# Unwanted Fertility and Impacts on Self-Rated Health of Women in India

Esha Chatterjee[1]

Johny KD[2]

[1] Assistant Professor, Department of Humanities and Social Sciences; Adjunct Assistant Professor Department of Economic Sciences, Indian Institute of Technology Kanpur, Kalyanpur, 208016, India. E-mail: eshachat@iitk.ac.in Phone Number +919830678004

[2] PhD Scholar, Department of Humanities and Social Sciences Indian Institute of Technology Kanpur, Kalyanpur, 208016, Email- johny22@iitk.ac.in

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## Abstract

This is the first study in India to move beyond women's sexual and reproductive health and examine the consequences of having an unwanted birth on women's general health. We use longitudinal nationally representative data from the two rounds of the India Human Development Survey (2005 and 2012) for 3,776 currently married, non-pregnant women aged 18-40 at baseline who were interviewed across both rounds. Results from multivariate linear and logistic regression show that mothers having an unwanted birth between the two time periods are likely to have worse self-rated health in the future and are more likely to experience a deterioration in health between the two waves compared to those who have a wanted birth, after accounting for all other maternal and household characteristics. Results are robust to models accounting for propensity weighting.

## Introduction

Fertility intentions associated with a birth are an important factor impacting maternal and child health globally (Brown and Eisenberg 1995; Gipson et al. 2008; Singh et al. 2010; Tsui et al. 2010; Sedgh et al. 2014). Unintended fertility is associated with negative consequences for women's and children's health (for e.g. Gipson et al. 2008; Goldin and Katz 2002, 2000; Fabic et al. 2015; Ahmed et al. 2012; Cleland et al. 2006; Cleland and Shah 2013*;* Singh et al. 2013; Chatterjee and Sennott 2020; Yeatman and Smith-Greenaway 2021; Bearak et al. 2023). Past literature shows that this association remains even after taking into account maternal characteristics (for e.g. Cheng et al. 2009; Joyce et al. 2000; Kost et al. 1998; Chatterjee and Sennott 2020; Yeatman and Smith-Greenaway 2021). Women who have unintended pregnancies have lower likelihoods of obtaining adequate antenatal, and postnatal care (for e.g. Kost and Lindberg, 2015; Eggleston 2000; Marston and Cleland 2003; Dibaba et al. 2013; Singh et al. 2013; Chatterjee and Sennott 2020); be at greater risks of experiencing antenatal and postpartum depression (McCrory and McNally 2013; Maxson and Miranda 2011; : Bunevicius et al. 2009; Karacam et al.2011; Bahk et al. 2015); and report higher levels of parenting stress (McCrory and McNally 2013; ; Bahk et al. 2015). Maternal depression and parenting stress associated with having unintended births could further impact childcare, and child development; this may extend beyond the first postpartum year too (Bahk et al. 2015). Recent studies have highlighted the need to further explore the relationship between having an unintended birth and later life physical, and mental health of mothers (Bahk et al. 2015; Herd et al. 2016; Barton et al. 2017; Roy et al. 2022). Thus, it is important to provide women who have the highest risks of adverse health outcomes with adequate antenatal, postnatal and child-rearing support (Yeatman and Smith-Greenaway 2021).

Focusing on improving maternal health is key to achieving the Sustainable Development Goal (SDG) of ensuring 'good health and well-being for all at all ages'. One of the targets of this SDG is to achieve a maternal mortality ratio (MMR) to less than 70 maternal deaths per 100 000 live births by 2030 (WHO, 2023). Even though there have been declines in MMR over the decades, the global MMR in 2020 was 223 maternal deaths, which would imply that to achieve the SDGs would require an average yearly decline rate of about 11.6% over the next decade. In India, though maternal mortality ratio has declined significantly to about 97 in 2018-20 (MoHFW, 2022); in 2020 India accounted for 8.3% of maternal deaths worldwide (WHO, 2023). Moreover, the World Health Organization (WHO), also emphasizes that merely surviving pregnancy and childbirth is not a good enough indicator of a competent maternal healthcare system; and that it is important to look beyond this to achieve better health and well-being. Globally, much of the past literature focuses on the impact of unintended births on maternal health during and after pregnancy in the postpartum period (with a few exceptions for e.g. Yeatman and Smith-Greenaway 2021, Bahk et al. 2015; Herd et al. 2016; Barton et al. 2017; Roy et al. 2022), even though the consequences of having an unintended birth can impact women's overall mental and physical health at later points of time as well (Brittain, Phillips, Zerbe, Abrams, and Myer 2019; Gipson, Koenig, and Hindin 2008; Herd, Higgins, Sicinski, and Merkurieva 2016; Yeatman and Smith-Greenaway 2018). Moreover, many past studies rely on retrospective measures of birth intentions which could be susceptible to ex-post rationalization leading to an underestimation of unintended births (Lightbourne 1985; Bongaarts 1990, 2011; Westoff 1991; Bhushan and Hill 1996; Koenig et al. 2006).

The present study fills these gaps in literature and uses a life course perspective to examine how having an unintended birth can impact women's general health afterwards. Its

focus is beyond mother's sexual and reproductive health and on their general health. This paper uses nationally representative longitudinal data from the India Human Development Survey (IHDS) and uses prospective measures of fertility intentions to study health differentials between women who have wanted and unwanted births between the two survey periods. To the best of the author's knowledge this is the first study to examine the relationship between having an unwanted birth (compared to a wanted birth) on subsequent general health outcomes for women in India.

**Unwanted Births and Women's Health in India**

Over the past three decades the rates of unintended pregnancy have fallen globally, though the extent of this varies between regions (Bearak et al. 2023; Bearak et al. 2020, 2018; Sedgh et al. 2014; Singh et al. 2010). However, still between 2015 and 2019 about half of all pregnancies in the world (about 121 million each year) were unintended (Bearak et al, 2020; UNFPA 2022). According to estimates from the United Nations, India has surpassed China and become the most populous country in the world in April 2023 (UNDESA 2022). Fertility rates in India have dropped to about 2 children per woman in 2019-21 (National Family Health Survey (NFHS 5) ) , and according to data from World Bank, wanted fertility in India in 2021 was around 1.6 children per woman. Out of all the unintended pregnancies globally greater than one in seven occur in India (FP2020; UNFPA 2022). Over the years various policies focusing on sexual and reproductive health care requirements of women in India have been made, however it remains important to base policies on women's needs across different sub-groups of the population and emphasize on reproductive autonomy and maternal well-being to enhance outcomes (Singh et al. 2022, Mark and Cowan 2022).

