Do Financial Incentives for Maternal Healthcare Matter?: Evidence from Programs in India

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Abstract

This paper evaluates the impact of financial incentives provided by *Janani Suraksha Yojna* (JSY), a conditional cash transfer program, on maternal health behavior and child mortality in India. JSY provides cash assistance for delivery at public facilities; it alters women's choices by changing the relative prices of different delivery options. Using a difference-in-differences approach, I exploit JSY eligibility variations across individuals and states and the program's timing to estimate its impact. I find that JSY significantly increases public facility deliveries. The increase comes from shifts away from both home births and private facility delivery. Besides, the decline in private facilities' use is considerably larger than the decline in home births. I find a modest effect of the program on child mortality, explained by the small decrease in home births. I also estimate the impact of JSY eligibility on women's pregnancy timing using a discrete-time hazard model. I find that the program reduces teen pregnancies. I further estimate the impact of JSY on the use of ante- and post-natal services, and its heterogeneous impact on women by education, wealth, and social group. Policymakers could integrate the program with financial incentives for other supporting healthcare services to improve health outcomes further.

JEL Codes: D04, I12, I18

Keywords: JSY, conditional cash transfer program, demand-side financing, maternal services

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1 Introduction

More than 2.8 million pregnant women and newborns die every year. 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 (Reed et al., 2000; Carroli et al., 2001; Gray et al., 2006). Studies have identified the lack of financial resources as one of the primary factors 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 a large-scale maternal healthcare program in India on women's healthcare behavior.

In 2005, India launched a conditional cash transfer (CCT), *Janani Suraksha Yojna* (JSY), to provide incentives to women to utilize institutional delivery at public health facilities. JSY aims to reduce maternal and infant mortality by integrating cash assistance with delivery care. Using information from different administrative surveys, I study the program's impact 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 increased 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 just one particular service, best promote maternal and child health.

With this paper, I contribute to the literature on maternal and child healthcare in three 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 rich data on healthcare supply variables 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, I add to the extensive literature on demand-side financing maternal healthcare programs.

I hypothesize that cash transfers under JSY change the relative prices of different healthcare-seeking options and alter women's decisions. 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 this result seems counter-intuitive, I postulate that women substitute expensive postpartum check-ups for the free immediate 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. The modest effect can be explained by the small shift from home births to health institutions which is not large enough to reflect changes in child health outcomes. Also, the lacunae in the public healthcare system could explain the results.

One of the program's eligibility criteria is based on women's age when giving birth.

Thus, I expect JSY eligibility to influence women's decisions regarding the timing of their pregnancy. I find that the eligibility criteria increases the probability of postponing one's first birth to at least 19 years of age. Since pregnancy-related complications are the leading causes of death among teenage girls, my results suggest that JSY might impact teen maternal mortality.

The paper continues in seven subsequent sections. Section 2 presents background information about India's healthcare landscape, followed by a detailed outline of JSY. Further, it discusses the literature related to maternal and child healthcare programs. Section 3 presents the data and discusses some conceptual definitions. Section 4 provides a detailed discussion of the research design implemented in this paper. Section 5 presents the main results for the impact of JSY on various utilization outcomes and child mortality; it analyzes alternative explanations that could potentially drive the results. Section 6 presents the results for the impact of JSY eligibility on woman's age at first birth. Section 7 discusses policy implications, and section 8 concludes the paper.

2 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 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 all 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).

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). 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.

2.1 *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 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. By restricting the age of participation above 19 years and the number of children at at most two, JSY intends to reduce fertility rates 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. 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., 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.

2.2 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 pro-

[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.

gram'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 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.

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 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 '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.

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. Additionally, women are more willing to participate in JSY as a response to ASHAs' support services and not by the cash incentive.

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.

3 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[2], and a Maternity and Child Welfare Centre[3].

Published annually since 2005, Rural Health Statistics (RHS) provide infrastructural

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

[3] 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.

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). The construction of newer facilities reduced the distance to the nearest available health resources, making formal care more accessible. 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.

Using these data sources, 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[4]. Another direct outcome is the presence of a skilled health professional[5] 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

[4]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.

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

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[6]. 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.

Table 1 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 3 shows the changes in the choice of place of delivery over time. The online appendix provides further details on the descriptive statistics.

4 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.

[6]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.

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:

$$\begin{aligned} Y_{idt} = \beta_0 + \beta_1 Eligible_{id}^{JSY} + \beta_2 Post_t + \beta_3 (Post_t X Eligible_{id}^{JSY}) \\ + \beta_4 X_{idt} + \beta_5 \gamma_d + \beta_7 \gamma_t + \epsilon_{idt} \end{aligned} \tag{1}$$

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)[7]. The post-treatment variable, $Post_t$, is a time indicator for the implementation of JSY (=1 if t$\geq$ 2005)[8]. β_1 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

[7]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.

[8]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 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)

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 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 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[9]

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.

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[10] (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

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

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

delivery after JSY cash transfers began. Since the private and public 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.

5 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.

5.1 Place of Delivery

Table 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.

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 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)[11] and information[12]. 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 are either strongly limited by financial costs or are bounded by beliefs and cultural practices[13]. 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 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

[11] 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.

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

[13] 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.

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[14], the effective prices reduction with cash transfers are quite small to alter women's behavior. Therefore, I find no evidence of a change in the use of public facilities for delivery care.

