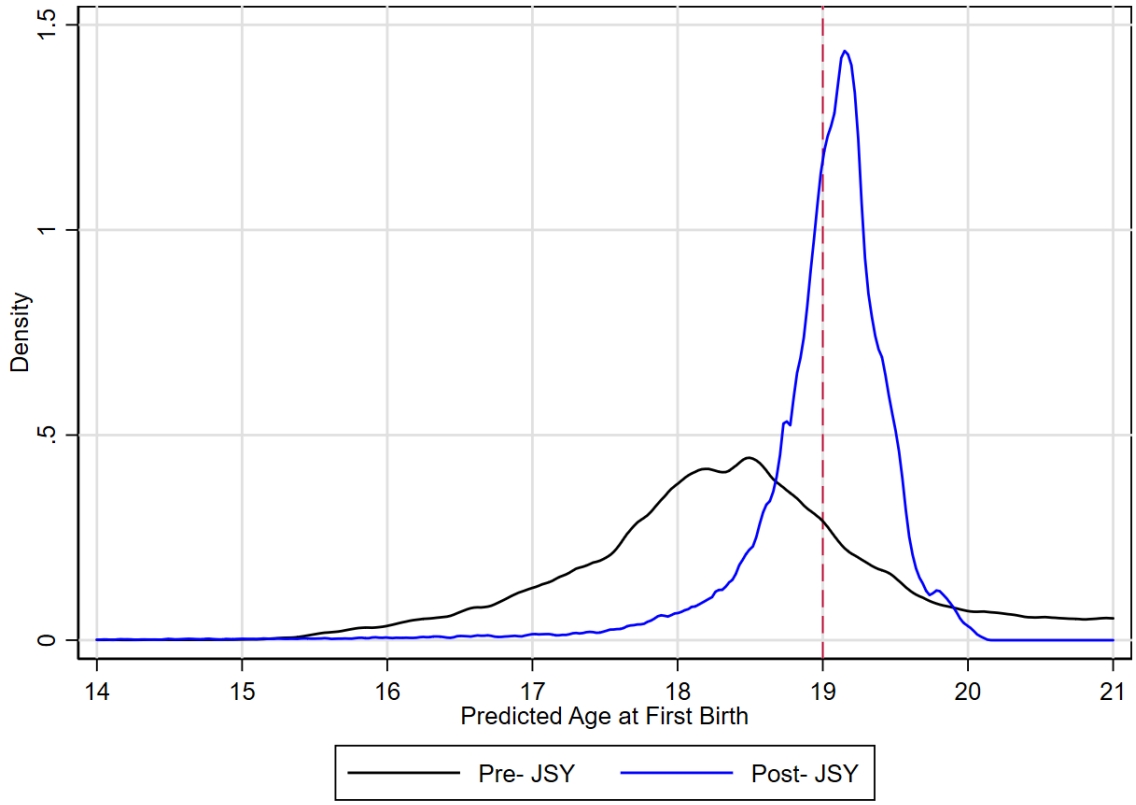
Table 4.3 – continued from previous page

	(1) Coef	(2) Coef	(3) Coef	(4) Coef
Potential Eligible* Age 15* Post JSY		0.696***		0.738***
		(0.0157)		(0.0289)
Potential Eligible* Age 16* Post JSY		0.852***		0.810***
		(0.0156)		(0.0257)
Potential Eligible* Age 17* Post JSY		0.926***		0.924**
		(0.0153)		(0.0257)
Potential Eligible* Age 18* Post JSY		1.015		0.928**
		(0.0164)		(0.0243)
Potential Eligible* Age 19* Post JSY		1.120***		1.147***
		(0.0184)		(0.0299)
Potential Eligible* Age 20* Post JSY		1.241***		1.227***
		(0.0225)		(0.0345)
Potential Eligible* Age 21* Post JSY		1.244***		1.188***
		(0.0262)		(0.0381)
Potential Eligible* Age 22* Post JSY		1.185***		1.156***
		(0.0293)		(0.0432)
Potential Eligible* Age 23* Post JSY		1.152***		1.235***
		(0.0341)		(0.0542)
Potential Eligible* Age 24* Post JSY		1.086*		1.137*
		(0.0390)		(0.0583)
Potential Eligible* Age 25* Post JSY		0.973		1.030
		(0.0410)		(0.0611)
Potential Eligible* Age 26* Post JSY		0.898		1.010
		(0.0506)		(0.0758)
Potential Eligible* Age 27* Post JSY		0.688***		0.758**
		(0.0463)		(0.0671)
Potential Eligible* Age 28* Post JSY		0.667***		0.689***
		(0.0538)		(0.0727)
Potential Eligible* Age 29* Post JSY		0.523***		0.612***
		(0.0505)		(0.0777)
Potential Eligible* Age 30* Post JSY		0.578***		0.698*
		(0.0663)		(0.104)
States	All	All	HPS	HPS
Observations	1690241	1644613	761962	732947
AIC	1348767.1	1319022.4	570209.9	553299.7
BIC	1357133.9	1327567.7	574504.1	557763.6

Columns (2) and (4) report the estimates for the impact of JSY on the hazard of child birth for potentially eligible women at each age-time period. The results suggest that after the implementation of JSY, potentially eligible women are 30 percent more likely to not give birth at the age of 15 compared to their ineligible counterparts. With JSY in place, the risk of potentially eligible women to have a first birth reduces at every age period till the age of 19 as compared to the ineligible population. The reduction in the likelihood of having a birth is due to the beneficiaries receiving cash benefits conditioned the birth occurs after the woman is at least 19 years old. The potentially eligible women compared to ineligible women are 12 to 14 percent more likely to have their first child at the age of 19 after the program was implemented.

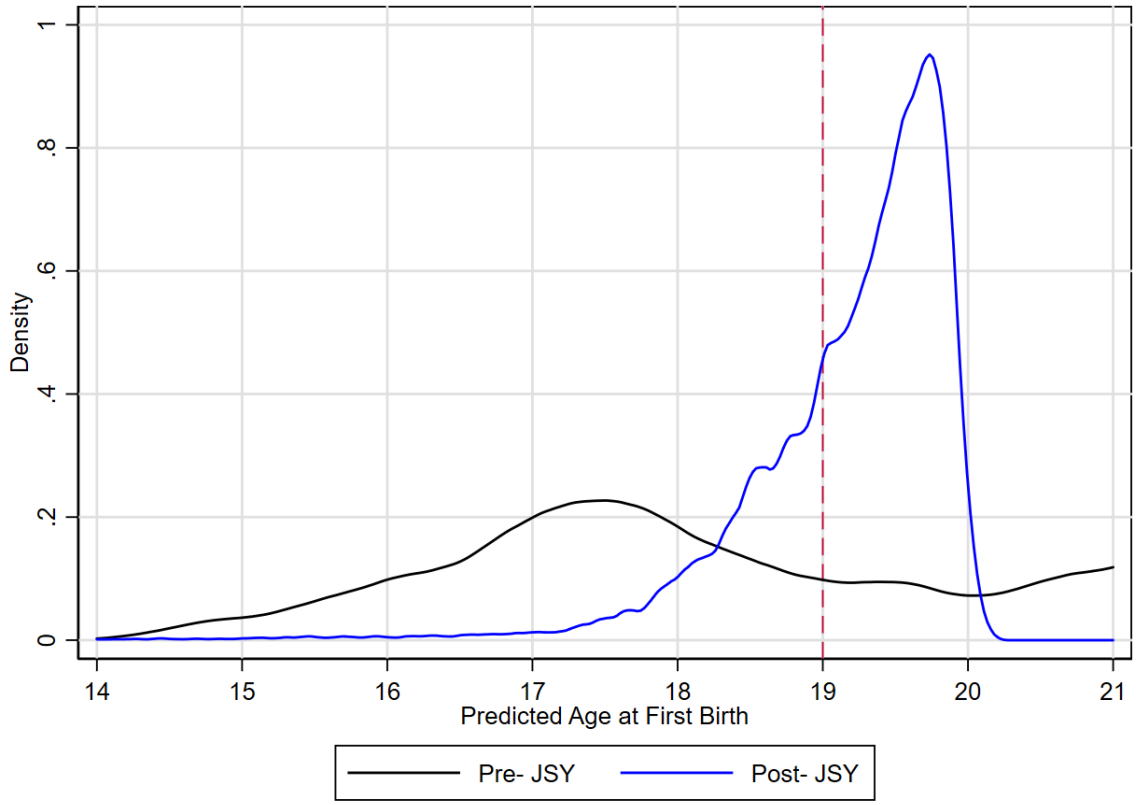
Figures 4.4 and 4.5 present the distribution of predicted age at first birth for potentially eligible women. The predicted first birth ages are calculated from the model estimated in columns (2) and (4) of Table 4.3. After the implementation of JSY, the distribution skews rightwards with the median age of first birth increasing by 0.3 years (or 3.6 months) to 18.89 years. The above results suggest that the cash benefits under JSY incentivized eligible women to shift their first birth over the eligibility age of 19 years.

Figure 4.4 Distribution of Age at First Birth for Potentially Eligible Women



Notes: The distribution of age at first birth for potentially eligible women is calculated by estimating the survival functions accumulating the information on the hazard from age 15 to age of first birth. The predicted age is estimated from Table 4.3.

Figure 4.5 Distribution of Age at First Birth for Potentially Eligible Women (HPS)



Notes: The distribution of age at first birth for potentially eligible women is calculated by estimating the survival functions accumulating the information on the hazard from age 15 to age of first birth. The predicted age is estimated from Table 4.3.

CHAPTER 5

Discussion and Conclusion

5.1 Discussion

My findings suggest that JSY increases the overall utilization of institutional delivery and antenatal services. After JSSK was implemented in 2011, women in HP states shift from home to health institutions for childbirth. This reiterates the fact the cash incentives are insignificant compared to the overall cost of delivery care to induce significant changes in the demand for institutional delivery. With free services under JSSK, the use of public institutional delivery increases enough to drive wealthier women away to private healthcare facilities. Compared to earlier studies on JSY, I document relatively smaller increases in these outcomes. I argue that some previous studies overestimate the impact due to a flawed definition of the treatment variable. Others fail to control for the changing healthcare infrastructure concurrent with JSY implementation, thus the overestimated results. Joshi and Sivaram (2014) uses a few parameters of JSY eligibility and shows a more modest effect of the program. On the contrary, I use complete individual eligibility criteria[1] and the timing of the program to estimate the impact on healthcare utilization. Unlike previous studies, I use several healthcare supply measures to counter the effect of changes in demand for healthcare services due to an increased supply of services.

I also find that the movement towards institutional delivery has an impact on the overall fetal mortality rates for the country. A portion of pregnancies that would have

[1]The individual eligibility criteria used by Joshi and Sivaram (2014) does not include the condition of women living below the poverty line, and thus, underestimated the effect.

resulted in stillbirths due to lack of immediate care at home are now being saved during childbirth in health facilities. I find that the fetal deaths reduced by almost 4 live births per 1000 pregnancies after the implementation of JSY. However, after the implementation of JSSK, institutional delivery rates increase significantly but have no impact on child mortality rates. JSY and JSSK also increase the use of antenatal care. In addition, the results show an interesting observation about the use of postnatal checkup by mothers. JSY reduces the use of PNC services while JSSK increases the probability of mothers visiting the doctor after delivery. Since this study is the first to understand the effect of JSY eligibility on women's age at first birth, there are no prior estimates for comparing my results.

My results have some important policy implications. First, financial incentives act as positive reinforcements for inducing a change in the target health behavior. The results show that conditional cash transfers and free services lead to a significant increase in public institutional delivery. Although various financial incentives programs are running worldwide, JSY is one of the few programs that provides one-time direct cash assistance to women for a particular behavior. Nepal introduced a similar CCT program, Safe Delivery Incentive Programme, in 2005, and evidence suggests a comparable increase of 17 percent in the utilization of in-facility delivery (Powell-Jackson and Hanson, 2012). Other programs based on continuous payouts to households show a relatively higher impact on the target behavior (Sosa-Rubí et al., 2011).