Most studies in India focus on the impact of birth intendedness on child health outcomes; for e.g. past research finds that unintended births are associated with lower rates of child immunization (for e.g. Singh et al. 2012; Singh et al. 2013, Chowdhury, P., Garg, M.K. and Sk, M.I.K., 2021; Chatterjee and Sennott 2021), timely breast feeding, ( Chowdhury, P., Garg, M.K. and Sk, M.I.K., 2021; Chatterjee and Sennott 2021); stunting (Singh et al. 2013; Chowdhury, P., Garg, M.K. and Sk, M.I.K., 2021) and child development (Singh et al. 2017). In comparison, very few studies in the past in India have examined the impact of having an unwanted birth on subsequent maternal healthcare utilization during and after pregnancy in the India and focus on outcomes such as antenatal checkups obtained during pregnancy, delivery in the presence of trained birth attendant, and obtaining timely postnatal checkups (P. K. Singh et al. 2012; Singh et al. 2013; A. Singh, Chalasani, et al. 2012; Chatterjee and Sennott 2020). Past studies have shown that unwanted births in the India are associated with lower likelihoods of obtaining antenatal care (Singh et al. 2013; Chatterjee and Sennott 2020); supervised delivery (Singh et al. 2012; Chatterjee and Sennott 2020), and timely postnatal care (Chatterjee and Sennott 2020).

**Linkages between Unwanted Births and Subsequent Decline in Women's Health**

Self-rated health (SRH) reflects an individual's perception of their health which is based on their assessment of their body's cumulated exposure to biological and social changes (Berthelot 1991). Different social conditions under which different groups experience change in their body, impact the extent of these conditions on an individual's perception of health. Thus, SRH is a social measure of health that brings together the assessment of interdependent social and biological bodies to obtain an improved understanding of health inequalities (Balaj, 2020).

Those who experience unintended pregnancies could experience worse quality relationships and have lesser social support from friends and family, and thus be exposed to greater risks of postpartum depression (Logsdon et al.1997; Forman et al. 2000; Elsenbruch et al. 2007; Yim et al. 2015; Bahk et al. 2015; Barton et al. 2017). Though research on the relationship between unintended births and maternal health in later life is limited, few studies have discussed the life course experiences that elucidate the relationships between unintended pregnancies and worse later- life health outcomes (Herd et al. 2016). In general women who have a child are likely to experience worsening of health because of the additional time spent in childcare (Bird and Fremont 1991). Additionally, due to the gendered nature of childcare, the socio-economic burden of childcare is particularly associated with higher risks of anxiety, depression, and lower well-being for mothers (Bird 1997; Nomaguchi and Milkie 2003); this maybe more pronounced for women who have a child after they had desired to stop childbearing because of the unexpected increased time they need to spend in caregiving (Herd et al. 2016). Additionally, unintended births could also lead to worse quality relationships between parents and children and in turn be associated with lower well-being for parents (Barber et al. 1999). Thirdly, having an unwanted child could have an adverse impact on economic security that in turn could impact maternal health (Herd et al. 2016). Finally, women who have unwanted births are less likely to obtain maternal healthcare utilization during their last birth (for e.g. Singh et al. 2012; Singh et al. 2013; Chatterjee and Sennott 2020); and this could also lead to worsening of health. Often women belonging to marginalized communities are more likely to have unwanted births, since they are less likely to obtain maternal healthcare services during their last birth; one of the reasons for this is that indifferent or rude behavior from healthcare workers towards these groups of women can cause stress and impact maternal well-being (Sabharwal et al. 2014).

Though the present study is limited and is not able to examine these pathways through which unwanted births impact women's general health, we try to look at how for women with different characteristics, having an unwanted birth (compared to a wanted birth) impacts subsequent SRH, and the deterioration of health over the two waves. We expect that having an unwanted birth would be associated with higher likelihoods of having worse SRH health in wave 2; and that having an unwanted birth (compared to a wanted birth) will lead to a worsening of health for mothers over the two waves.

## Data and Methods

### *Data and Sample*

This study uses longitudinal data from the two rounds of the India Human Development Survey (2005 and 2012). In the first round of the IHDS face-to-face interviews were collected from individuals across 41,554 households in 33 (now 34) states and union territories, including 1,503 villages and 971 urban regions in India (Desai et al. 2010). In the year 2012, the second round of the IHDS was conducted and follow-up interviews were conducted with the IHDS-1 households. Rates of attrition were higher amongst households that didn't own land, were smaller, and located in urban regions (Thorat et al. 2017). The survey included several modules including the household module (consisted of questions on assets, income, consumption expenditure, social capital etc. that was answered by a knowledgeable informant -usually the household head); and the eligible woman module (consisted of questions on health, fertility, family planning, marriage etc. that was answered by an ever-married woman aged 15-49 in the household). In 2005 one eligible woman per household was interviewed, and our sample included eligible women who were interviewed across both rounds (women aged above 49 who were interviewed in 2005 were also re-interviewed in 2012).

Our analyses include non-pregnant, currently married women aged 18-40 in 2005, who were interviewed across both rounds and had atleast one birth between 2005 and 2012. We start off with 25,479 ever-married women who were interviewed across both rounds; from here we include only currently married, non-pregnant women aged 18-40 which brings us to a sub-sample of about 18,737 women. 71 women with missing data on SRH in 2005 and 2012 were dropped from the analyses. Next, 1779 women had missing or invalid data on fertility intentions and were dropped from the analyses. Women who reported that they were not fertile in 2005 (about 0.6% of the sample were dropped from the analyses). For the first part of our analyses, 16,714 non-pregnant, ever-married women aged 18-40 with valid data on fertility intentions and non-missing data on the key dependent and independent variables were included. If we compare women who had missing or invalid data on fertility preferences with this sample, a larger percentage of those with missing data on fertility preferences were illiterate, Muslim women, residing in EAG states. This could imply that our present sample may give underestimates of unwanted births. While, the largest share of women for both these groups belonged to the age group 26-30, for women with missing data on fertility preferences a larger percentage belong to the younger age groups (18-25) compared to the final larger analytical sample.

Weighted summary statistics show that for this larger sample about 22.3% of the women have an unwanted birth. We begin reporting results for this larger sample. Next for our main analyses, we only focus on non-sterilized women who have atleast one birth between the two time periods, since having a birth can impact health and lead to health declines amongst women (Ryan et al. 2024). Understanding the impact of wantedness of the last birth on women's health is therefore more appropriate for those who have atleast one birth between the two waves. About 76% of the women from the larger sub-sample didn't have a birth between the two time periods

and were dropped from the analyses. Thus, our final analytical sample included 3,776 women. In this smaller sub-sample 58.8% of the women have an unwanted birth, which is higher than the larger sample since we are looking only at those who are having atleast one birth between the two waves (and leaving out those who didn't want any more children and had no births between the two waves).