5.2 Antenatal Care

Table 3 presents the results of equation (1) on the outcomes of antenatal care. Column (1) estimates the impact of JSY on any type antenatal care used by women[15], 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. Panel B suggests no evidence of imapct of JSY on antenatal care in HP states.

The results can be explained by the interaction of women with formal healthcare system under the program (Table 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

[14] 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.

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

delivery 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.

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, I infer that it indirectly impacts maternal mortality.

5.3 Postnatal Care

Table 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.

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 although the cash incentives under the program are not conditional upon the utilization of postnatal services, the increase in the use of cost-less changes is due to the mother's interaction with ASHAs and formal care institutions and professionals during her visits.

5.4 Child Mortality

Table 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[16], and even neonatal mortality[17].

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 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 1.8 infants per 10,000 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. Another explanation could be that the public health facilities lack the required quality of services (Hulton et al., 2007).

5.5 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

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

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

experience relatively larger gains from the program. I estimate impact heterogeneity using the following specification:

$$\begin{aligned} Y_{idt} =& \beta_0 + \beta_1 Eligible_{id}^{JSY} + \beta_2 Post_t + \beta_3 Characteristic_i + \beta_4 (Post_t \times Eligible_{id}^{JSY}) \\ &+ \beta_5 (Post_t \times Characteristic_i) + \beta_6 (Characteristic_i \times Eligible_{id}^{JSY}) \\ &+ \beta_7 (Characteristic_i \times Eligible_{id}^{JSY} \times Post_t) + \beta_8 X_{idt} + \beta_9 \gamma_d + \beta_{10} \delta_t + \epsilon_{idt} \end{aligned} \tag{2}$$

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 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 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.

6 JSY and Fertility Choices

In this section, 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. Narrow spacing between pregnancies or a higher number of pregnancies pose severe implications for all future pregnancies including a higher risk of maternal and infant mortality. 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 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 5a 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 5b, 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.

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* 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. 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:

$$\begin{aligned} Y_i = & \beta_1 + \beta_2 PotentialEligible_i^{JSY} + \beta_3 PostJSY_t \\ & + \beta_4 (PotentialEligible_i^{JSY} \times PostJSY_t) + \beta_5 X_{ivdt} + \gamma_d + \gamma_t + \epsilon_{ivdt} \end{aligned} \tag{3}$$

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.

I run equation (3) using the sample of all women at least 19 years and above[18]. The results are presented in Table 11. 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 point more likely to have their first birth

[18] 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.

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) for each age between 15 and 30 years, i.e. t={15,16,...29,30}[19]. This estimates the impact of JSY eligibility rules on woman's decision to give birth at different ages. Table 12 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[20]. 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.

The two sets of estimates (Tables 11 & 12) 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[21] (Mistry et al.,

[19] 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.

[20]

[21] 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.

2009).

To formally estimate the impact of JSY on a woman's decision to postpone pregnancy, I use a discrete-time hazard model (Appendix C). 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[22]. The estimation is given by the following equation:

$$\begin{aligned} Logit\lambda_i(a_j) = \boldsymbol{\alpha}(\mathbf{BirthTime}) + \delta_1(Eligible_i^{JSY}) + \sum_{t=2000}^{2010} \Gamma_t(Time_t) \\ + \sum_{t=2000}^{2010} \gamma_t(Eligible_i^{JSY} \times Time_t) + \boldsymbol{\zeta}(\mathbf{BirthTime} \times Eligible_i^{JSY}) \\ + \sum_{t=2000}^{2010} \eta_t(\mathbf{BirthTime} * Time_t * Eligible_i^{JSY}) + \mathbf{X}\boldsymbol{\beta} + \gamma_d + \epsilon_{ij} \end{aligned} \tag{4}$$

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.

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.

Studies have evaluated the effect of women's autonomy on fertility and family planning (Abadian, 1996; Saleem and Bobak, 2005).

[22]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 $a = 20, 21, .., 29, 30$.

Figure 6 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.

Column (1) from Table 13 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. The results are consistent for women living in high performing states as stated in column (2).

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 7a and 7b 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 13. 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.

7 Discussion

The results documented in previous sections suggest that JSY increases the overall utilization of institutional delivery and antenatal services. Compared to the earlier studies on JSY, I document a relatively smaller increase in these outcomes. I argue that a flawed definition of the treatment variable in many previous studies leads to the overestimation in their studies (Lim et al., 2010; Powell-Jackson et al., 2015). A few other studies fail to control for the changing healthcare infrastructure concurrent with JSY implementation, thus overestimating the program's impact (Das et al., 2011; Rahman and Pallikadavath, 2018). Unlike previous studies, I use ample healthcare supply measures from various sources to counter the effect of changes in healthcare demand due to an increased supply of services. 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 the complete criteria for individual eligibility[23] and the timing of the program to estimate its impact on healthcare utilization. Additionally, this study is the first to examine the effect of JSY eligibility on women's age at first birth; there are no prior estimates for comparing my results.

My results have several important policy implications. First, financial incentives act as positive reinforcements for inducing a change in the targeted health behavior. The results show that conditional cash transfers lead to a significant increase in public institutional delivery. While various financial incentives programs are running worldwide, JSY is one of the few programs that provide a one-time direct cash assistance to women for a particular behavior. Nepal introduced a similar 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). Programs based on continuous payouts to households show a relatively higher impact on target behavior (Sosa-Rubí et al., 2011).