Second, although I do not study the impact of JSY and JSSK on maternal mortality due to data limitations, the results suggest an indirect effect on maternal mortality. Direct

obstetric causes like postpartum hemorrhage and sepsis are the leading causes of maternal mortality in India with anemia as a contributory factor (Montgomery et al., 2014). With the increased availability of immediate care during institutional delivery, JSY could reduce maternal mortality. The increase in the use of antenatal care services, including regular doctor visits and provision of iron supplements, could further reduce maternal mortality. I find that JSY affects the pregnancy timing of eligible women. By being JSY eligible, women shift their first birth after the age of 19 years. This could indirectly reduce the incidence of pregnancy complications in teen pregnancies and thus, reduce teen maternal mortality. However, the negative impact of JSY on postpartum services suggests otherwise. I find that eligible women reduce their postnatal checkups after JSY. A shortage of care post child delivery could result in ill health, disabilities, and deaths among women and newborns, thus increasing the mortality rate (Li et al., 1996). Future studies could merge maternal mortality indicators from other administrative sources to study the program's impact.

Third, I find a modest association between the programs and child mortality. The lacunae in the public healthcare system could explain the results. A possibility is that the public healthcare facilities provide sub-optimal care and fail to recognize high-risk cases, leading to a modest decline. From the policy perspective, the program be accompanied by higher availability and quality of care at public health institutions. Another possible explanation is that public institutional delivery increases through a substantial decline in the use of private institutions and not home. Thus, the effect on utilization is not large enough to translate into better child health outcomes. The program's targeting on merely

institutional delivery, without nutritional and postpartum support, could also explain the results. For example, CCT programs that significantly reduced child mortality in countries such as Brazil (Rasella et al., 2013) and Mexico (Barham, 2011) were based on regular cash payments to households to provide nutritional supplements to pregnant women, unlike the one-time payment under JSY. With free services, I find a significant increase in all types of formal healthcare services.

Fourth, the paper's evidence on the effects of JSY on health behaviors points towards the need for policymakers to be cautious of defining targeted groups (de Brauw and Peterman, 2020; Sosa-Rubí et al., 2011). I find that the increase in public institutional delivery due to JSY comes from a significant shift away from the private health facilities and not home births. This suggests that the program may have failed to introduce many women to formal maternal care. Further, the analysis of the heterogeneity of program impact suggests that even though the program has a significant overall effect, it delivered smaller benefits to more vulnerable groups such as women with no schooling and poor women.

Fifth, intrafamilial decision-making power also affects women's ability to access and use maternal health services. Thus, the programs must be integrated with other social schemes to increase awareness about maternal healthcare within households who play a significant role in determining women's healthcare choices. Future research could tap into evaluating the impact of financial incentives on the household's behavior.

5.2 Conclusion

Most of the global financial incentives-based maternal care programs provide regular payments to their target population. Their cash receipts are conditional upon a wide range of desired health behavior. JSY stands out among these programs because it provides one-time direct cash assistance to women for a particular behavior. It is essentially a partial price reduction for delivering in public health institutions. Introduced in 2005, the program uses a conditional cash transfer to incentivize the utilization of public institutional delivery.

My results suggest that the program significantly increases in-facility delivery and the use of antenatal care. The program shifts women away from both home and private facilities to public facilities for delivery. The decline in the use of private facilities is larger than home births, suggesting that the program does not fully succeed in increasing the use of formal healthcare. Instead, it leads to a greater shift within the formal options of delivery care. Another program introduced in 2011, JSSK, provided free maternal healthcare. It not only moved women away from homes for childbirth, but also increased the utilization of private healthcare facilities.

JSY reduces the use of postnatal services as women substitute it with immediate in-facility care during delivery. However, with the introduction of JSSK and free care services, women increase their use of postnatal care services. I find no significant impact of the programs on infant mortality. Additionally, JSY eligibility induces women to shift their firth birth pregnancy timing to above 19 years, thus reducing teen pregnancies.

The collective argument presented in the paper reinforces that demand-side interventions by the government can be effective in improving the uptake of health services but alone may be insufficient to improve health outcomes. Maternal health services must be available, accessible, and of acceptable quality for financial incentives-based programs to reach their full implementation potential. Moving ahead, we need to broaden our research on JSY and JSSK to address questions around the long-term effects of financial incentives, including changes in women's decisions regarding the use of healthcare services outside of maternal care. Also, the programs' interaction with other healthcare and educational programs must be studied to provide a holistic view of changes in women's healthcare behavior to different types of incentives. Finally, even if we form a consensus on the positive effects of JSY and JSSK, studies on its cost-effectiveness are missing from the literature. We require research on the cost-efficacy of such demand-side financing programs for practical policy recommendations.

APPENDIX A

Additional Tables

Table A1 Eligibility for Cash Assistance under JSY

State	**Criteria**
Low Performing States	All pregnant women delivering in Government health centres like Sub-centre, primary/ community health centers/ general wards of District and state Hospitals or accredited private institutions.
High Performing States	Below Poverty Line pregnant women, aged 19 years and above.
Both States	All Scheduled Caste and Scheduled Tribe women delivering in a government health centre like Sub-centre, primary/ community health centers/ general wards of District and state Hospitals or accredited private institutions.

Table A2 Limitations of Cash Assistance for Institutional Delivery

State	**Criteria**
Low Performing States	All births, delivered in a health centre Private health institutions.
High Performing States	Up to 2 live births

Table A3 Cash Payments for Institutional Delivery

	Rural		Urban	
	Woman	ASHA	Woman	ASHA
Low Performing States	1400	600	1000	200
High Performing States	700	N/A	600	N/A

Table A4 Entitlements for pregnant women and sick newborns under JSSK

Pregnant Women	**Sick newborns**
Free and cashless delivery	
Free C-Section	Free treatment
Free drugs and consumables	Free drugs and consumables
Free diagnostics	Free diagnostics
Free diet during stay in the health institutions	Free provision of blood
Free provision of blood	Exemption from user charges
Exemption from user charges	Free Transport from home to health
Free transport from home to health institutions	institutions
Free transport between facilities in case	Free Transport between facilities in case
of referral	of referral
Free drop back from Institutions to home	Free drop Back from Institutions to home.
after 48hrs stay	

Table A5 Summary Statistics by Eligibility Criteria

	Caste-SC/ST		Poor		LP State	
	Non Eligible	Eligible	Non Eligible	Eligible	Non Eligible	Eligible
Delivery at Home	0.60	0.70	0.48	0.77	0.47	0.76
Delivery at Public Facility	0.21	0.21	0.28	0.16	0.30	0.15
Skilled Health Professional	0.42	0.31	0.53	0.25	0.55	0.26
Fetal Deaths*	0.03	0.03	0.03	0.03	0.03	0.03
Perinatal Deaths**	0.05	0.05	0.05	0.05	0.04	0.05
Any Antenatal Care	0.72	0.65	0.82	0.59	0.83	0.60
Atleast 4 Antenatal Visits	0.44	0.38	0.56	0.29	0.63	0.27
First Trimester Antenatal Care	0.38	0.30	0.48	0.24	0.49	0.24
Postnatal Care	0.44	0.34	0.52	0.28	0.57	0.29
Immunization	0.71	0.68	0.79	0.62	0.80	0.62
Breastfeeding	0.33	0.41	0.42	0.31	0.49	0.27
Observations	200,832	133,476	153,127	182,514	136,392	199,474

Notes: The sample consists of all 35 states and 591 districts from thre rounds of the District Level Households Survey (DLHS).

* Fetal Death Rate is the number of deaths within the gestation period per 1000 pregnancies.

** Perinatal Death Rate is the number of deaths under a week including stillbirths per 1000 pregnancies.

Antenatal care includes checkup during pregnancy, tetnus injections and intake of iron supplements.

Table A6 States Specific Summary Statistics

	High Performing	Low Performing	Total
Controls			
Woman's Age	26.01	26.37	26.23
Woman's Age at First Birth	20.10	19.18	19.55
Poor	0.39	0.64	0.54
Caste-SC/ST	0.47	0.35	0.40
Caste-General	0.24	0.20	0.21
Religion-Hindu	0.66	0.84	0.76
No Education	0.58	0.31	0.42
Village- Health Worker	0.63	0.70	0.67
Village- Distance to Facility	2.79	3.01	2.93
Village-ASHA	0.27	0.38	0.34
District- CHC per sq km	0.37	0.29	0.33
Outcomes			
Delivery at Home	0.47	0.76	0.64
Delivery at Public Facility	0.30	0.15	0.21
Skilled Health Professional	0.55	0.26	0.38
Fetal Deaths*	0.01	0.02	0.02
Perinatal Deaths**	0.02	0.03	0.03
Any Antenatal Care	0.83	0.60	0.69
Atleast 4 Antenatal Visits	0.63	0.27	0.42
First Trimester Antenatal Care	0.49	0.24	0.34
Postnatal Care	0.57	0.29	0.40
Immunization	0.80	0.62	0.70
Breastfeeding	0.49	0.27	0.36
Observations	137,922	201,447	339,369

Notes: The sample consists of all 35 states and 591 districts from thre rounds of the District Level Households Survey (DLHS).

* Fetal Death Rate is the number of deaths within the gestation period per 1000 pregnancies.

** Perinatal Death Rate is the number of deaths under a week including stillbirths per 1000 pregnancies.

Antenatal care includes checkup during pregnancy, tetnus injections and intake of iron supplements.

Table A7 Impact of JSY on Choice of Delivery: Inclusion of Healthcare Supply

	(1)	(2)	(3)	(4)
Delivery at Home				
Eligible	0.0106**	0.00797*	0.00890*	0.00658
	(0.004)	(0.004)	(0.004)	(0.004)
Eligible x Post JSY	-0.0238***	-0.0199***	-0.0217***	-0.0179***
	(0.004)	(0.004)	(0.004)	(0.004)
Observations	281712	279826	278882	277126
R^2	0.328	0.328	0.329	0.328
Public Institutional Delivery				
Eligible	0.0279***	0.0314***	0.0298***	0.0330***
	(0.004)	(0.004)	(0.004)	(0.004)
Eligible x Post JSY	0.0443***	0.0393***	0.0425***	0.0373***
	(0.004)	(0.004)	(0.004)	(0.004)
Observations	281712	279826	278882	277126
R^2	0.185	0.185	0.184	0.184
Private Institutional Delivery				
Eligible	-0.0383***	-0.0392***	-0.0386***	-0.0394***
	(0.003)	(0.003)	(0.003)	(0.003)
Eligible x Post JSY	-0.0194***	-0.0183***	-0.0196***	-0.0184***
	(0.003)	(0.003)	(0.003)	(0.003)
Observations	281712	279826	278882	277126
R^2	0.241	0.239	0.240	0.239
Presence of Skilled Professional				
Eligible	-0.00952*	-0.00723	-0.00795*	-0.00589
	(0.004)	(0.004)	(0.004)	(0.004)
Eligible x Post JSY	0.0250***	0.0214***	0.0228***	0.0192***
	(0.004)	(0.004)	(0.004)	(0.004)
Supply Measure	None	Village	District	Both
Observations	279797	277923	276977	275233
R^2	0.314	0.313	0.315	0.314

Notes: The table presents estimates of β_3 from from equation (1). The columns represent different sets of supply side health controls: no health supply (1), village-level (2), district-level (3), and village and district-level (4). Eligible is a binary variable that equals one if the woman is eligible for JSY benefits and zero otherwise. Post JSY is a time dummy variable that equals one for the years after 2005 and zero otherwise. All estimations control for age, education, wealth, caste and religion of woman, place of residence, education of husband and birth order. District and time fixed effects are included. Robust standard errors are clustered at the district level with significance levels at the 10, 5, and 1 percent.