*Dependent Variable*

The present study uses longitudinal data from IHDS 2005 and 2012, and the main analyses focuses on 3,776 non-sterilized women who had atleast one birth between the two waves. We examine how having an unintended birth (compared to having an intended birth) from a pregnancy that occurred between 2005 and 2012 impacts: i) women's health in 2012, and ii) the likelihood of women's health deteriorating between 2005 and 2012, after taking into account other maternal characteristics. The first dependent variable we use as a measure of women's health is SRH in 2012. The survey asks 'In general, would you say your own health is...', and the responses take a value of 1 to 5, where 1 indicates 'very good', 2 'good', 3 'fair', 4'poor', and 5 'very poor'. SRH has been used as a valid measure of health globally (Yeatman and Smith-Greenaway 2021, Vikram 2021, Farmer & Ferraro, 1997; Johnson & Wolinsky, 1993), and it is a robust predictor of mortality (Goldman, Glei, and Weinstein 2017; Idler & Angel, 1990; Idler & Benyamini, 1997), and allostatic load in later life (Vie et al., 2014; Vikram 2021). The second dependent variable is a dichotomous variable that is constructed using panel data from IHDS to indicate whether women's SRH worsened over the two waves (Vikram 2021). If SRH worsens over time then the variable takes a value of 1 and if it doesn't then the variable takes a value of 0.

*Independent Variable*

The main independent variable used in this study is a measure of women's prospective fertility intentions. Our measure evaluates whether the last birth a woman had was unwanted or wanted. In order to assess this, we examine whether the number of additional children desired in the first wave of the interview was lesser than the number of children born after January 2005 as reported in 2012, if this is the case then we label the most recent birth was labelled as 'unwanted'. In case the number of children desired in wave 1 was more than or equal to the number of children born after January 2005 as reported in 2012, then the last birth that the woman had was labelled as 'wanted' (Yeatman and Sennott 2015; Chatterjee and Sennott 2020; Chatterjee and Sennott 2021). Thus, our key independent variable is a dichotomous variable that takes a value of '1' if the last birth that a woman had was labelled 'unwanted' and takes a value of '0' if the last birth was wanted.

*Control Variables*

Mother's life choices including health behavior, and eventual perceptions of health are impacted by several social-economic factors. We control for several household and maternal sociodemographic variables pre-pregnancy (in 2005) for women who have wanted and unwanted births between 2005 and 2012. One of the strongest determinants of SRH is socio-economic status (SES). Higher SES is associated with poorer SRH and morbidities (for e.g. Subramanian et al. 2009; Patnaik et al. 2023). Greater income levels would be expected to lead to better health via improved access to 'nutrition, housing, knowledge and health care' (Patnaik et al. 2023; Marmot 2002). Education is also an important part of social stratification, and it can also impact income and occupation and thus one's social standing (Lahelma 2001). The extent to which education can impact one's social standing depends on social origin and on the composition and integration of the education system and associated modes of labor market (Müller 2005). In the

India on one hand women's education doesn't translate into higher labor force participation (Chatterjee, Desai and Vanneman 2018), but higher education is associated with marrying into richer families. Additionally, higher education is associated with greater use of maternal healthcare services (Navaneetham and Dharmalingam 2002; Sharma 2004; Chandhiok et al. 2006; Simkhada et al. 2008; Ahmed et al. 2010; Amin et al. 2010; Pathak et al. 2010; A. Singh, Chalasani, et al. 2012; A. Singh, Padmadas, et al. 2012; Chatterjee and Sennott, 2020) and would thus be expected to lead to better health outcomes and SRH. Some past studies in India have shown that women who are: older, who have a higher number of living children, belong to Scheduled Castes (SC), Scheduled Tribes (ST) and Other Backward Classes (OBC) (compared to Forward Castes (FC)); Muslim families (compared to Hindu families); reside in rural areas (compared to urban areas), and reside in Empowered Action Group (EAG) states are likely to have lower maternal healthcare utilization (for e.g. Navaneetham and Dharmalingam 2002; Pallikadavath et al. 2004; Matthews et al. 2005; A. Singh, Chalasani, et al. 2012; P. K. Singh et al. 2012 ; Chatterjee and Sennott 2020) and poorer health outcomes (for e.g. with an increase in age women's SRH worsens (Hosseinpoor et al. 2012)). EAG states include a group of northern states: Uttar Pradesh, Uttarakhand, Bihar, Jharkhand, Madhya Pradesh, Chhattisgarh, Rajasthan and Odisha that have higher population, lower levels of education, relatively weaker health infrastructure and more traditional norms. These states have been the center point of several health and population related policies of the Government of India. Overall, some of the most crucial factors associated with SRH in India are income, region, and age; and these overshadow the importance of education, caste, religion and gender (Patnaik et al. 2023).

In the present study we control for women's household asset quintile (indicator of SES), education level (six categories, illiterate, less than primary school, primary complete, secondary

complete, higher secondary complete, college degree and higher), caste (four categories, forward caste (FC), Scheduled Castes (SC), Scheduled Tribes (ST), Other Backward Classes (OBC)), religion (three categories, Hindu, Muslim, Other Religions), Empowered Action Group (EAG) States (dummy variable), area of residence (dummy variable indicating rural or urban), age categories (five categories 18-20, 21-25, 26-30, 31-35, and 36-40) and parity (indicating the number of children the woman had in wave 1).

*Analytical Strategy*

Before proceeding with the analyses, we compare the percentage of married women aged 15-49 who want no more children by the number of living children, and gender of the child in the IHDS 2005 sample (who were interviewed across both waves) with the National Family and Health Survey (NFHS) 2005-06 sample. Comparing the percentage of women who want no more children from the NFHS and IHDS data shows that overall while in NFHS 2005-06 70.5 % of married women aged 15-49 did not want any more children, in the IHDS sample 79.97% married women aged 15-49 in 2005 did not want any more children. For both IHDS and NFHS as women have a greater number of children, they are more likely to want no more children (again the percentage who do not want any more children is higher as per the IHDS). For those who have two children (considered to be ideal in many cases) women with a higher number of sons are slightly more likely to want no more children in the IHDS sample. While in the NFHS sample, about 62.1% of women who had 2 children (and no son) wanted no more children, in the IHDS 88.69% of women with 2 children (and no son) wanted no more children. The difference between the surveys narrows down when women have atleast one living son. 88.1% of the women in the NFHS sample with two children (one living son) wanted no more children, and

91.25% of the women in the IHDS sample with two children (one living son) wanted no more children. Detailed results are reported in Appendix Table A1.