Second, the results suggest an indirect effect on maternal mortality. Direct obstetric mortality 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 deaths. 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 the program also affects the pregnancy timing of eligible women. To become JSY eligible, women shift their first birth after the age of 19 years. This could indirectly reduce complications in teen pregnancies and thus, reduce teen mortality. On the other hand, I find that eligible women reduce their postnatal checkups after JSY.

[23]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.

The reduction of care post child delivery could result in ill health, disabilities, and deaths among both women and newborns, thus increasing mortality rates (Li et al., 1996). Future studies should merge additional indicators from other administrative sources to study the program's impact on maternal mortality.

Third, I find a modest association between JSY and child mortality. One possible explanation concerns the small reduction in home deliveries. The effect on institutional utilization is not large enough to translate into significantly better child health outcomes. The lacunae in the public healthcare system could also explain the results. Public healthcare facilities provide sub-optimal care and fail to recognize high-risk cases, leading to only a modest decline. From a policy perspective, the program could be supported by higher availability and quality of care at public institutions. The program's specific target on 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.

Fourth, the paper's evidence on the effects of JSY on health behaviors points towards the need for policymakers to be cautious when defining the targeted groups (de Brauw and Peterman, 2020; Sosa-Rubí et al., 2011). I find that the increase in public institutional delivery 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 additional women to formal maternal care. Further, the analysis of the heterogeneity of the program's impacts 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. The impact of JSY may be missing the most vulnerable populations.

Fifth, intrafamilial decision-making affects women's ability to access and use maternal health services. The program needs be integrated better with other social schemes to increase awareness about maternal healthcare within households. Future research could tap into evaluating the impact of financial incentives on household behavior.

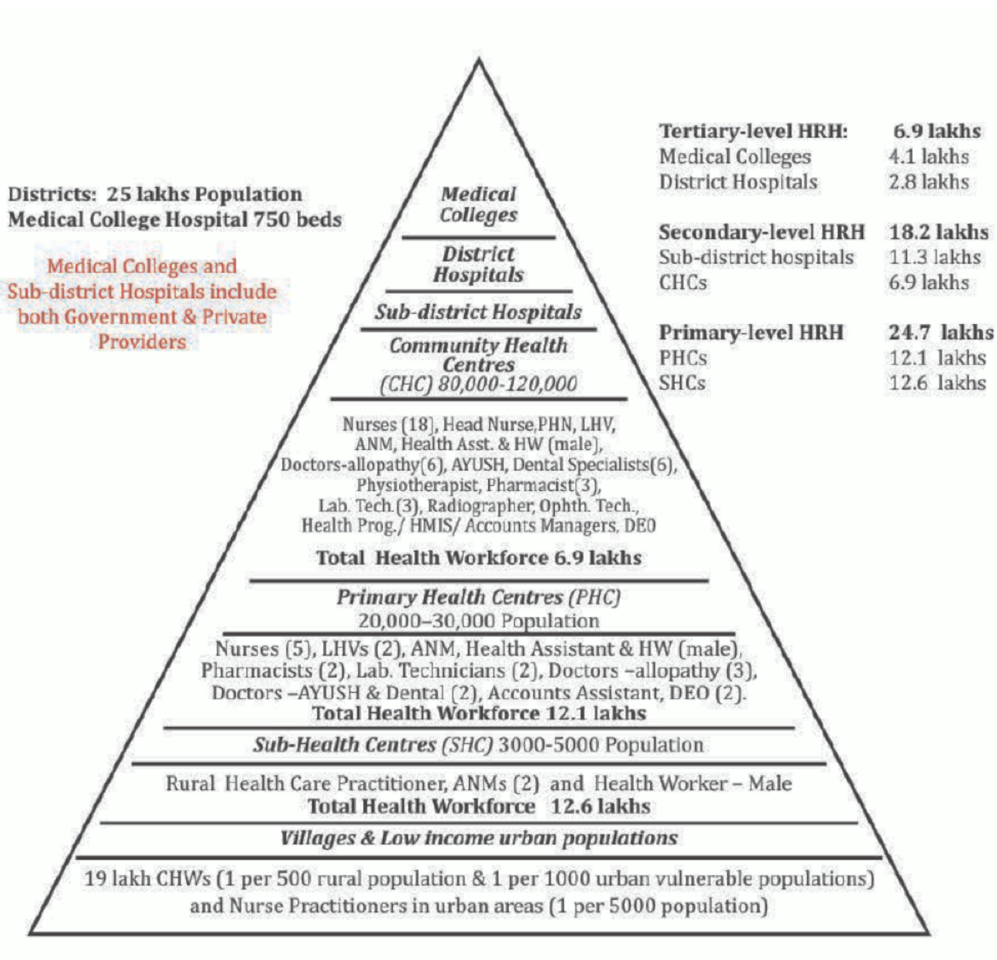
8 Conclusion

Introduced in 2005, JSY uses targeted financial incentives to increase the utilization of public institutional delivery. The cash transfers provided under JSY change the relative price of different delivery options and alter women's maternal healthcare decisions. My results suggest that the program significantly increases in-facility deliveries. It shifts women away from home and private facilities to public facilities. The decline in private facility utilization is relatively more significant than the decline in home births; this suggests that many of the program's benefits accrue to those who would otherwise have chosen an institutional delivery. The program reduces postnatal services as women substitute for it with immediate in-facility care received during their delivery. JSY does not have a significant impact on child mortality. This can be explained by the smaller shift of births away from home to health institutions and the lacunae in the public healthcare system. Additionally, JSY eligibility induces women to shift their first pregnancy by 3-4 months and reduces teen pregnancies. I intend to look at the interaction of health and human capital to study whether JSY eligibility affects women's school graduation rates.