Table A8 Impact of JSY on Antenatal Care: Inclusion of Healthcare Supply

	(1)	(2)	(3)	(4)
Any Antenatal Care				
Eligible	-0.0106***	-0.00702*	-0.0107***	-0.00710*
	(0.003)	(0.003)	(0.003)	(0.003)
Eligible x Post JSY	0.0455***	0.0383***	0.0433***	0.0363***
	(0.003)	(0.003)	(0.003)	(0.003)
Observations	281680	279793	278850	277093
R^2	0.236	0.236	0.237	0.237
Recommended Antenatal Care				
Eligible	-0.00274	-0.00168	-0.00181	-0.000742
	(0.004)	(0.004)	(0.004)	(0.004)
Eligible x Post JSY	0.00954*	0.00792*	0.00766*	0.00628
	(0.004)	(0.004)	(0.004)	(0.004)
Observations	281878	279990	279044	277286
R^2	0.298	0.297	0.298	0.297
Four Visits or More				
Eligible	-0.00242	-0.000899	-0.00188	-0.000305
	(0.004)	(0.004)	(0.004)	(0.004)
Eligible x Post JSY	0.0131***	0.0102**	0.0106**	0.00779*
	(0.004)	(0.004)	(0.004)	(0.004)
Observations	273366	271509	270653	268913
R^2	0.311	0.309	0.310	0.309
Second Trimester Visit				
Eligible	-0.0350***	-0.0299***	-0.0353***	-0.0303***
	(0.004)	(0.004)	(0.004)	(0.004)
Eligible x Post JSY	0.0780***	0.0682***	0.0769***	0.0673***
	(0.004)	(0.004)	(0.004)	(0.004)
Supply Measure	None	Village	District	Both
Observations	291123	289208	288212	286429
R^2	0.212	0.212	0.213	0.213

Notes: The table presents estimates of β_3 from from equation (1). The columns represent different sets of supply side health controls: no health supply (1), village-level (2), district-level (3), and village and district-level (4). Eligible is a binary variable that equals one if the woman is eligible for JSY benefits and zero otherwise. Post JSY is a time dummy variable that equals one for the years after 2005 and zero otherwise. All estimations control for age, education, wealth, caste and religion of woman, place of residence, education of husband and birth order. District and time fixed effects are included. Robust standard errors are clustered at the district level with significance levels at the 10, 5, and 1 percent.

Table A9 Impact of JSY on Postnatal Care: Inclusion of Healthcare Supply

	(1)	(2)	(3)	(4)
Postnatal Checkup				
Eligible	0.0250***	0.0264***	0.0262***	0.0276***
	(0.004)	(0.004)	(0.004)	(0.004)
Eligible x Post JSY	-0.0619***	-0.0625***	-0.0629***	-0.0635***
	(0.004)	(0.004)	(0.004)	(0.004)
Observations	271995	270115	269219	267468
R^2	0.254	0.252	0.254	0.252
Breastfeeding Within Hour				
Eligible	-0.0346***	-0.0321***	-0.0355***	-0.0331***
	(0.004)	(0.004)	(0.004)	(0.004)
Eligible x Post JSY	0.0495***	0.0454***	0.0498***	0.0454***
	(0.004)	(0.004)	(0.004)	(0.004)
Observations	276692	274827	273872	272135
R^2	0.218	0.219	0.219	0.220
Breastfeeding Within Day				
Eligible	-0.0489***	-0.0455***	-0.0495***	-0.0461***
	(0.004)	(0.004)	(0.004)	(0.004)
Eligible x Post JSY	0.0641***	0.0576***	0.0642***	0.0576***
	(0.004)	(0.004)	(0.004)	(0.004)
Observations	276692	274827	273872	272135
R^2	0.295	0.296	0.296	0.297
Infant Immunization				
Eligible	-0.0324***	-0.0263***	-0.0320***	-0.0258***
	(0.003)	(0.003)	(0.003)	(0.003)
Eligible x Post JSY	0.0515***	0.0396***	0.0499***	0.0378***
	(0.003)	(0.003)	(0.003)	(0.003)
Supply Measure	None	Village	District	Both
Observations	279466	277584	276613	274860
R^2	0.183	0.184	0.182	0.183

Notes: The table presents estimates of β_3 from from equation (1). The columns represent different sets of supply side health controls: no health supply (1), village-level (2), district-level (3), and village and district-level (4). Eligible is a binary variable that equals one if the woman is eligible for JSY benefits and zero otherwise. Post JSY is a time dummy variable that equals one for the years after 2005 and zero otherwise. All estimations control for age, education, wealth, caste and religion of woman, place of residence, education of husband and birth order. District and time fixed effects are included. Robust standard errors are clustered at the district level with significance levels at the 10, 5, and 1 percent.

Table A10 Heterogeneous Impact of JSY on Place of Delivery in HPS

	(1) Home	(2) Govt	(3) Pvt	(4) Home	(5) Govt	(6) Pvt	(7) Home	(8) Govt	(9) Pvt
Eligible	0.0160**	0.0389***	-0.0556***	0.0152	0.0126	-0.0269***	0.00821	0.0615***	-0.0707***
	(0.006)	(0.006)	(0.005)	(0.008)	(0.008)	(0.006)	(0.007)	(0.007)	(0.006)
Eligible x Post JSY	-0.0161**	0.0161**	0.00179	-0.00324	0.00640	-0.00318	-0.00598	0.000623	0.00520
	(0.006)	(0.006)	(0.005)	(0.009)	(0.009)	(0.006)	(0.008)	(0.008)	(0.007)
Eligible x Post JSY x Tribal	0.0610***	-0.0454**	-0.0198*						
	(0.015)	(0.016)	(0.008)						
Eligible x Post JSY x Primary Edu				0.000467	0.000662	0.000541			
				(0.011)	(0.011)	(0.009)			
Eligible x Post JSY x Poor							0.0147	-0.0131	0.00107
							(0.011)	(0.011)	(0.009)
Mean	0.441	0.317	0.234	0.441	0.317	0.234	0.441	0.316	0.234
Observations	114505	114505	114505	114505	114505	114505	114330	114330	114330
R^2	0.331	0.156	0.269	0.330	0.157	0.270	0.330	0.157	0.269

Notes: The table presents estimates from equation (2). The columns represent heterogeneous estimates of impact of JSY on the choice of place of delivery in the high performing states. Eligible is a binary variable that equals one if the woman is eligible for JSY benefits and zero, otherwise. Post JSY is an indicator dummy for the implementation of JSY. *Tribal* is a dummy for states with mostly tribal population, *Primary Educ* is a dummy for women with more than primary education, and *Poor* is a dummy for women living below the poverty line. Controls include age, education,wealth, caste and religion of woman, place of residence, education of husband, birth order of children, presence of health worker and ASHA in village, and distance to the nearest health facility. District and time fixed effects are included. Robust standard errors are clustered at the district level with significance levels at the 10, 5, and 1 percent.

Table A11 Heterogeneous Impact of JSY on Antenatal Care in HPS

	(1) ANC	(2) Visits	(3) Sem	(4) ANC	(5) Visits	(6) Sem	(7) ANC	(8) Visits	(9) Sem
Eligible	0.0167***	-0.0132*	-0.0361***	0.0150*	-0.0254**	-0.0202*	0.0341***	0.0107	-0.0248**
	(0.004)	(0.006)	(0.006)	(0.006)	(0.008)	(0.008)	(0.005)	(0.007)	(0.008)
Eligible x Post JSY	0.00654	0.00845	0.0252***	-0.00204	0.0110	-0.00642	-0.00107	-0.0122	0.0208*
	(0.004)	(0.006)	(0.007)	(0.008)	(0.010)	(0.010)	(0.005)	(0.008)	(0.008)
Eligible x Post JSY x Tribal	-0.0195	-0.00832	-0.0264						
	(0.015)	(0.016)	(0.016)						
Eligible x Post JSY x Primary Educ				0.0126	-0.00543	0.0442***			
				(0.009)	(0.012)	(0.012)			
Eligible x Post JSY x Poor							-0.00447	0.00710	-0.0402**
							(0.009)	(0.012)	(0.012)
Mean	0.848	0.647	0.520	0.848	0.647	0.520	0.848	0.648	0.520
Observations	114498	112369	116815	114498	112369	116815	114323	112194	116640
R^2	0.237	0.242	0.167	0.237	0.242	0.168	0.237	0.244	0.169

Notes: The table presents estimates from equation (2). The columns represent heterogeneous estimates of impact of JSY on the use of antenatal care in the high performing states. Eligible is a binary variable that equals one if the woman is eligible for JSY benefits and zero, otherwise. Post JSY is an indicator dummy for the implementation of JSY. *Tribal* is a dummy for states with mostly tribal population, *Primary Educ* is a dummy for women with more than primary education, and *Poor* is a dummy for women living below the poverty line. Controls include age, education,wealth, caste and religion of woman, place of residence, education of husband, birth order of children, presence of health worker and ASHA in village, and distance to the nearest health facility. District and time fixed effects are included. Robust standard errors are clustered at the district level with significance levels at the 10, 5, and 1 percent.

Table A12 Heterogeneous Impact of JSY on Postnatal Care in HPS

	(1) ANC	(2) Visits	(3) Sem	(4) ANC	(5) Visits	(6) Sem	(7) ANC	(8) Visits	(9) Sem
Eligible	-0.0193**	0.0193**	0.00338	-0.0283***	0.0219*	-0.00285	0.0287***	0.00425	0.00401
	(0.006)	(0.006)	(0.004)	(0.008)	(0.009)	(0.007)	(0.007)	(0.008)	(0.005)
Eligible x Post JSY	0.0184**	-0.00946	-0.00787	0.0423***	-0.00111	-0.00386	-0.0327***	-0.00389	0.00488
	(0.006)	(0.007)	(0.005)	(0.009)	(0.010)	(0.008)	(0.008)	(0.008)	(0.006)
Eligible x Post JSY x Tribal	0.0314*	0.0124	-0.0265						
	(0.014)	(0.017)	(0.015)						
Eligible x Post JSY x Primary Educ				-0.0481***	-0.0120	-0.00633			
				(0.011)	(0.012)	(0.010)			
Eligible x Post JSY x Poor							0.130***	-0.0160	-0.0316**
							(0.012)	(0.013)	(0.010)
Mean	0.446	0.504	0.801	0.446	0.504	0.801	0.446	0.503	0.802
Observations	106506	112890	113757	106506	112890	113757	106331	112716	113582
R^2	0.286	0.134	0.181	0.288	0.134	0.180	0.286	0.134	0.181

Notes: The table presents estimates from equation (2). The columns represent heterogeneous estimates of impact of JSY on the use of postnatal care in the high performing states. Eligible is a binary variable that equals one if the woman is eligible for JSY benefits and zero, otherwise. Post JSY is an indicator dummy for the implementation of JSY. *Tribal* is a dummy for states with mostly tribal population, *Primary Educ* is a dummy for women with more than primary education, and *Poor* is a dummy for women living below the poverty line. Controls include age, education,wealth, caste and religion of woman, place of residence, education of husband, birth order of children, presence of health worker and ASHA in village, and distance to the nearest health facility. District and time fixed effects are included. Robust standard errors are clustered at the district level with significance levels at the 10, 5, and 1 percent.

Table A13 Heterogeneous Impact of JSY on Place of Delivery

	(1) Home	(2) Govt	(3) Pvt	(4) Home	(5) Govt	(6) Pvt	(7) Home	(8) Govt	(9) Pvt
Eligible	0.00200	0.0350***	-0.0368***	-0.0266***	0.0203***	0.00590	0.0213***	0.0464***	-0.0667***
	(0.004)	(0.004)	(0.003)	(0.006)	(0.005)	(0.004)	(0.005)	(0.004)	(0.004)
Eligible x Post JSY	-0.0177***	0.0385***	-0.0196***	0.00322	0.0211***	-0.0221***	-0.0334***	0.0324***	0.00127
	(0.004)	(0.004)	(0.004)	(0.006)	(0.006)	(0.005)	(0.005)	(0.005)	(0.004)
Eligible x Post JSY x Tribal	0.0578***	-0.0660***	0.00451						
	(0.015)	(0.015)	(0.007)						
Eligible x Post JSY x 5 Years Educ				-0.0510***	0.0461***	0.00627			
				(0.014)	(0.013)	(0.010)			
Eligible x Post JSY x 8 Years Educ				-0.0144	0.0181	-0.00354			
				(0.011)	(0.010)	(0.009)			
Eligible x Post JSY x 10 Years Educ				-0.0232*	0.00576	0.0149			
				(0.011)	(0.011)	(0.009)			
Eligible x Post JSY x 12 Years Educ				-0.0330**	0.0160	0.0131			
				(0.012)	(0.012)	(0.012)			
Eligible x Post JSY x 12+ Years Educ				-0.0445***	0.0173	0.0260*			
				(0.013)	(0.014)	(0.013)			
Eligible x Post JSY x Poor							0.0278***	-0.00735	-0.0193**
							(0.008)	(0.008)	(0.006)
Mean	0.612	0.229	0.152	0.612	0.229	0.152	0.612	0.228	0.152
Observations	277126	277126	277126	277126	277126	277126	276950	276950	276950
R^2	0.327	0.183	0.237	0.327	0.184	0.239	0.327	0.183	0.238

Notes: The table presents estimates from equation (2). The columns represent heterogeneous estimates of impact of JSY on the choice of place of delivery. Eligible is a binary variable that equals one if the woman is eligible for JSY benefits and zero, otherwise. Post JSY is an indicator dummy for the implementation of JSY. *Tribal* is a dummy for states with mostly tribal population, *Educ* is a dummy for women with different levels of education, and *Poor* is a dummy for women living below the poverty line. Controls include age, education,wealth, caste and religion of woman, place of residence, education of husband, birth order of children, presence of health worker and ASHA in village, and distance to the nearest health facility. District and time fixed effects are included. Robust standard errors are clustered at the district level with significance levels at the 10, 5, and 1 percent.