We begin our analyses by examining the descriptive statistics for the larger sample of 16,714 women (including sterilized and non-sterilized women, and those who may or may not have had a birth between the two waves). Women in this larger group are divided into four broad categories: a) sterilized women in 2005 who had no unwanted birth between the two rounds, b) women who report that they were sterilized in 2005 and have an unwanted birth between 2005 and 2012, c) women who were not sterilized in 2005, and have no unwanted birth between the two waves, and d) women who were not sterilized in 2005 and had atleast one unwanted birth between the two waves. The difference between these groups of women in terms of the key dependent variables: a) SRH in 2012, and b) worsening of maternal health between 2005 and 2012 and baseline socio-demographic characteristics are examined. We also report results from linear and logistic regression results for this larger sample in appendix tables A2 and A3.

Next, we examine for the smaller sub-sample of 3,776 non-sterilized women who have atleast one birth between the two waves, how the key dependent variables and maternal characteristics differ by birth intendedness. Thirdly, to evaluate the relationship between having an unwanted birth and mother's SRH, we use multivariate ordinary least squares regression with a lagged dependent variable (with sample weights) (using ordered logistic regression with a lagged dependent variable doesn't change the results). This evaluates the relationship between having an unwanted birth and subsequent SRH of women in wave 2. Linear regression is used since SRH is treated as a continuous variable (Vikram 2021). Some of the unobserved factors that impact the propensity of a woman to have an unwanted birth could also simultaneously impact her health. It is assumed that unobserved characteristics associated with women and their

families that could impact health in 2005 would also affect health in 2012. A regression model with a lagged dependent variable accounts for these unobserved characteristics and controlling for SRH in 2005, would show that the rest of the variations in SRH in 2012 would mostly be due to changes between the two waves; this to an extent helps us understand the causal relationship between having an unwanted birth between the two waves and SRH of women (Lei and Desai 2021). The first model takes into account SRH in 2005, and all the control variables mentioned above. The second model examines whether the impact of having an unwanted birth on a woman's health is moderated by her age. Next, in order to see if women's health worsens over the years as a result of having an unwanted birth (versus a wanted birth) over the years, logistic regression was run with all control variables in the first model. The second model includes interaction terms between age and birth wantedness.

The adverse consequences of having an unwanted birth could be because of selection, since the likelihoods of having an unwanted birth are also dependent on a mother's socio-demographic traits. Propensity score models help adjust the distribution of the traits of a treatment and control group in order to match them with regard to traits that are important for both group assignment and outcome of interest (Austin 2011; Rosenbaum and Rubin 1983; Stuart 2010*;* Kost and Lindberg 2015). Additionally, propensity score matching is less sensitive to model specification error than regression models *(*Drake 1993; Dehejia and Wahba 2002; Messer et al. 2010; Stuart 2010; McCaffrey et al. 2013; Kost and Lindberg 2015). Thus, in the recent past some studies have used variations of propensity score matching to reduce the bias that would occur due to non-random selection into having an unwanted birth as a reason for the impact of having an unwanted birth on women's health outcomes (Kost and Lindberg 2015; Chatterjee and Sennott 2020). We use an adaptation of propensity score matching namely-IPW

estimator as a robustness check for the multivariate regression results. In the first step the propensity scores used for weighting are estimated using a multivariate logistic regression model with intention status as the dependent variable and all other maternal traits (such as women's age, education level, socio-economic status, region of residence, caste and religion) associated with both intention status and women's health as explanatory variables. In calculating propensity scores that are estimated from a multivariate logistic regression model with intention status as the dependent variable, eventually used to estimate the regression model for examining the relationship between wantedness of a birth and SRH of women in 2012; SRH of women in 2005 was included in the analyses. The estimated IPWs are used to create a counterfactual situation that indicates what the differences between women with wanted and unwanted births in terms of health outcomes would be if they had similar chances of being in the groups that we find them in (Kost and Lindberg 2015; Chatterjee and Sennott 2020). Thus, in the second step two sets of regressions are run to estimate the relationship between birth intentions and the two dependent variables measuring women's general health. We compare the predicted values and predicted probabilities obtained using the unadjusted data with the adjusted sample that weighs each observation by the inverse of the propensity (Kost and Lindberg 2015). In the adjusted sample we also include sample weights where each observation's IPW is multiplied by sample weights to get unbiased effects based on the population of all births in India (see DuGoff et al. 2014; Kost and Lindberg 2015, Chatterjee and Sennott 2020).

**Results**

--Table 1 about here--

Table 1 shows the weighted summary statistics for the larger sample of 16,714 non-pregnant, ever-married women aged 18-40 in 2005 (who reported they are fertile in 2005) who

had non-missing data on fertility preferences and were interviewed across both waves. The table shows differences between different groups of women in terms of the key dependent variables and baseline socio-demographic characteristics based on their sterilization status in 2005, and intention to have another child. This part of the analysis focuses on both sterilized and non-sterilized women who could have had atleast one birth, and also on those who have had no births between 2005 and 2012. There are four broad groups of women in our sample: a) sterilized women in 2005 who had no unwanted birth between the two rounds (column1) (about 41.3% of the sample), b) women who report that they were sterilized in 2005 and have an unwanted birth between 2005 and 2012 (1.4% of the sample) (column2), c) women who were not sterilized in 2005, and have no unwanted birth between the two waves (43.9% of the sample) (column3), d) women who were not sterilized in 2005 and had atleast one unwanted birth between the two waves (13.3% of the sample) (column4). The table shows that women who were not sterilized and had atleast one unwanted birth between the two waves were likely to have the worst SRH in 2005. Worsening of health between two rounds was the highest for those who had an unwanted birth between the two rounds, particularly for the smaller group of women who were sterilized and had atleast one unwanted birth between the two waves. This small group of women (1.4% of the sample) could have an unwanted birth after reporting they were sterilized in 2005 because of post sterilization failure, reversal of sterilization, or misreporting (for e.g. Paul et al. 2017, Akshara et al. 2021, Stecklov et al. 2015). A greater percentage of women who had atleast one unwanted birth were in the age groups 21-30 compared to those who had no unwanted birth. A larger share of women who had an unwanted birth were likely to belong to the poorest families compared to those who have a wanted birth. Majority of women in the sample belong to Other Backward Classes (OBC) (about 43%), Hindu (about 84%), and rural (about 76%) households. A higher percentage of women who have atleast one unwanted

birth belong to Scheduled Caste (SC) households compared to those who have no unwanted birth. A large share of women in the sample were illiterate, and a higher percentage of those who had atleast one unwanted birth (compared to those who had a wanted birth) were illiterate. Finally, about 68% of women who were not sterilized and had atleast one unwanted birth resided in Empowered Action Group (EAG) states, and in comparison, only 25% of the women who were sterilized and had no unwanted birth resided in EAG states.