The collective argument presented in the paper reinforces that demand-side interventions can be effective in improving the uptake of health services but that alone may be insufficient to improve health outcomes. For financial incentives-based programs to reach their full implementation potential, maternal health services must be available, accessible, and of acceptable quality. Moving ahead, we need to broaden our research to address questions about the long-term effects of financial assistance, including changes in women's healthcare decisions outside of maternal care. Studies based on the interaction of demand-side healthcare financing programs with other social programs are required for a holistic view of the determinants of women and child health outcomes. Finally, even if we form a consensus on the positive effects of cash transfer programs and other forms of financial incentives, studies on their cost-effectiveness are missing from the literature. We require research for estimating the cost-effectiveness of different programs and their comparisons to recommend practical policy changes.

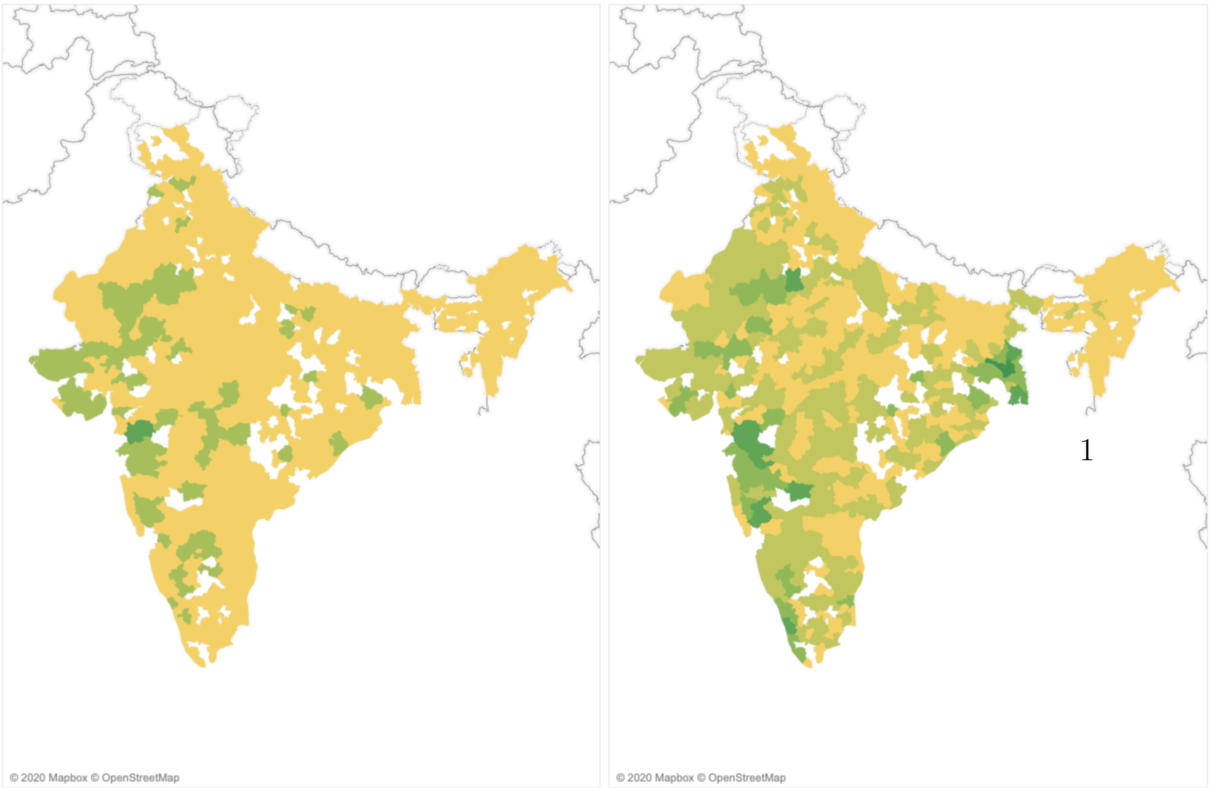
A Figures

Figure 1: **Health Infrastructure in India**



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

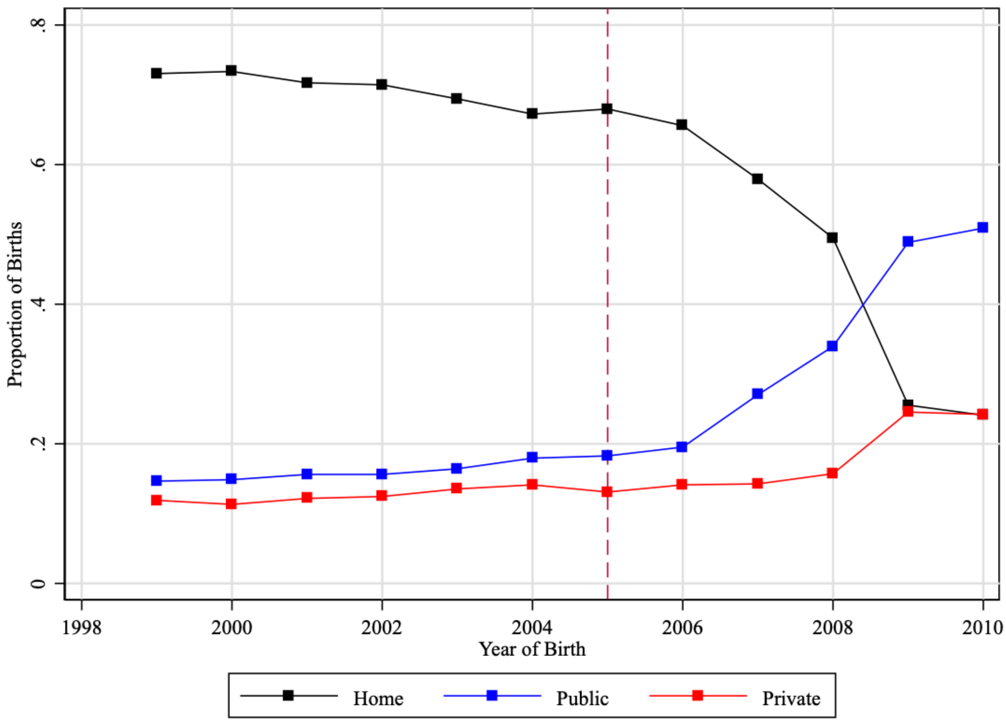
Figure 2: **Intensity of Healthcare Centres- 2005 (left) and 2010 (right)**



Source: Dataset compiled using DLHS II and DLHS III

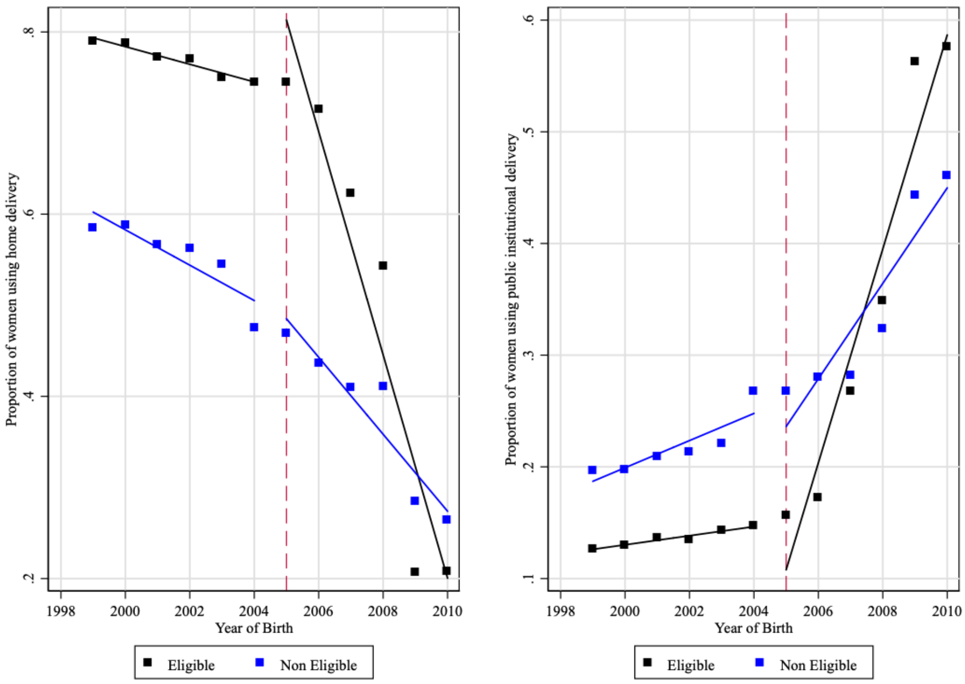
Notes: Healthcare centers include PHCs, SCs and CHCs. The growth in the number of centers is illustrated by yellow (lowest) to green (highest). The missing districts in the survey are white in color.

Figure 3: **Choices of Place of Delivery**



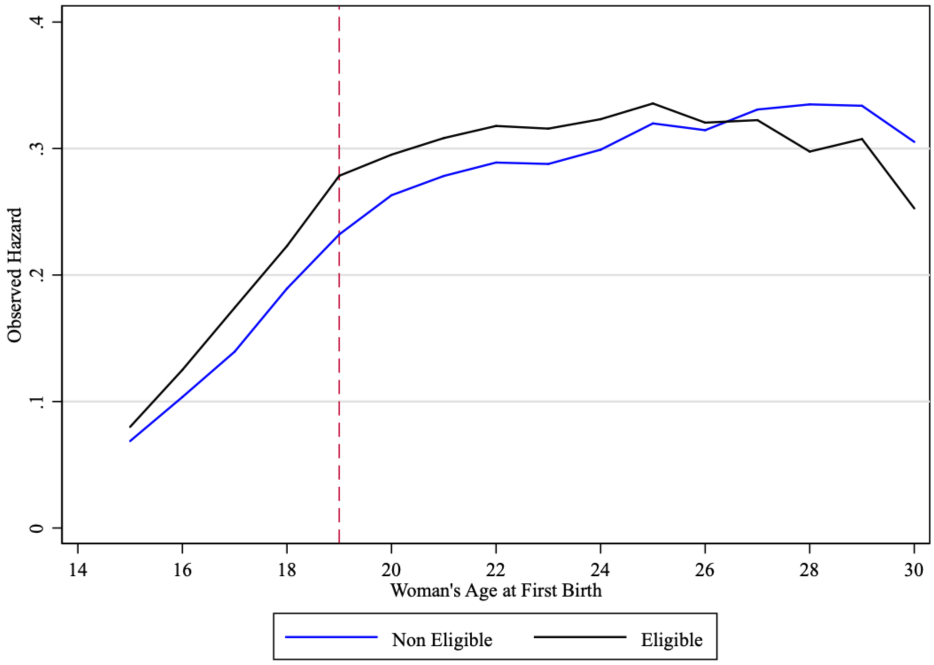
Source: Dataset compiled using DLHS II and DLHS III Notes: The dotted line represents the implementation of JSY in 2005.