Table A14 Heterogeneous Impact of JSY on Antenatal Care

	(1) Any ANC	(2) Visits	(3) Timing	(4) Any ANC	(5) Visits	(6) Timing	(7) Any ANC	(8) Visits	(9) Timing
Eligible	-0.00398	0.00376	-0.0120**	-0.0528***	0.00383	0.00846	0.0165***	0.00197	-0.0181***
	(0.003)	(0.004)	(0.004)	(0.005)	(0.006)	(0.006)	(0.003)	(0.005)	(0.005)
Eligible x Post JSY	0.0403***	0.00761	0.000975	0.0572***	0.0113	-0.0424***	0.0305***	0.0145**	0.0118*
	(0.003)	(0.004)	(0.004)	(0.006)	(0.007)	(0.007)	(0.004)	(0.005)	(0.005)
Eligible x Post JSY x Tribal	-0.0557***	-0.00548	-0.00275						
	(0.015)	(0.016)	(0.015)						
Eligible x Post JSY x 5 Years Educ				-0.0115	-0.00697	0.0222			
				(0.013)	(0.015)	(0.015)			
Eligible x Post JSY x 8 Years Educ				-0.0373***	-0.0179	0.0365**			
				(0.009)	(0.011)	(0.012)			
Eligible x Post JSY x 10 Years Educ				-0.0531***	-0.0128	0.0450***			
				(0.009)	(0.011)	(0.012)			
Eligible x Post JSY x 12 Years Educ				-0.0291**	-0.0102	0.0716***			
				(0.010)	(0.013)	(0.013)			
Eligible x Post JSY x 12+ Years Educ				-0.0460***	0.00363	0.0976***			
				(0.009)	(0.013)	(0.014)			
Eligible x Post JSY x Poor							-0.00333	-0.0311***	-0.0516***
							(0.007)	(0.009)	(0.009)
Mean	0.719	0.441	0.368	0.719	0.441	0.368	0.719	0.441	0.367
Observations	277093	268913	286429	277093	268913	286429	276917	268737	286251
R^2	0.235	0.308	0.197	0.236	0.308	0.198	0.236	0.308	0.198

Notes: The table presents estimates from equation (2). The columns represent heterogeneous estimates of impact of JSY on the use of antenatal care. Eligible is a binary variable that equals one if the woman is eligible for JSY benefits and zero, otherwise. Post JSY is an indicator dummy for the implementation of JSY. *Tribal* is a dummy for states with mostly tribal population, *Educ* is a dummy for women with different levels of education, and *Poor* is a dummy for women living below the poverty line. Controls include age, education,wealth, caste and religion of woman, place of residence, education of husband, birth order of children, presence of health worker and ASHA in village, and distance to the nearest health facility. District and time fixed effects are included. Robust standard errors are clustered at the district level with significance levels at the 10, 5, and 1 percent.

APPENDIX B

Additional Figures

Figure B1 Distance to Nearest Health Facility

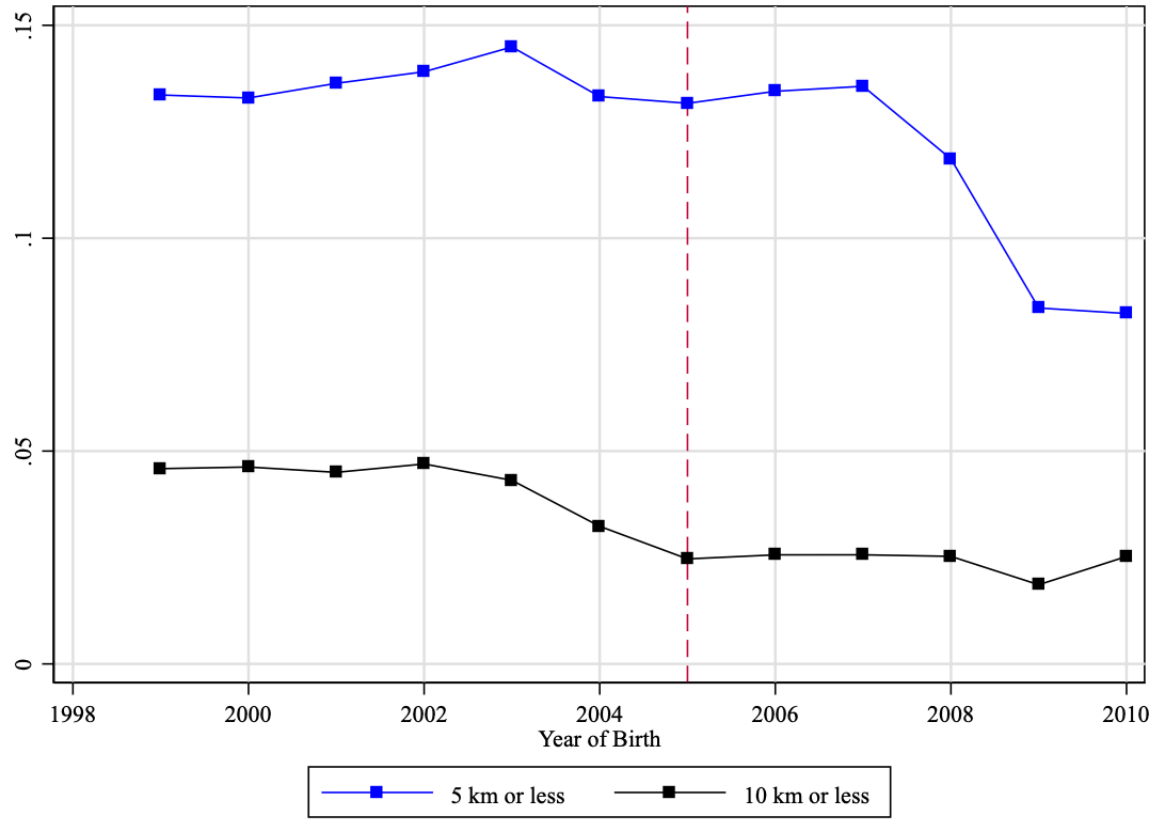
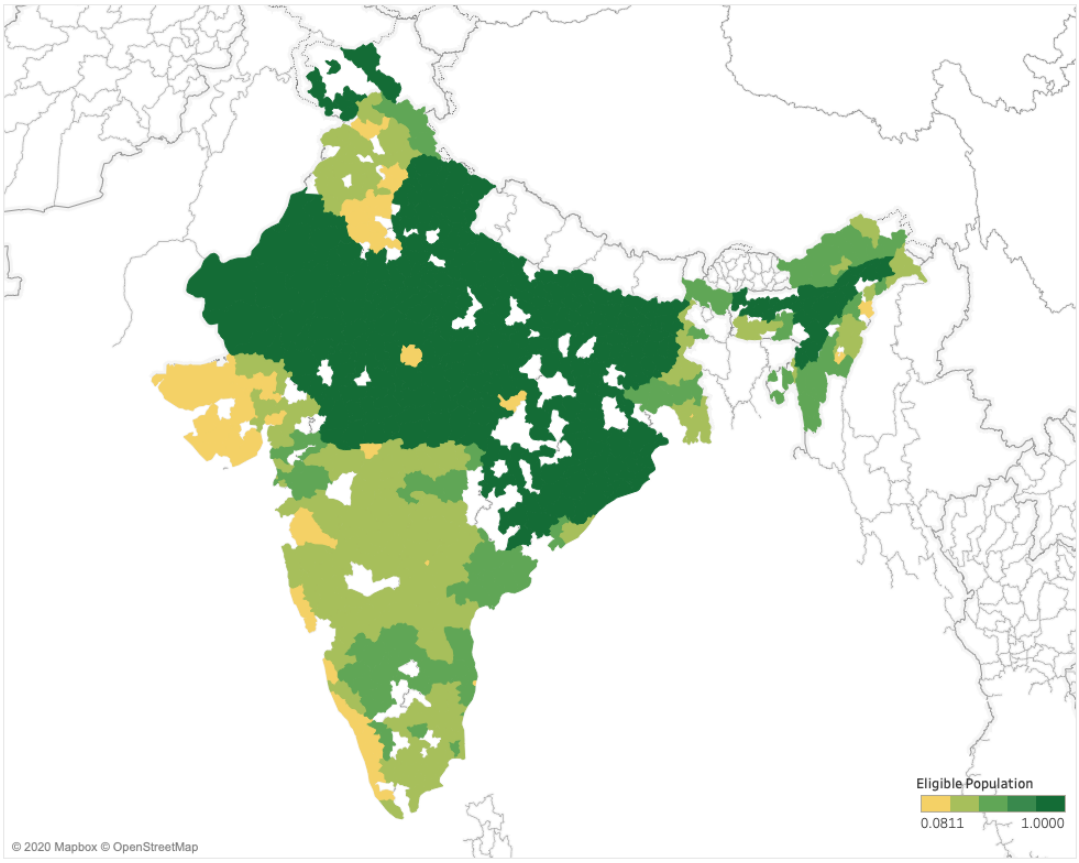