Results from linear regression with lagged dependent variable models examining the impact of fertility intentions and sterilization status on SRH of women in 2012 show that women who were not sterilized in 2005 and had an unwanted birth between the two waves rated their health higher by 0.08 points on a scale of 1–5 (indicating worse health) compared to those who were sterilized in 2005 and had no unwanted birth between the two periods. Additionally, richer, more educated, younger, non-Muslim women who had better SRH in 2005, and those residing in urban areas, in non-EAG states were likely to have better SRH in 2012. Results are reported in table A2.

Results from multivariate logistic regression examining fertility intentions and sterilization status and maternal health declines between 2005–12 for the larger sample of women show that women who were sterilized in 2005 and still had an unwanted birth between the two waves were 1.5 times as likely as women who were sterilized in 2005 and didn't have any unwanted birth to experience worsening of health between two waves. Additionally, women who had a greater number of living children in 2005, aged 21-30 (compared to 36-40) in 2005, and resided in non-EAG states were less likely to experience declines in health over the two waves. Results are reported in appendix table A3.

For the purpose of this study, we focus only on non-sterilized, fertile, non-pregnant women aged 18-40 women with non-missing data on fertility preferences who have atleast one birth between two periods. We compared women who have atleast one birth because having a birth between the two waves in itself can impact health outcomes. Recent studies have shown that having a birth is associated with faster epigenetic ageing for women (Ryan et al. 2024). Appendix table A4 shows the distribution of percentage women by number of children alive in 2005, number of additional children desired in 2005, number of children alive in 2012, and number of children who died between 2005 and 2012 for this smaller sample of women who have atleast one birth between the two waves by intention status. It can be seen that, wanted births were more prevalent amongst women who had less than two children, whereas a larger percentage of unwanted births were amongst women who had two or more children in 2005. Amongst women who had an unwanted birth, a majority of women didn't want any more children (about 68%) or wanted one more (in addition to the number they had) in 2005 (about 24%), whereas for women who had wanted births majority wanted one or two additional children. While majority of women who had a wanted birth between the two waves had two children alive in 2012, majority of women who had one unwanted birth had four or more children in 2012. Finally, while majority of the women in the sample didn't have any child deaths between the two waves, percentage women who had atleast one child death was greater amongst women who had an unwanted birth.

--Table 2 about here--

Table 2 shows the differences in means, and proportions for the key dependent variables, and baseline socio-demographic characteristics by intention status for our final unweighted sample. Statistically significant differences in terms of health outcomes, and other socio-demographic traits between women who had an unwanted birth (compared to those who had a

wanted birth) were tested using t-test and test of proportions. Results show that women who have atleast one unwanted birth (compared to a wanted birth) are likely to have worse SRH in 2012, and more likely to experience worsening of health between the two waves. Mean SRH in 2012 for women who had atleast an unwanted birth between the waves was 2.12, whereas that for those with a wanted birth was 1.97. 28% of women with atleast an unwanted birth experienced declines in health between the two waves, compared to 25% women who have a wanted birth. Women who have an unwanted birth have lower levels of education and are more likely to belong to poorer, SC, Muslim, rural households and reside in EAG states.

--Table 3 about here--

Table 3 shows results from linear regression analyses with a lagged dependent variable model examining the impact of fertility intentions on the SRH of women in 2012. Results from table 3 (model 1) show that women who have unwanted births are likely to have a higher score on SRH in 2012 (indicating worse health) compared to women who have wanted births. For e.g., we can see that women who had an unwanted birth between 2005 and 2012 rated their health higher by 0.15 points on a scale of 1–5 (where lower scores indicate better SRH). Adding interaction terms between age categories and unwanted birth (in model 2) to see if the impact of having an unwanted birth is worse for women at later ages shows that for women in the age groups 21-25 and 26-30, the negative effect of having an unwanted birth on SRH is lesser compared to those aged 36-40. Results from this model show that women who had an unwanted birth between 2005 and 2012 rated their health higher by 0.62 points on a scale of 1–5. Women who had better SRH in 2005, belonged to the richest families (compared to the poorest), scheduled tribe (ST) households (compared to forward castes), had higher secondary education (compared to being

illiterate), and resided in non-EAG states (compared to EAG states) are likely to have better SRH in 2012.

--Table 4 about here—

Results from Table 4 (model 1) show that women who have an unwanted birth between the two waves are more likely to report worsening of health over two time periods. Women who had an unwanted birth between the two time periods were 1.33 times as likely as those who had a wanted birth to experience worsening of SRH between the two waves. Adding interaction terms between age categories and unwanted birth (in model 2) to see if worsening of health because of having an unwanted birth is worse for women at later ages shows that for women in the age groups 21-25 and 26-30 the worsening of health because of having an unwanted birth is lesser compared to those aged 36-40. Women residing in urban areas, and non-EAG states are less likely to experience worsening of health between the two waves.

--Table 5 about here--

Table 5 shows the predicted values (for SRH) and predicted probabilities (for health worsening over the two rounds) that we would find if women with wanted and unwanted births had the similar maternal traits (such as women's age, education level, socio-economic status, region of residence, caste, and religion). The IPW adjustment allows us to separate out the impact of the women's fertility intentions from the impact of her other characteristics on her health outcomes. The results are consistent with the results obtained from multivariate regression. Even after the IPW adjustment, women who have unwanted births are more likely to have worse SRH and have greater likelihoods of their health worsening between 2005 and 2012 compared to women who had wanted births.

## Discussion

Globally, between 1990-1994 and 2015-2019 unintended pregnancy rates have declined by about 19% (Bearak et al. 2018; Bearak et al. 2020). However, over this period there were about 121 million unintended pregnancies annually (Bearak et al. 2020). While 61% of these unintended pregnancies ended in abortion, the unintended pregnancies that lead to births can cause greater economic, social, and psychological costs to women (Gipson et al. 2008; Smith-Greenaway and Sennott 2016). More than one in seven of the unintended pregnancies across the world occur in India (FP2020; UNFPA 2022). Likelihoods of having an unwanted birth varies by several socio-demographic factors such as income, education, religion, region of residence and age. For e.g. women with lower levels of education, belonging to poorer, Muslim families, and residing in EAG states are more likely to have unwanted births (for e.g. Dixit et al. 2012; Islam et a. 2022; Singh et al. 2024). Having an unwanted birth is associated with lower maternal healthcare utilization during and after pregnancy (P. K. Singh et al. 2012; Singh et al. 2013; A. Singh, Chalasani, et al. 2012; Chatterjee and Sennott 2020).