Figure 4: **Trends of Outcome Averages for Treatment and Control Groups**

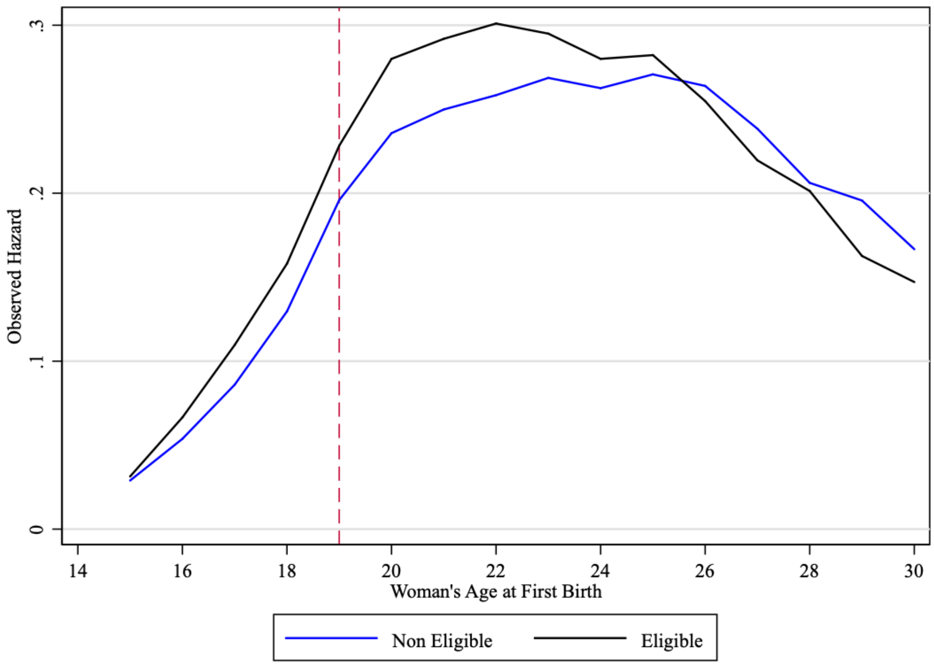


Notes: The figure provides evidence of the assumption of parallel trends. The dotted points are the averages for each year for the outcomes of public institutional delivery and home births, respectively. The lines are fitted over the pre- and post-JSY years.

Figure 5: **Observed First Birth Hazard Curves**



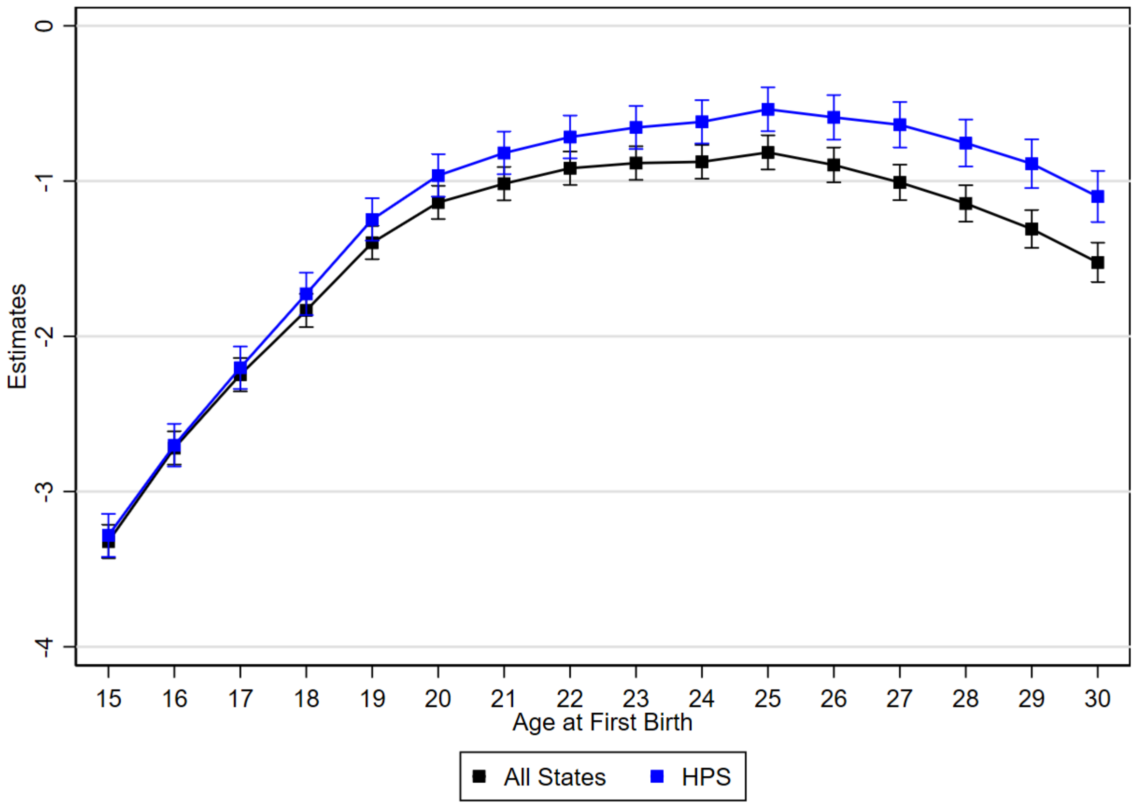
(a) Pre-JSY (1999-2004)