Figure B2 District-wise JSY Eligible Population



Source: Dataset compiled using DLHS II and DLHS III

Figure B3 Choices of Place of Delivery- High Performing States

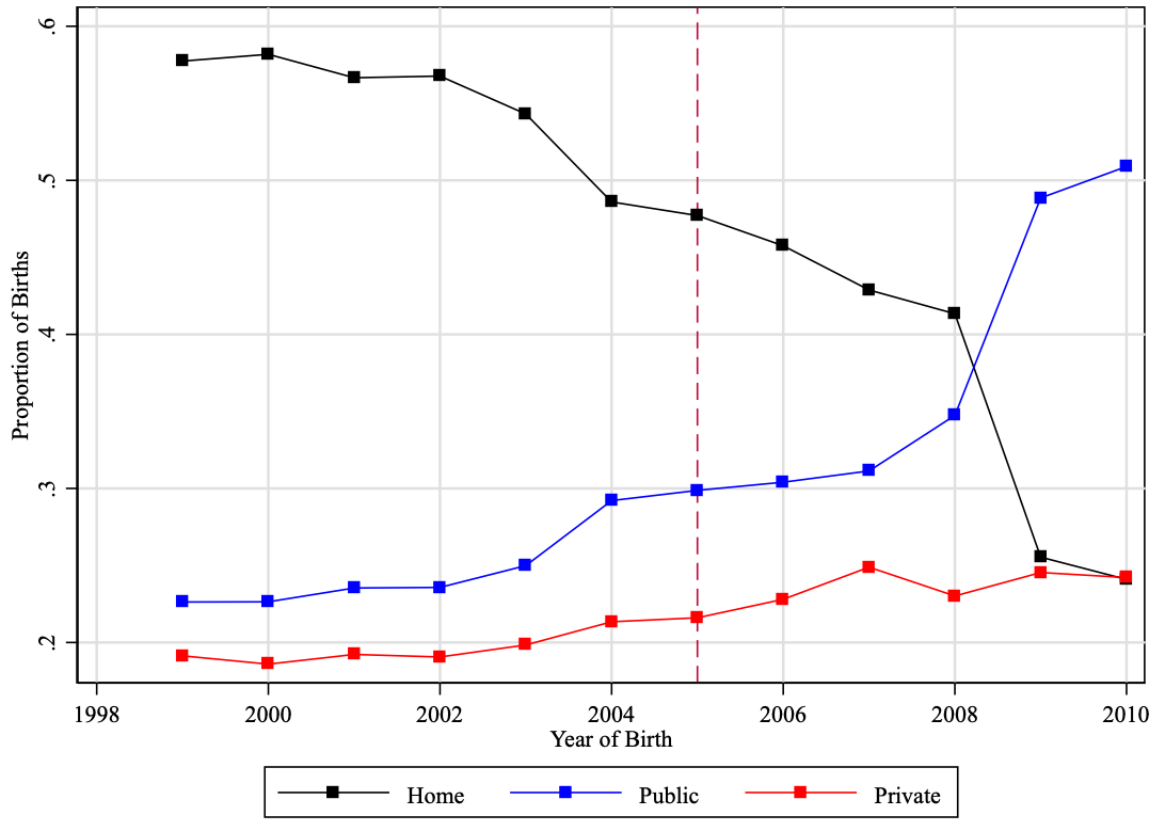


Figure B4 Choices of Place of Delivery by Eligibility

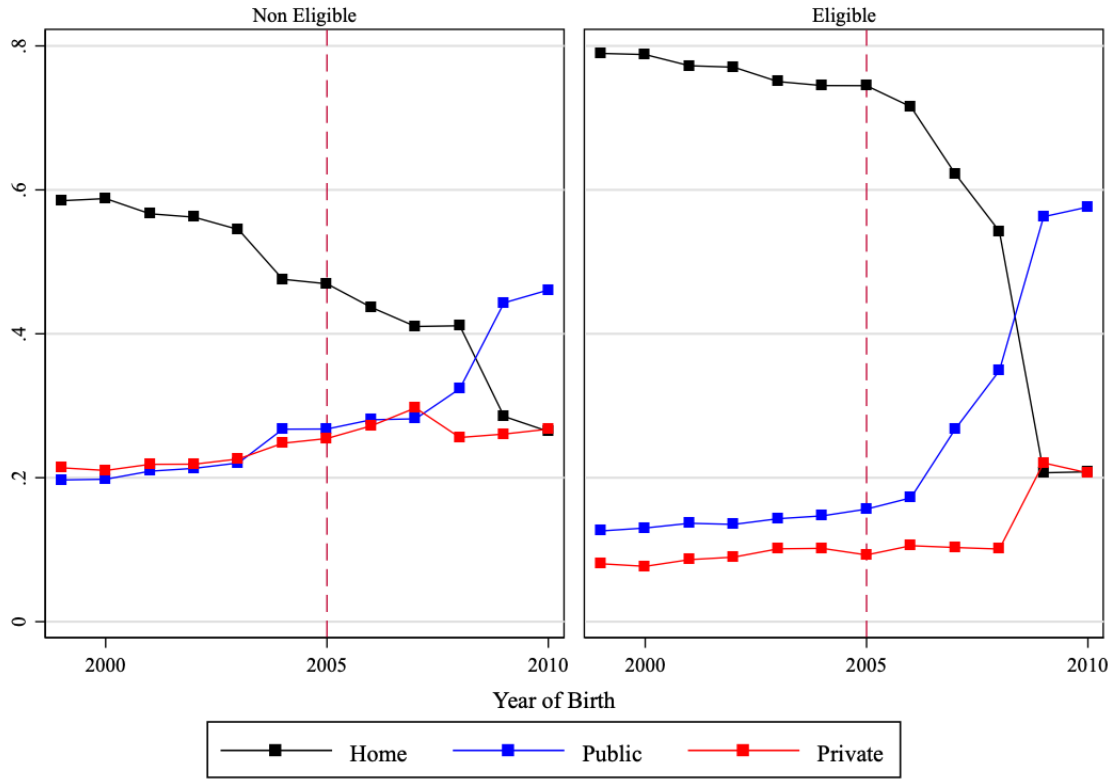
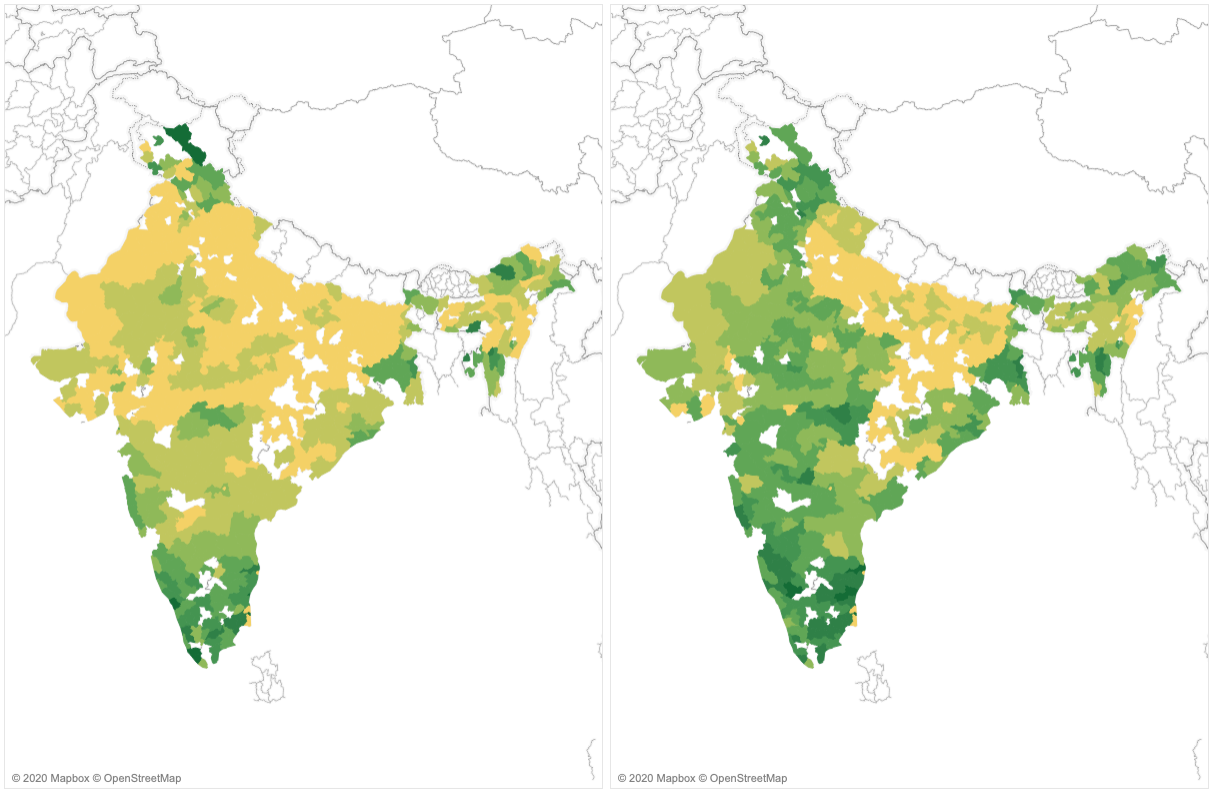
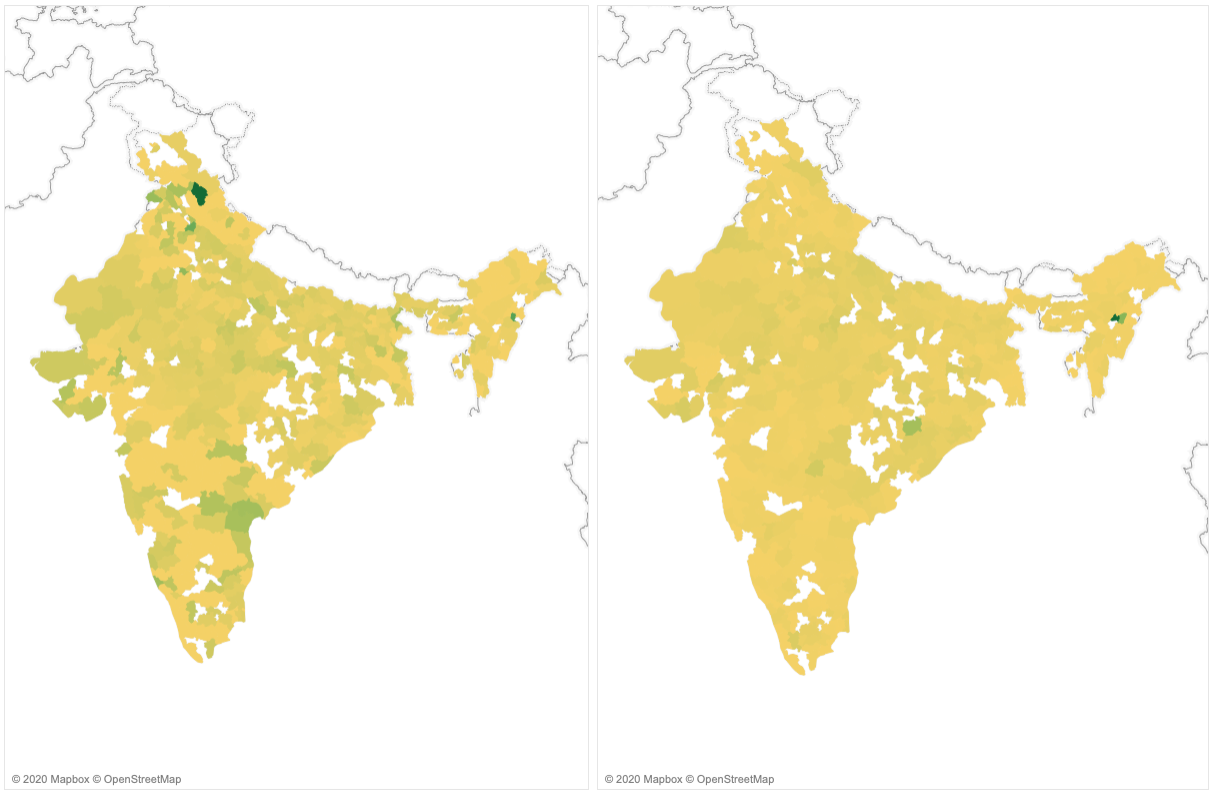


Figure B5 Utilization of Public Health Facilities for JSY Eligible Women



Source: Dataset compiled using DLHS II and DLHS III
Notes: The change in the average utilization of institutional delivery at public health facilities is illustrated by yellow (lowest) to green (highest). The missing districts in the survey are white in color.

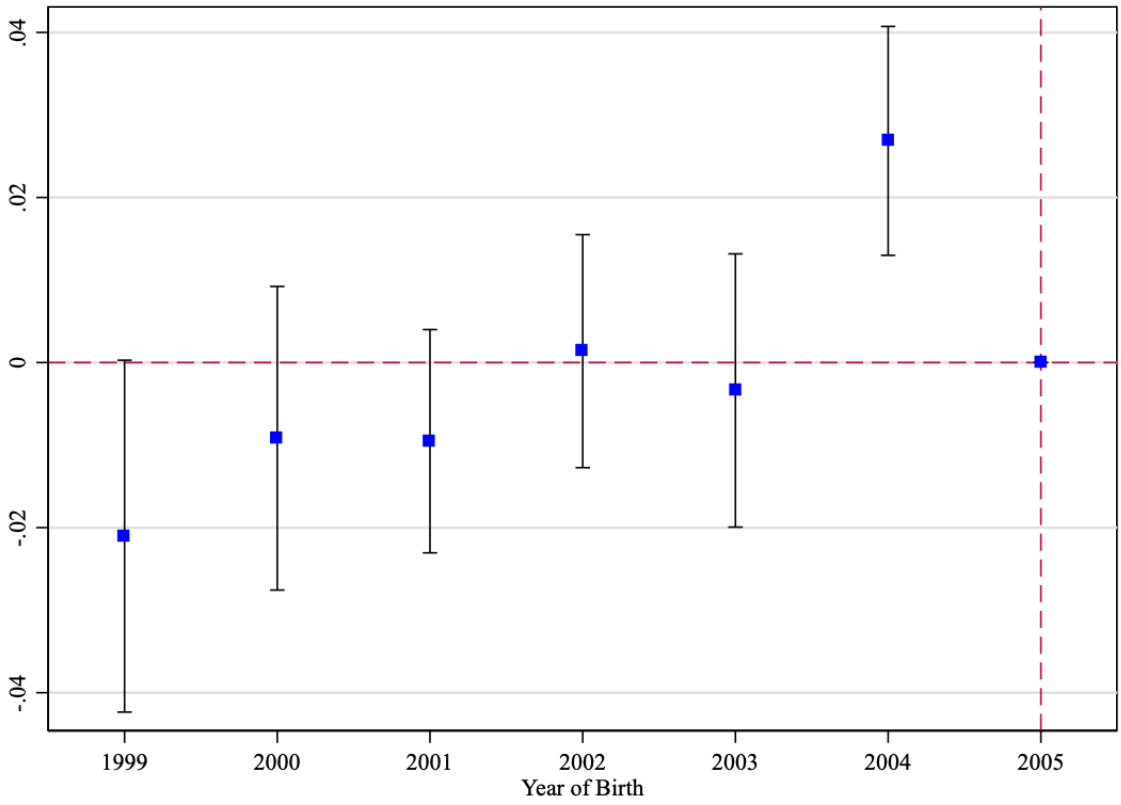
Figure B6 Neonatal Mortality Reported by JSY Eligible Women (Pre vs Post)