Studies examining the long-term impact of having an unwanted birth on subsequent general health and health declines in the Indian context are limited. The present study addresses this gap and uses prospective measures of unwanted fertility from IHDS and examines the associations between having an unwanted birth and subsequent SRH, and declines in SRH. Even though SRH is a subjective measure of health and it's reporting could be impacted by personality traits and factors such as hypochondria (Appels et al. 1996; Barksy et al. 1992; Fýlkesnes and Førde 1992), it is identified as a valid measure of health, and a predictor of future mortality (Yeatman and Smith-Greenaway 2021, Vikram 2021, Goldman, Glei, and Weinstein 2017). SRH relies on individual's perception of their health and may indicate ill-health that is not

diagnosed. This could be a useful measure of health in the context of low-and middle-income countries, where particularly for those belonging to low-income groups, diseases may not have been diagnosed. Additionally, in the present study we use a non-comparative measure of SRH (where respondents are asked to rate their health as ‘very good’ to ’very poor’) to measure health at base-and endline which is seen as an appropriate measure of health particularly in longitudinal studies (Eriksson et al. 2001).

In the first part of our analyses, we focus on a larger sample of non-pregnant, ever-married women aged 18-40 who reported they were fertile in 2005, had non-missing data on fertility preferences and were interviewed across both waves. About 22% women in this sample had unwanted births between the two waves of IHDS. Results from the lagged dependent variable model (with control variables) for this larger sample shows that: women who were not sterilized in 2005 and had an unwanted birth between the two waves were more likely to have worse SRH health compared to those who reported that they were sterilized in 2005 and had no unwanted birth between the two periods. Additionally younger women with secondary school and higher education, belonging to richer, Hindu (compared to Muslim) families, in urban and non-EAG states were likely to have better SRH in 2012. This is consistent with findings from past studies in India (for e.g. Navaneetham and Dharmalingam 2002, Chatterjee and Sennott 2020, Patnaik et al. 2023). Some of this difference in SRH amongst these groups maybe because higher and more timely maternal healthcare utilization amongst more educated (compared to those who are illiterate), richer (compared to poorest) women residing in urban (compared to rural), and non-EAG (compared to those residing in EAG states) states translates to better health in the future.

Next, results from logistic regression models (with control variables) show that women who were sterilized in 2005 and still had an unwanted birth between the two waves were more likely to experience declines in health between the two waves compared to women who were sterilized in 2005 and didn't have any unwanted birth. Despite reporting that they were sterilized at baseline, women could have had an unwanted birth between the two waves because of misreporting, post sterilization failure or reversal of sterilization (for e.g. Paul et al. 2017, Akshara et al. 2021, Stecklov et al.2015). Those who have the double impacts of having an unwanted birth and undergoing a sterilization failure or reversal are more likely to experience worsening of health. Child mortality is also seen as one of the main reasons for reversal of sterilization (Puri and Jain 2000). Additionally, in contexts with high contraceptive prevalence, particularly with high prevalence of female sterilization, over-reporting of female sterilization may occur, since non-users (or users of other methods) may feel it is socially acceptable to claim being sterilized (Stecklov et al. 2015). Our results further show that, women aged 21-30 (compared to those aged 36-40) were less likely to experience declines in health, which is consistent with past studies (Hosseinpoor et al. 2012). Interestingly our results show that for this larger sample, women who had a greater number of children alive in 2005 were less likely to experience worsening of health between the two waves, and this could be because about 76% of them do not have any births at all between the two waves, and having births in itself could lead to declines in health (Ryan et al. 2024). Finally, women residing in EAG states (compared to those residing in non-EAG states) are more likely to experience a worsening of health between the two waves. This can be explained by poor quality of health services, lesser average education, and overall lower levels of maternal healthcare utilization in EAG states.

Our main analyses focus on women who have atleast one birth between the two waves, since having a birth could in itself lead to faster biological ageing, which is usually the precursor to age-related health declines (Ryan et al.2024). This limits our final sample to non-sterilized, fertile, non-pregnant women aged 18-40 women with non-missing data on fertility preferences who have atleast one birth between two periods. The percentage women having an unwanted birth over these two periods is higher (58.8%) in this sub-sample compared to the larger sample. This is because in the smaller sample we only take into account those who have atleast one birth between the two waves, whereas in the larger sample women who do not have any more children between the two waves are also included. Findings from this sub-sample show that richest women (compared to poorest), with better health in 2005, with high secondary education (compare to those who are illiterate), residing in non-EAG states were likely to have better SRH in 2012. Women residing in urban areas (compared to rural) areas, and in EAG states (compared to non-EAG states) are more likely to experience worsening of health between the waves.

Though this study contributes significantly to the literature and highlights the role of birth-wantedness in affecting mother's overall health subsequently, there are certain limitations of this study which future studies in this context can address. Firstly, while we can hypothesize the various pathways via which birth wantedness can impact women's SRH, and the likelihood of her health deteriorating, we are not able to account for them in the model. For e.g. change in relationship quality, economic security, and attitude of healthcare workers could be likely channels via which having an unwanted birth can impact postpartum health behavior and health outcomes of women. This in turn can have long-term consequences for women's general health. In the future closely spaced longitudinal studies could help understand some of these

mechanisms via which having an unwanted birth can impact later life health outcomes. Secondly, we are not able to take into account the emotional response to pregnancy as an alternate measure in this study. For example, in the context of Malawi, Yeatman and Smith-Greenaway (2021) find that not all women who had an unintended birth were likely to experience declines in health; on one hand those who had a positive reaction to the unintended pregnancy did not experience a decline in health after birth, whereas those who had a more negative feeling about the unwanted pregnancy experienced declines in SRH even much after birth. In the present context, this kind of a measure would help us understand the heterogeneity in terms of health outcomes for women who have an unwanted birth. Thirdly, we base our analyses on a single measure of health: SRH. Though SRH is a commonly used valid measure of women's general health (for e.g., Yeatman and Smith-Greenaway 2021; Vikram 2021; Farmer & Ferraro, 1997; Johnson & Wolinsky, 1993) we are not able to use other indicators that help separate out mental and physical health outcomes of mothers; future studies could focus on these. Fourthly, we are not able to account for the impact of ambivalence or mistimed births on women's subsequent health in the present study because of a lack of data on timing preferences. Fifthly, since the time difference between the two surveys is seven years and women's fertility intentions are not static, we could be at risks of misclassifying certain births (Westoff and Ryder 1977; Kodzi et al. 2010; Sennott and Yeatman 2012; Yeatman et al. 2013). Evaluating women's fertility intention closer to the date of conception would give more reliable results. Sixthly, we are not able to capture the strength of preferences in the present study. It could be that women with stronger preferences to stop childbearing are more likely to use permanent methods like sterilization or undertake abortion. However, this would depend on the context, and also on the preferences of the woman towards using these measures (which is not captured in the study).