(b) Post-JSY (2005-2010)

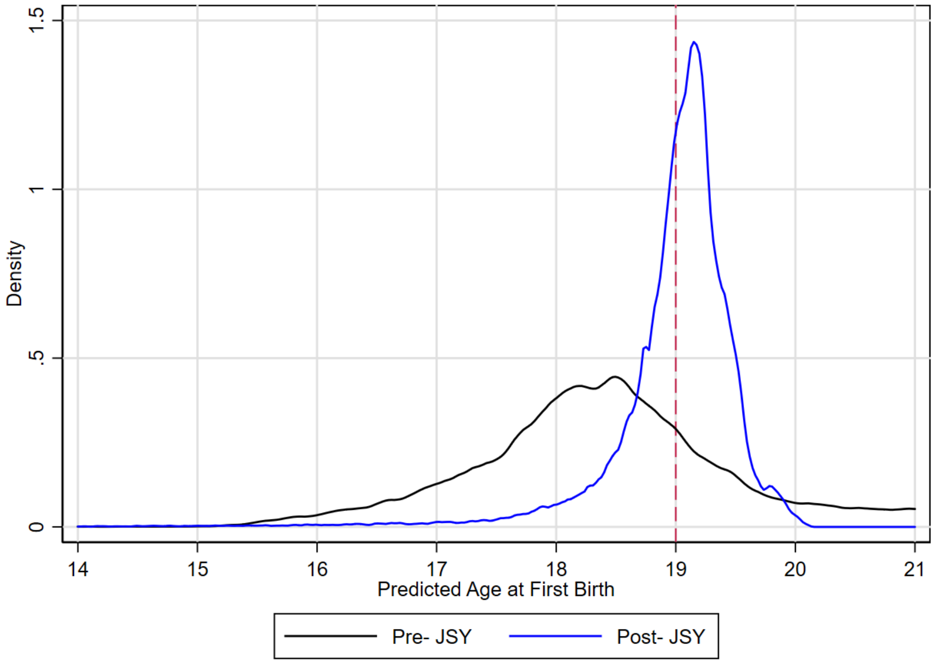
Notes: The hazard curve shows the observed proportion of eligible women — among those who have not reported earlier child birth — who report a first birth at each age period before (a) and after (b) the program was implemented. The figure uses data from DLHS between 1999-2010.

Figure 6: **Odds Ratio of Giving Birth at Different Ages**

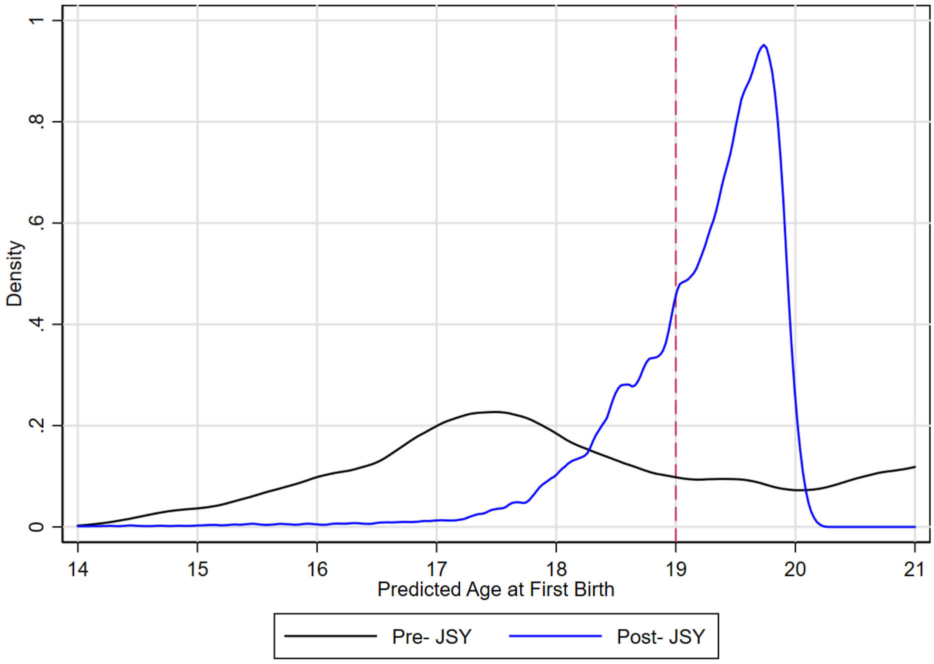


Notes: The odds ratio are estimates from a simple discrete-time hazard model using a standard logistic regression model that includes only a set of age dummy variables and no intercept. The dashed lines are confidence intervals within 95 percent for the estimates.

Figure 7: **Distribution of Age at First Birth for Potentially Eligible Women**



(a) All States



(b) High Performing States

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 13.