1

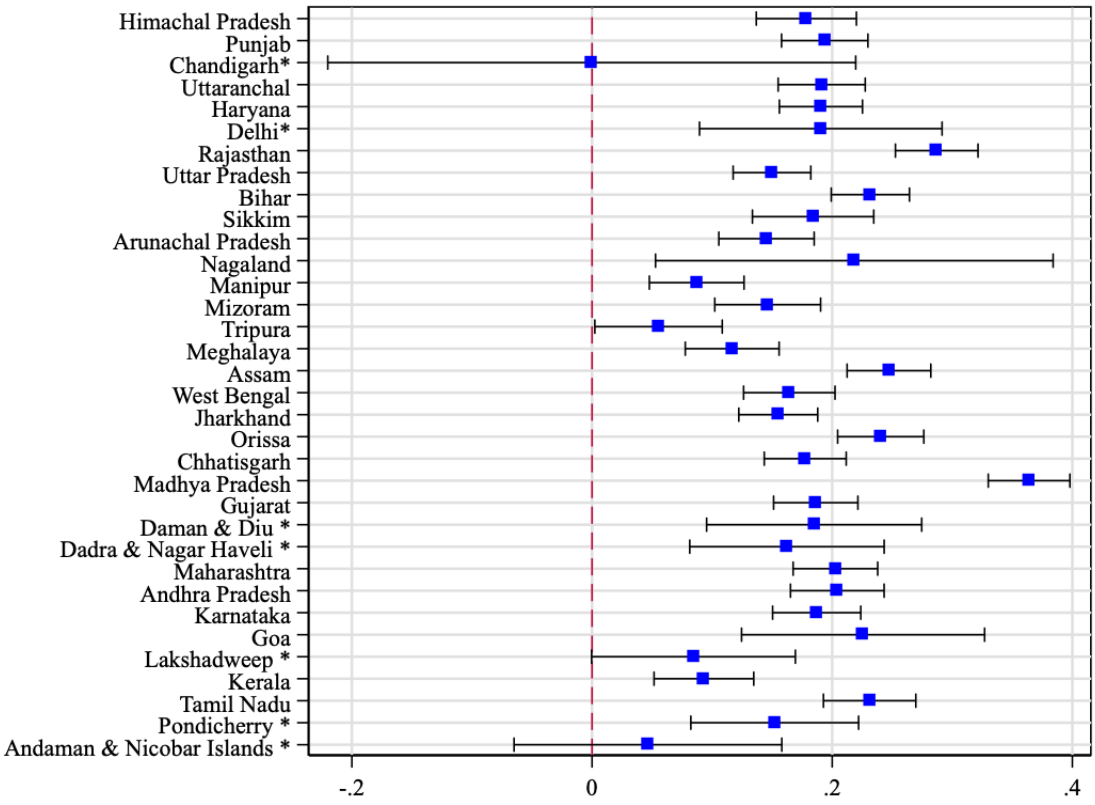
Source: Dataset compiled using DLHS II and DLHS III
Notes: The change in the average neonatal mortality is illustrated by yellow (lowest) to green (highest). The missing districts in the survey are white in color.

Figure B7 Parallel Trends: Sensitivity Analysis



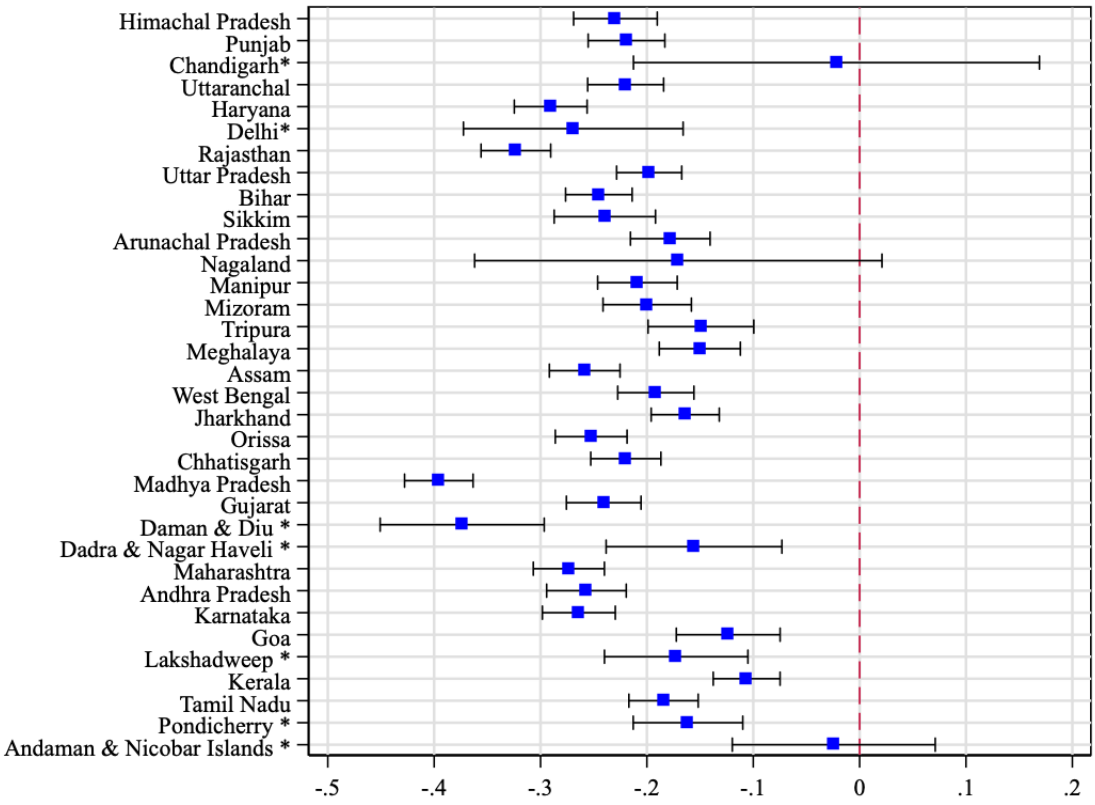
Notes: The estimates are from a difference-in-difference model with only pre-event years (1999-2004). The model is a sensitivity test for the assumption of parallel trends. As per the test, the estimated treatment effects for all pre-event years should be zero.

Figure B8 State-wise Impact of JSY on Public Institutional Delivery



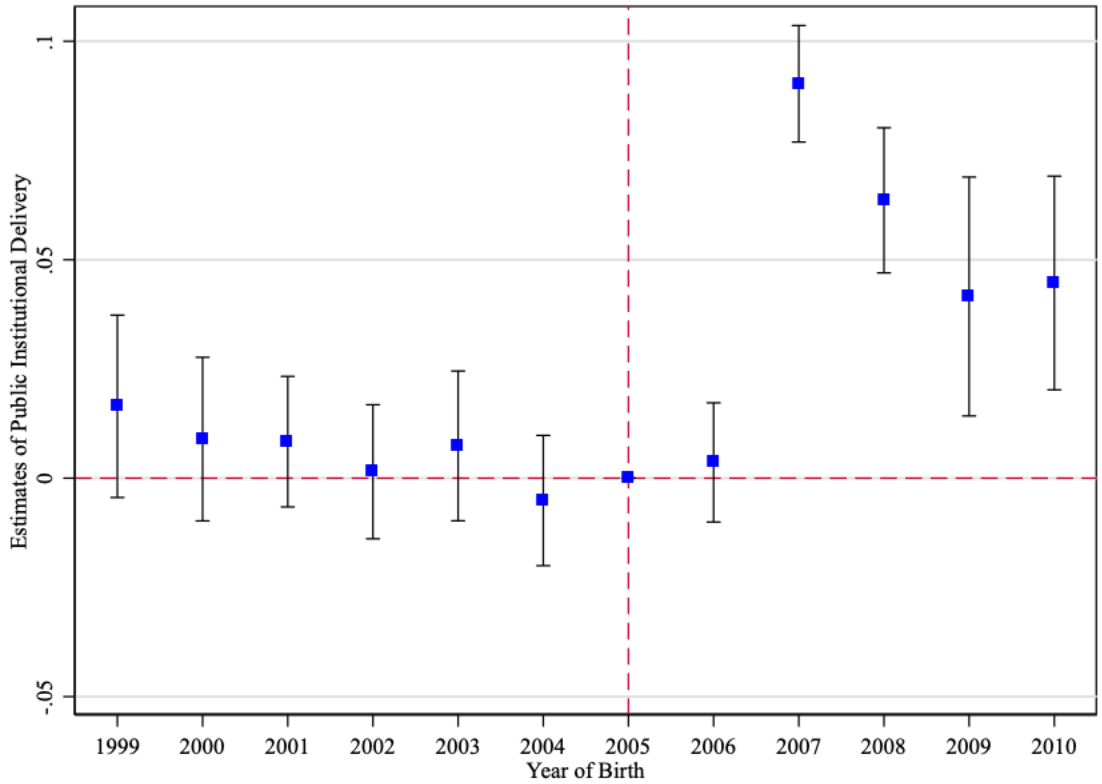
Notes: The dotted squares are the point estimates with 95 percent confidence intervals of the impact of the implementation of JSY on public institutional delivery in different states. * denotes the union territories while the rest are states. The controls include the individual and household characteristics, village and district-level health infrastructure. District and time fixed effects are included.

Figure B9 State-wise Impact of JSY on Home Births



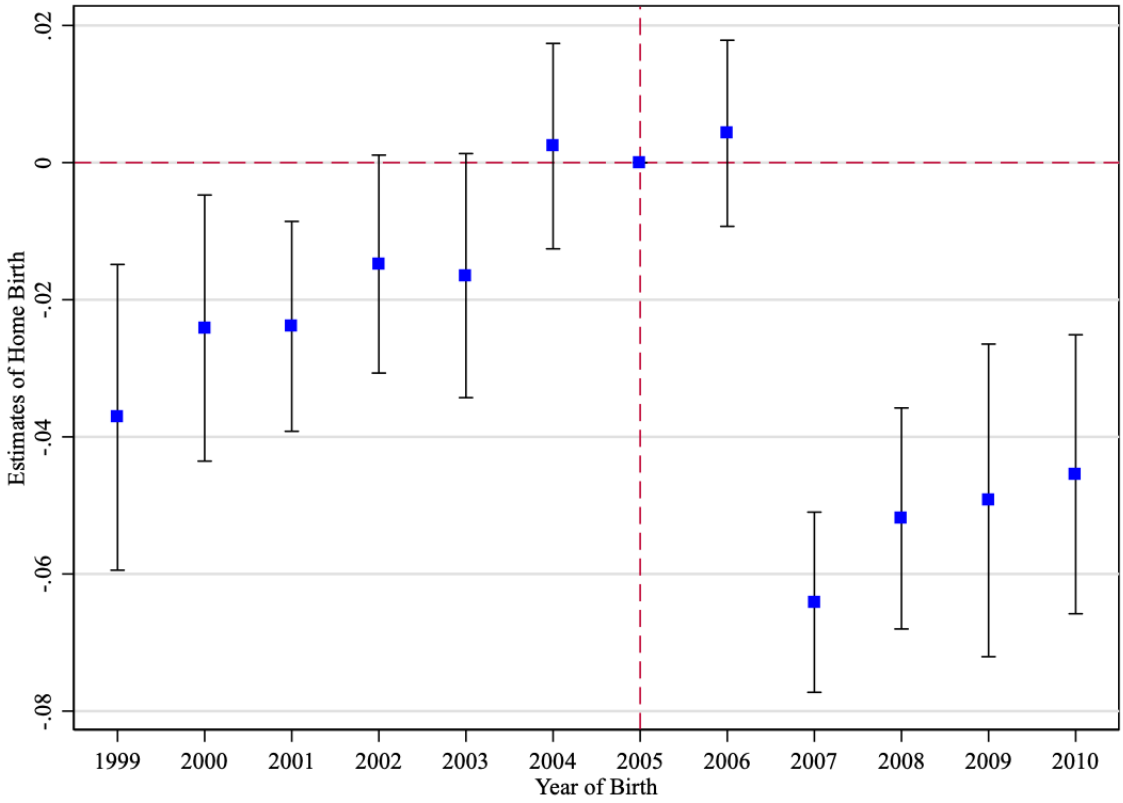
Notes: The dotted squares are the point estimates with 95 percent confidence intervals of the impact of the implementation of JSY on home births in different states. * denotes the union territories while the rest are states. The controls include the individual and household characteristics, village and district-level health infrastructure. District and time fixed effects are included.