Including improved measures of preferences such as the 'London measure of unplanned pregnancy' (LMUP) that asks women questions that capture information on contraceptive use, desire to have a child, discussion/agreement with partner, and health behavior in preparation for the pregnancy during their last pregnancy, can help us understand birth wantedness better in future surveys (Cleland et al. 2020). Seventhly, it is important to note that globally, about 6 in 10 unintended pregnancies are estimated to end in abortion every year (Bearak et al. 2020; UNFPA 2024). The primary reason behind induced abortions in the Indian context is unintended pregnancies (IIPS and ICF 2021; Rahaman et al. 2024; Saikia and Pradhan 2024). Therefore, since many unwanted pregnancies are terminated, this could dilute the association between unwanted births and women's health in the present study. Next, even though we use a variation of PSM as robustness checks, this too could be sensitive to bias if treatment and outcome models are impacted by confounding unobservable factors (Imbens 2004, 2015; Abadie and Imbens 2006; Kebebe and Shibru 2017; Chatterjee and Sennott 2020). Finally, the present study is unable to account for variation in contextual factors; future studies could focus on examining the detailed impact of contextual factors such as quality of healthcare facilities in the neighborhood and how it can moderate the relationship between unintended fertility and women's health outcomes.

Despite these limitations the study contributes to the literature examining the relationship between birth wantedness and later life health outcomes for women. To the best of the authors' knowledge this is the first study in India to move beyond women's sexual and reproductive health and examine the consequences of having an unintended birth on women's general health. Using nationally representative data from the two rounds of the IHDS we find that women who

have an unwanted birth between the two waves are more likely to have worse SRH, and experience health decline between the two waves compared to those who have a wanted birth between the two waves. Providing women particularly from the marginalized communities with proper access to and knowledge about contraception, access to safe abortion, good quality counselling services, and empathetic and fair treatment by healthcare workers could help women avoid pregnancies when they want no more children and help them detect pregnancies earlier. Good quality post-partum care including counselling services for women could also help them deal with the stress associated with having a birth (particularly when the birth is unwanted) and help improve their well-being post pregnancy and in the long-term as well.

## List of Tables

**Table 1:**

Summary Statistics: Key Dependent Variables & baseline sociodemographic characteristics of ever-married women aged 18-40# in the overall sample by sterilization status and intention status.

| | **Sterilized have no unwanted birth** | **Sterilized have atleast one unwanted birth between two waves** | **Not Sterilized have no unwanted birth** | **Not Sterilized have atleast one Unwanted Birth** | **Overall Sample** |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| **Self-Rated Health in 2012** | 2.101 (0.814) | 2.076 (0.877) | 2.112 (0.870) | 2.164 (0.862) | 2.116 (0.848) |
| **Health Worsening between two waves** | 24.61% | 30.85% | 25.13% | 26.22% | 25.17% |
| **Self-Rated Health in 2005** | 2.212 (0.757) | 2.101 (0.763) | 2.29 (0.764) | 2.27 (0.764) | 2.255 (0.762) |
| **Age** | | | | | |
| 18-20 | 1.04% | 3.97% | 8.78% | 17.06% | 7.08% |
| 21-25 | 10.12% | 36.15% | 22.29% | 41.75% | 20.92% |
| 26-30 | 24.82% | 39.47% | 23.06% | 26.29% | 24.46% |
| 31-35 | 30.73% | 11.74% | 22.74% | 10.31% | 23.67% |
| 36-40 | 33.28% | 8.67% | 23.12% | 4.60% | 23.86% |
| **Parity in 2005** | 2.761 (0.840) | 2.540(1.005 ) | 2.211(1.280 ) | 2.213 (1.201) | 2.426(1.146 ) |
| **Household Asset Quintile** | | | | | |
| *Poorest* | 14.14% | 26.12% | 17.14% | 27.96% | 17.84% |
| *Second Quintile* | 17.97% | 12.42% | 19.45% | 25.78% | 19.81% |
| *Third Quintile* | 26.44% | 22.98% | 23.44% | 22.75% | 24.47% |
| *Fourth Quintile* | 24.50% | 21.36% | 21.04% | 14.64% | 21.34% |
| *Richest* | 16.95% | 17.12% | 18.93% | 8.87% | 16.54% |

| | | | | | |
|---|---|---|---|---|---|
| **Caste Group** | | | | | |
| *Scheduled Castes (SC)* | 24.81% | 26.62% | 18.90% | 27.48% | 22.64% |
| *Scheduled Tribes (ST)* | 6.96% | 7.77% | 6.65% | 8.02% | 7.00% |
| *Other Backward Classes (OBC)* | 40.62% | 45.93% | 44.07% | 45.55% | 43.01% |
| *Forward Castes (FC)* | 27.61% | 19.68% | 30.38% | 18.95% | 27.35% |
| **Religion** | | | | | |
| *Hindu* | 88.25% | 81.58% | 82.17% | 79.92% | 84.13% |
| *Muslim* | 7.08% | 13.61% | 12.15% | 16.38% | 10.91% |
| *Other Religion* | 4.67% | 4.81% | 5.68% | 3.70% | 4.97% |
| **Area of Residence** | | | | | |
| *Urban* | 43.66% | 31.19% | 24.46% | 16.67% | 23.75% |
| *Rural* | 56.34% | 68.81% | 75.54% | 83.33% | 76.25% |
| **Education** | | | | | |
| *Illiterate* | 48.01% | 53.65% | 44.45% | 56.28% | 47.82% |
| *Incomplete primary* | 9.44% | 7.70% | 7.22% | 6.24% | 7.92% |
| *Primary* | 30.10% | 26.65% | 27.69% | 26.25% | 28.37% |
| *Secondary* | 7.59% | 3.81% | 10.86% | 5.70% | 8.69% |
| *Higher secondary* | 2.93% | 4.58% | 5.16% | 3.42% | 4.02% |
| *College and higher* | 1.94% | 3.62% | 4.62% | 2.11% | 3.18% |
| **State Group** | | | | | |
| *Empowered Action Group (EAG) state* | 25.19% | 33.28% | 49.38% | 69.41% | 43.12% |
| *Non-Empowered Action Group (EAG) state* | 74.81% | 66.72% | 50.62% | 30.59% | 56.88% |

| | | | | | |
|---|---|---|---|---|---|
| **Sample Size** | 6,907 | 239 | 7,343 | 2,225 | 16,714 |

# For women (who report they are fertile) with non-missing data on fertility preferences and key dependent and independent variables

Source: Authors' calculations from IHDS 2005 and 2012.