B Tables

Table 1: **Summary Statistics**

	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 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 supplements.
The full forms include: SC/ST - Scheduled Caste/ Scheduled Tribe, ASHA - Accredited Social Health Activists, and CHC- Community Health Centers.

Table 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
N	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.

Table 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
N	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
N	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.

Table 13: **Impact of JSY on Age at First Birth using Discrete Time Hazard Model**

	(1)	(2)	(3)	(4)
	Coef	Coef	Coef	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)
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)

Table 13 – continued from previous page

	(1) Coef	(2) Coef	(3) Coef	(4) Coef
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
N	1690241	1644613	761962	732947
AIC	1348767.1	1319022.4	570209.9	553299.7
BIC	1357133.9	1327567.7	574504.1	557763.6

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.

Table 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)
N	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.

Table 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
N	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
N	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.

Table 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
N	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
N	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. 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.

Table 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)
N	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 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, *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 9: **Heterogeneous Impact of JSY on Antenatal Care**

	(1) ANC	(2) Visits	(3) Sem	(4) ANC	(5) Visits	(6) Sem	(7) ANC	(8) Visits	(9) Sem
Eligible	-0.00400	0.00373	-0.0124**	-0.0485***	0.00161	0.00375	0.0165***	0.00193	-0.0189***
	(0.003)	(0.004)	(0.004)	(0.005)	(0.005)	(0.005)	(0.003)	(0.005)	(0.005)
Eligible x Post JSY	0.0402***	0.00765	-0.000419	0.0546***	0.00857	-0.0388***	0.0305***	0.0146**	0.0116*
	(0.003)	(0.004)	(0.004)	(0.006)	(0.006)	(0.006)	(0.004)	(0.005)	(0.005)
Eligible x Post JSY x Tribal	-0.0557***	-0.00548	-0.000911						
	(0.015)	(0.016)	(0.015)						
Eligible x Post JSY x Primary Educ				-0.0354***	-0.00360	0.0592***			
				(0.007)	(0.008)	(0.008)			
Eligible x Post JSY x Poor							-0.00347	-0.0312***	-0.0530***
							(0.007)	(0.009)	(0.009)
Mean	0.719	0.441	0.372	0.719	0.441	0.372	0.719	0.441	0.372
N	277048	268868	283163	277048	268868	283163	276873	268693	282988
R^2	0.235	0.308	0.203	0.235	0.308	0.203	0.236	0.308	0.204

Notes: The table presents estimates from equation (2). The columns represent heterogeneous estimates of impact of JSY on use of antenatal care 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, *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 10: **Heterogeneous Impact of JSY on Postnatal Care**

	(1) PNC	(2) Bf	(3) Imz	(4) PNC	(5) Bf	(6) Imz	(7) PNC	(8) Bf	(9) Imz
Eligible	0.0354***	-0.0272***	-0.0244***	0.00766	-0.0354***	-0.0611***	0.0427***	-0.0259***	-0.00687
	(0.004)	(0.004)	(0.003)	(0.005)	(0.006)	(0.005)	(0.004)	(0.005)	(0.004)
Eligible x Post JSY	-0.0779***	0.0459***	0.0440***	-0.00932	0.0294***	0.0657***	-0.0752***	0.0451***	0.0283***
	(0.004)	(0.004)	(0.004)	(0.006)	(0.006)	(0.006)	(0.005)	(0.005)	(0.004)
Eligible x Post JSY x Tribal	0.127***	-0.0418*	-0.0776***						
	(0.013)	(0.016)	(0.015)						
Eligible x Post JSY x Primary Educ				-0.0653***	0.0252**	-0.0526***			
				(0.008)	(0.008)	(0.007)			
Eligible x Post JSY x Poor							0.0778***	-0.0106	0.0168*
							(0.008)	(0.009)	(0.008)
Mean	0.322	0.377	0.710	0.322	0.377	0.710	0.322	0.377	0.710
N	267468	272135	274860	267468	272135	274860	267293	271961	274685
R^2	0.251	0.218	0.182	0.253	0.218	0.182	0.251	0.218	0.182

Notes: The table presents estimates from equation (2). The columns represent heterogeneous estimates of impact of JSY on use of postnatal care 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, *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 11: **Impact of JSY on Age at First Birth**

	(1)	(2)	(3)	(4)
	$\geq 19years$	$\geq 19years$	$\geq 19years$	$\geq 19years$
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
N	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.

Table 12: **Impact of JSY Eligibility on Woman's Age at First Birth**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	15	16	17	18	19	20	21	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)
N	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)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
	23	24	25	26	27	28	29	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)
N	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.

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 $t_j = \{15, 16, 17, ...30\}$[24]. 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 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

[24] 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.

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.

$$
\begin{aligned}
Logit\lambda(t_j|X) = \boldsymbol{\alpha}(\mathbf{BirthTime}) + \delta_1(Eligible_i^{JSY}) + \sum_{t=2000}^{2010}\Gamma_t(Time_t) \\
+ \sum_{t=2000}^{2010}\gamma_t(Eligible_i^{JSY} * Time_t) + \boldsymbol{\zeta}(\mathbf{BirthTime} * Eligible_i^{JSY}) \\
+ \sum_{t=2000}^{2010}\eta_t(\mathbf{BirthTime} * Time_t * Eligible_i^{JSY}) + \mathbf{X}\boldsymbol{\beta} + \epsilon_{ij}
\end{aligned} \quad (5)
$$

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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