Figure B10 Impact of JSY on Public Institutional Delivery- Event Analysis



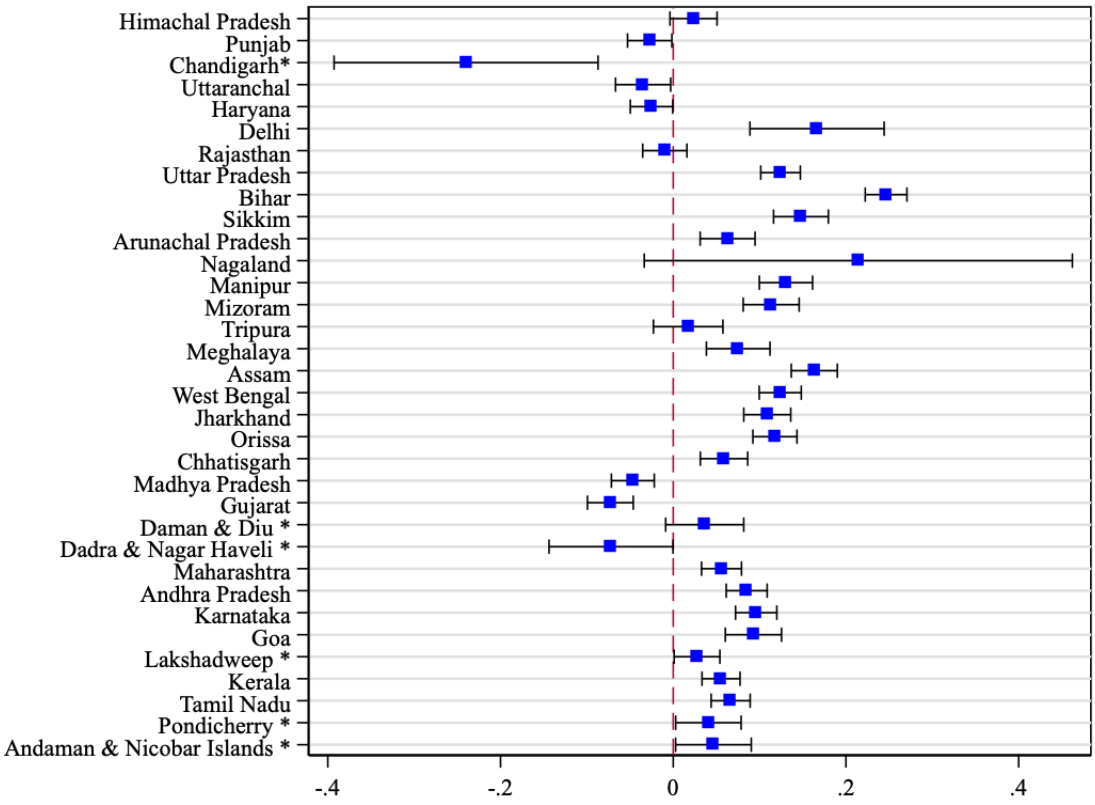
Notes: The dotted squares are the point estimates with 95 percent confidence intervals of the impact of the implementation of JSY on public institutional delivery in different years. The controls include the individual and household characteristics, village and district-level health infrastructure. District and time fixed effects are included.

Figure B11 Impact of JSY on Home Births- Event Analysis



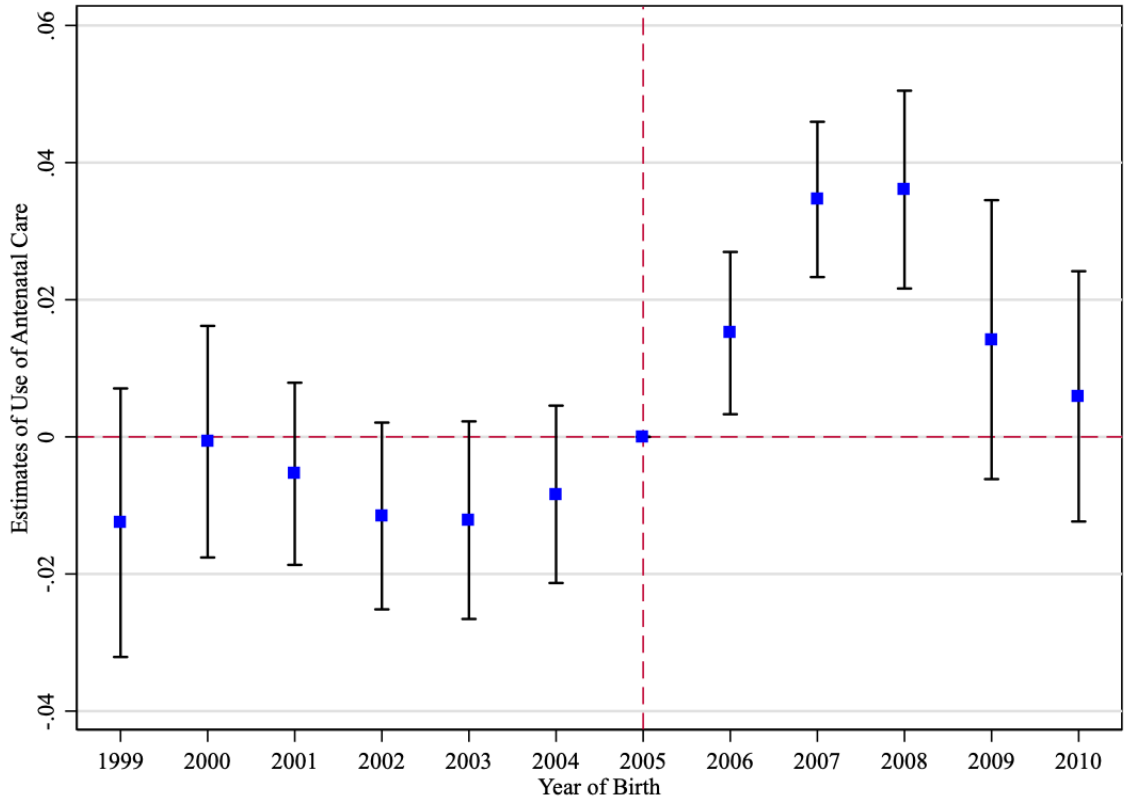
Notes: The dotted squares are the point estimates with 95 percent confidence intervals of the impact of the implementation of JSY on home births in different years. The controls include the individual and household characteristics, village and district-level health infrastructure. District and time fixed effects are included.

Figure B12 State-wise Impact of JSY on Antenatal Care



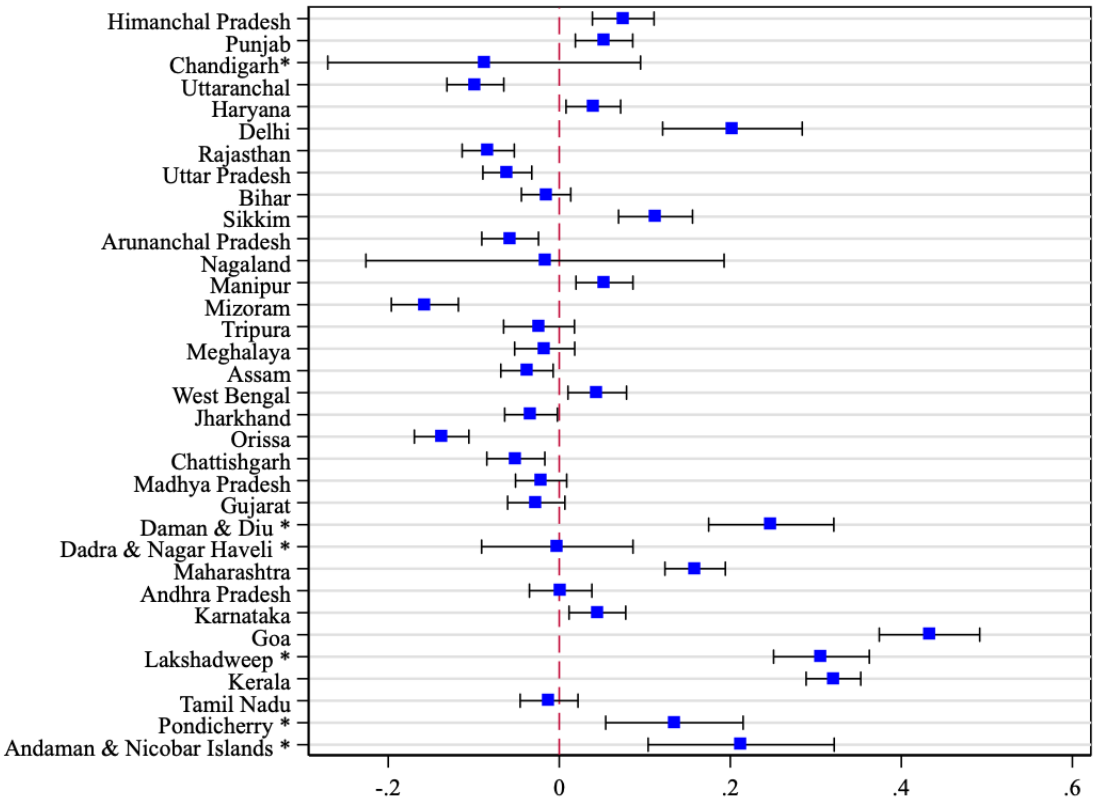
Notes: The dotted squares are the point estimates with 95 percent confidence intervals of the impact of the implementation of JSY on the use of any antenatal care in different states. * denotes the union territories while the rest are states. The controls include the individual and household characteristics, village and district-level health infrastructure. District and time fixed effects are included.

Figure B13 Impact of JSY on Antenatal Care- Event Analysis



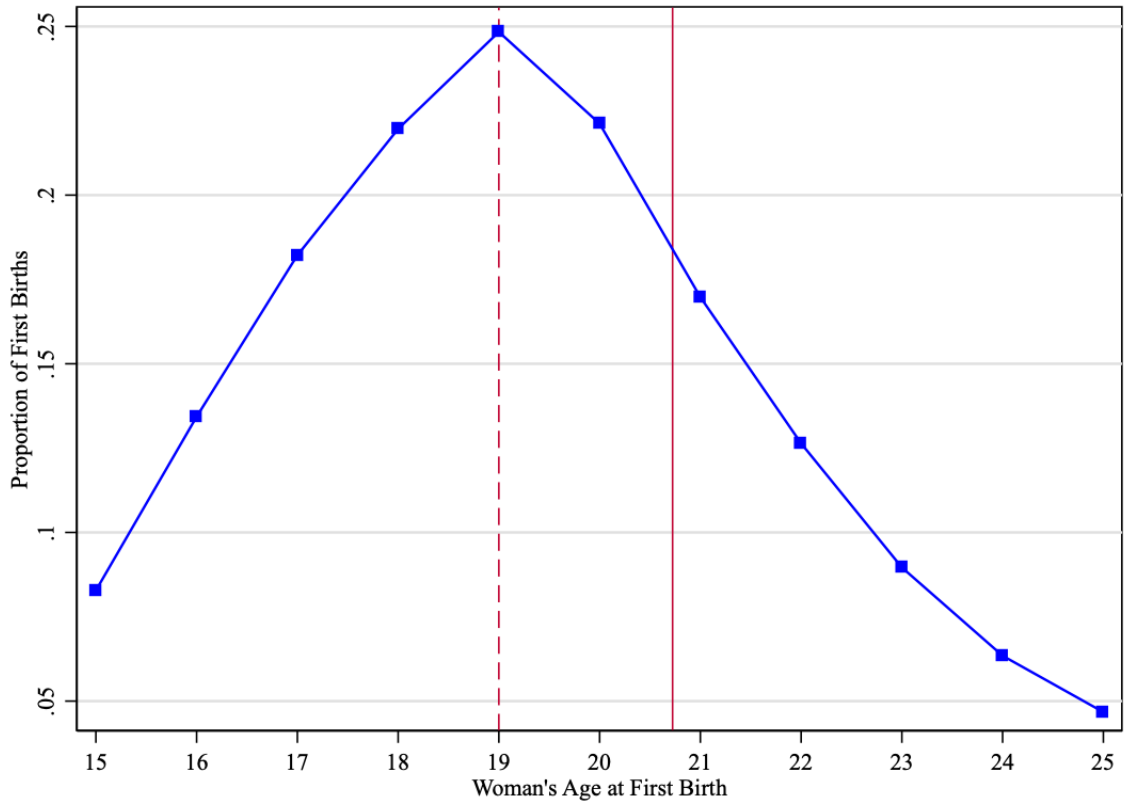
Notes: The dotted squares are the point estimates with 95 percent confidence intervals of the impact of the implementation of JSY on antenatal care in different years. The controls include the individual and household characteristics, village and district-level health infrastructure. District and time fixed effects are included.

Figure B14 State-wise Impact of JSY on Postnatal Care



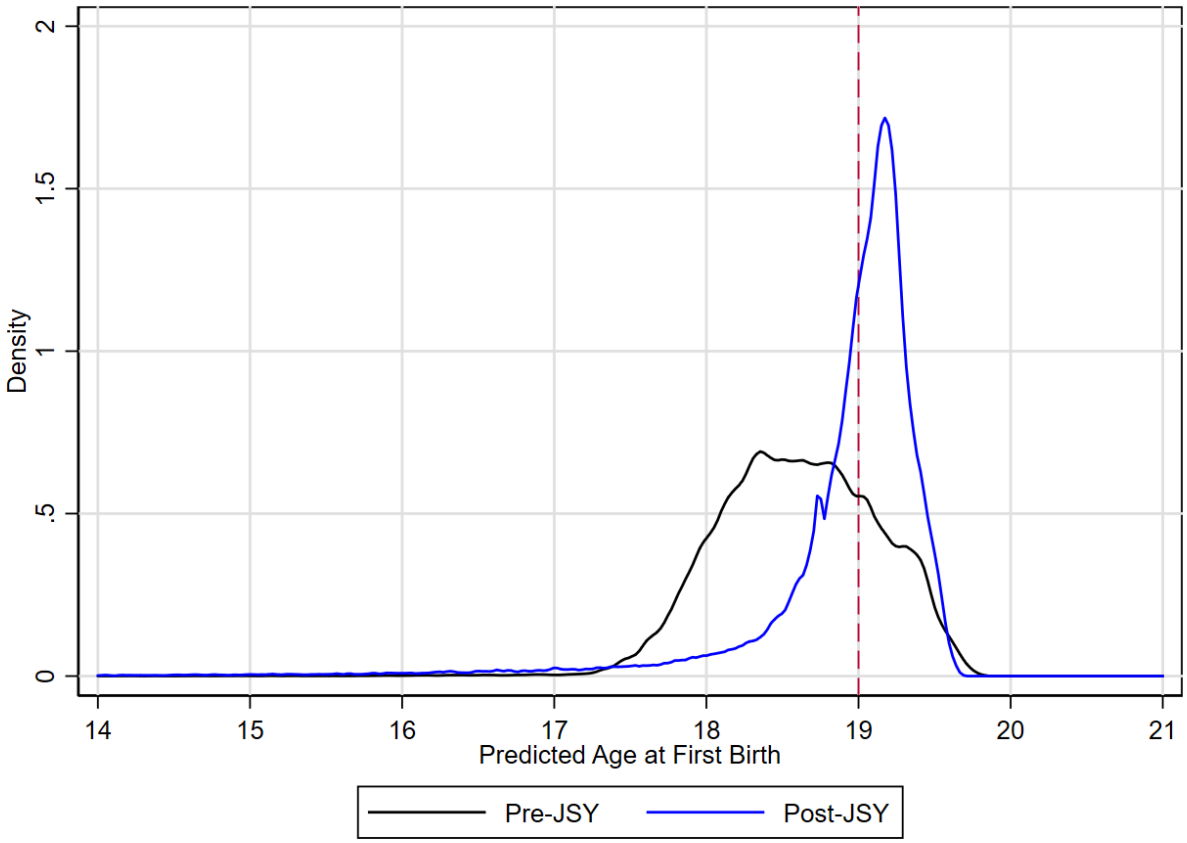
Notes: The dotted squares are the point estimates with 95 percent confidence intervals of the impact of the implementation of JSY on the use of postnatal care in different states. * denotes the union territories while the rest are states. The controls include the individual and household characteristics, village and district-level health infrastructure. District and time fixed effects are included.

Figure B15 Woman's Age at First Birth



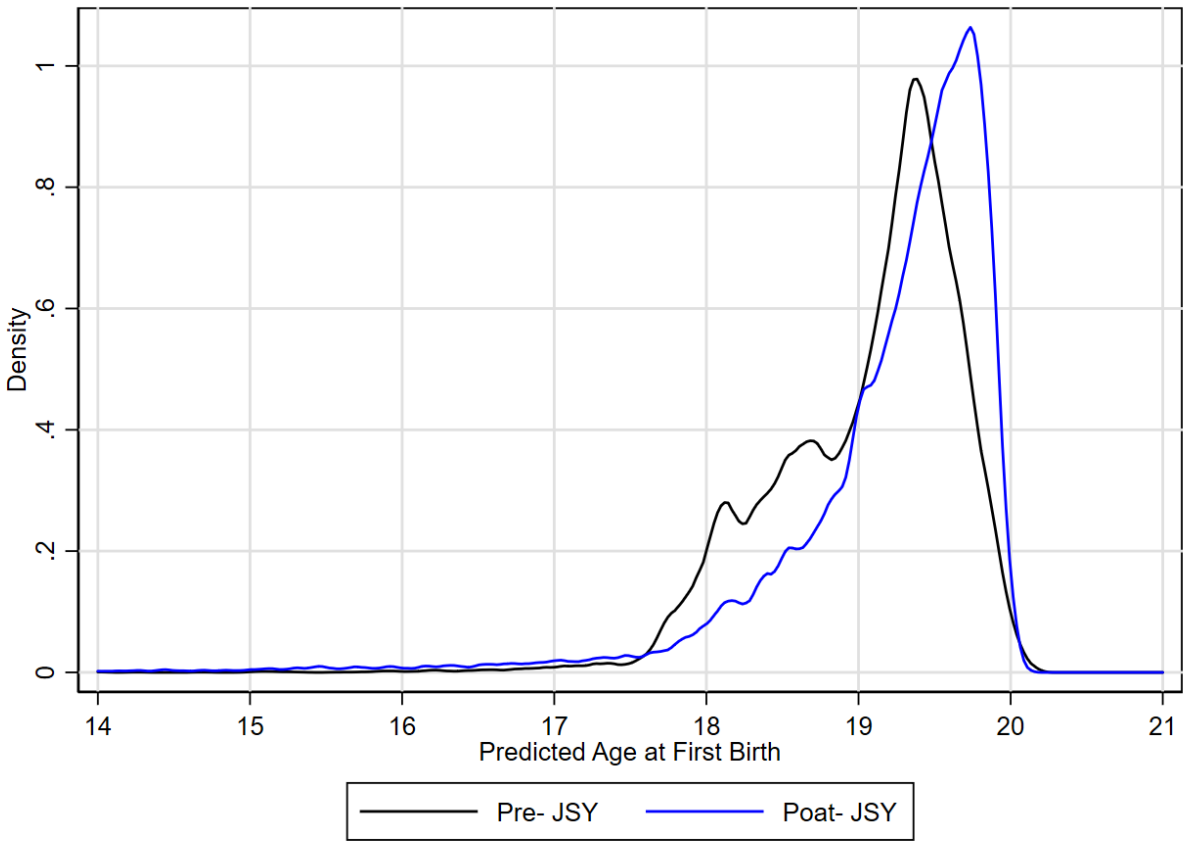
Notes: The dotted squares are the proportion of women with different woman's age at first birth. The red lines, dotted and solid, represent the eligibility age and the mean age at first birth, respectively.

Figure B16 Distribution of Age at First Birth for Eligible Women



Notes: The distribution of age at first birth for eligible women is calculated by estimating the survival functions accumulating the information on the hazard from age 15 to age of first birth. The predicted age is estimated from Table 4.3.

Figure B17 Distribution of Age at First Birth for Eligible Women (HPS)



Notes: The distribution of age at first birth for eligible women is calculated by estimating the survival functions accumulating the information on the hazard from age 15 to age of first birth. The predicted age is estimated from Table 4.3.

APPENDIX C

Discrete-Time Hazard Model

For the model, let us assume T is the woman's age at first birth which takes values t_j such that $t_j = \{15, 16, 17, ...30\}$[1]. The probability of the woman giving birth at time j, $T = t_j$ is given by

$$f(t_j) = f_j = Pr\{T = t_j\}$$

The survivor function, S_j, measures the probability of the woman 'surviving' a time period t_j by not giving birth and is given by

$$S(t_j) = S_j = Pr\{T \geq t_j\} = \sum_{j=15}^{T} f_j$$

The hazard at time t_j is the conditional probability of giving birth at that time given that woman has survived to that point such that

$$\begin{aligned} H(t_j) = H_j = P\{T = t_j | T >= j\} &= \frac{f_j}{S_j} \\ &= \frac{f_j}{(1 - H_1)(1 - H_2)....(1 - H_{j-1})} \end{aligned}$$

To translate the model using logistic regression, I change the discrete time hazard with conditional odds of giving birth at each time t_j such that

$$\frac{H(t_j|X)}{(1 - H(t_j|X))} = \frac{H_0(t_j)}{1 - H_0(t_j)} e^{\mathbf{X}\boldsymbol{\beta}}$$

where $H(t_j|X)$ is the conditional hazard of giving birth at time t_j based on a set of covariates, X, and $H_0(t_j)$ is the baseline hazard at time t_j. By taking logs on both sides, we

[1]Since around 99 percent of the women in the sample have had their first birth before the age of 30, I assume that women with first births after 30 are outliers to the sample.

get logit of the hazard of giving birth at t_j given survival up to that time.

$$Logit\lambda(t_j|X) = Logit\lambda_0(t_j) + \mathbf{X}'\boldsymbol{\beta} = \alpha_j + \mathbf{X}'\boldsymbol{\beta}$$

where the model will essentially treat time of birth as a discrete factor by introducing one parameter α_j for each possible time of birth t_j.

Since I want to estimate the impact of eligibility rules of JSY program on age at first birth, the estimated effect is a ratio of the hazard for those in the treatment group to the hazard for those in the control group. Additionally, since the eligibility rules, by themselves, have a component of age at first birth, the estimation results would be biased. Therefore, I use the concept of *potential eligibility* for estimating the impact of JSY on woman's age at first birth. Potential eligibility is defined by the exogenous components of the eligibility criteria, namely belonging to either SC/ST caste or living below the poverty line.

$$\begin{aligned} Logit\lambda(t_j|X) = \boldsymbol{\alpha}(\mathbf{BirthTime}) + \delta_1(Eligible_i^{JSY}) + \sum_{t=2000}^{2010} \Gamma_t(Time_t) \\ + \sum_{t=2000}^{2010} \gamma_t(Eligible_i^{JSY} * Time_t) + \boldsymbol{\zeta}(\mathbf{BirthTime} * Eligible_i^{JSY}) \\ + \sum_{t=2000}^{2010} \eta_t(\mathbf{BirthTime} * Time_t * Eligible_i^{JSY}) + \mathbf{X}\boldsymbol{\beta} + \epsilon_{ij} \end{aligned} \tag{C.1}$$

where $\boldsymbol{\alpha}(\mathbf{BirthTime}) = (\alpha_1 D15 + \alpha_2 D16 + ... + \alpha_{16} D30)$ and $D15$ to $D30$ are age-time dummies for woman's potential first birth age. $Eligible_i^{JSY}$ is an indicator for JSY- potentially eligible women while $Time_t$ are year dummies.

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VITA

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Prior to joining graduate school at Georgia State University, she worked at various think-tanks and research organizations in India. At the Indian Institute of Management, Ahmedabad, she was responsible for conducting an impact evaluation study on rural connectivity projects in Gujarat. Once the project was approved, she traveled to the rural districts of the state to conduct interviews with village heads about the newly constructed roads, and wrote the report indicating the impact of the rural connectivity on access to education and health facilities, markets, and employment opportunities.

After the project, she joined ICRIER's newest branch, Health Policy Initiative, to research and recommend policy changes for the quality, safety and efficacy of drugs in India. Particularly, she worked on regulations related to clinical trials and new drug launches and co-authored a paper on the challenges and prospects for clinical trials in India.

At Georgia State University, she works in the fields of health economics, development economics, the economics of education, and public policy evaluations. She primarily focuses on programs and policies that affect women and child healthcare. Her job market paper evaluates the impact of financial incentives on women's health behavior, fertility choices, and child mortality.