**Table 2:**

Summary Statistics: background characteristics and dependent variables for non-sterilized women aged 18-40 who had atleast a birth between 2005 and 2012 by Intention Status (unweighted)

| | **Overall non-sterilized sample that has a birth between 2005 & 2012, but no unwanted birth** | **Overall non-sterilized sample that has a birth between 2005 & 2012, and atleast one unwanted birth** | **Overall non-sterilized sample that has atleast one birth between 2005 & 2012** |
|---|---|---|---|
| **Self-Rated Health in 2012** | 1.97 (0.80) | 2.12*(0.87) | 2.06(0.84) |
| **Health Worsening between two waves** | 0.25 | 0.28* | 0.27 |
| **Self-Rated Health in 2005** | 2.13 (0.75) | 2.24*(0.79) | 2.19 (0.77) |
| **Age** | | | |
| 18-20 | 0.24 | 0.14* | 0.18 |
| 21-25 | 0.47 | 0.4* | 0.43 |
| 26-30 | 0.23 | 0.29* | 0.26 |
| 31-35 | 0.05 | 0.12* | 0.09 |
| 36-40 | 0.01 | 0.06* | 0.04 |
| **Parity in 2005** | 1.19 (1.04) | 2.23* (1.22) | 1.80 (1.26) |
| **Household Asset Quintile** | | | |
| *Poorest* | 0.17 | 0.26* | 0.22 |
| *Second Quintile* | 0.16 | 0.23* | 0.20 |
| *Third Quintile* | 0.21 | 0.21 | 0.21 |
| *Fourth Quintile* | 0.23 | 0.18* | 0.20 |
| *Richest* | 0.23 | 0.12* | 0.17 |
| **Caste Group** | | | |

| | | | |
|---|---|---|---|
| *Scheduled Castes (SC)* | 0.21 | 0.27* | 0.25 |
| *Scheduled Tribes (ST)* | 0.08 | 0.09 | 0.08 |
| *Other Backward Classes (OBC)* | 0.4 | 0.4 | 0.40 |
| *Forward Castes (FC)* | 0.3 | 0.24* | 0.27 |
| **Religion** | | | |
| *Hindu* | 0.81 | 0.77* | 0.79 |
| *Muslim* | 0.11 | 0.18* | 0.16 |
| *Other Religion* | 0.07 | 0.05* | 0.06 |
| **Area of Residence** | | | |
| *Urban* | 0.31 | 0.24* | 0.27 |
| *Rural* | 0.69 | 0.76* | 0.73 |
| **Education** | | | |
| *Illiterate* | 0.33 | 0.54* | 0.45 |
| *Incomplete primary* | 0.07 | 0.07 | 0.07 |
| *Primary* | 0.31 | 0.25* | 0.28 |
| *Secondary* | 0.13 | 0.07* | 0.10 |
| *Higher secondary* | 0.1 | 0.04* | 0.06 |
| *College and higher* | 0.07 | 0.03* | 0.05 |
| **State Group** | | | |
| *Empowered Action Group (EAG) state* | 0.4 | 0.6* | 0.52 |
| *Non-Empowered Action Group (EAG) state* | 0.6 | 0.4* | 0.48 |
| **Sample Size** | 1,551 | 2,225 | 3,776 |

Source: Authors' calculations from IHDS 2005 and 2012. *p < .05 (indicates a statistically significant difference in means or proportion between births in this group and those who have no unwanted birth)

**Table 3:**

Linear Regression with lagged dependent variable models examining the impact of fertility intentions on self-rated health of women in 2012.

| | **Model 1** | **Model 2** |
|---|---|---|
| **Unwanted Birth** | 0.151** | 0.615** |
| | (0.05) | (0.20) |
| **Self-Rated Health in 2005** | 0.081** | 0.083** |
| | (0.03) | (0.03) |
| **Age Category (Reference Group 36-40)** | | |
| *18-20* | -0.157 | 0.188 |
| | (0.12) | (0.17) |
| *21-25* | -0.134 | 0.314 |
| | (0.11) | (0.18) |
| *26-30* | -0.140 | 0.290 |
| | (0.11) | (0.17) |
| *31-35* | -0.007 | 0.334 |
| | (0.12) | (0.20) |
| **Age Category*Unwanted birth** | | |
| *18-20* | | -0.334 |
| | | (0.22) |
| *21-25* | | -0.546* |
| | | (0.22) |

| | | |
|---|---|---|
| *26-30* | | -0.510* |
| | | (0.21) |
| *31-35* | | -0.395 |
| | | (0.24) |
| **Parity in 2005** | -0.022 | -0.018 |
| | (0.02) | (0.02) |
| **Household Asset Quintile (Reference Group: Poorest)** | | |
| *Second Quintile* | -0.009 | -0.011 |
| | (0.06) | (0.06) |
| *Third Quintile* | -0.052 | -0.057 |
| | (0.08) | (0.08) |
| *Fourth Quintile* | -0.095 | -0.097 |
| | (0.07) | (0.07) |
| *Richest* | -0.213** | -0.220** |
| | (0.08) | (0.08) |
| **Caste Group (Reference Group: Forward Caste)** | | |
| *Scheduled Castes (SC)* | -0.059 | -0.062 |
| | (0.06) | (0.06) |
| *Scheduled Tribes (ST)* | -0.240** | -0.241** |
| | (0.07) | (0.07) |
| *Other Backward Classes (OBC)* | -0.087 | -0.088 |
| | (0.05) | (0.05) |

| | | |
|---|---|---|
| **Religion (Reference Group: Hindu)** | | |
| *Muslim* | 0.031 | 0.029 |
| | (0.07) | (0.07) |
| *Other Religion* | 0.004 | -0.004 |
| | (0.07) | (0.07) |
| **Area of Residence (Reference Group: Rural)** | | |
| *Urban* | -0.022 | -0.021 |
| | (0.04) | (0.04) |
| **Education (Reference Group: Illiterate)** | | |
| *Incomplete primary* | 0.040 | 0.035 |
| | (0.09) | (0.09) |
| *Primary* | -0.047 | -0.049 |
| | (0.06) | (0.06) |
| *Secondary* | -0.072 | -0.076 |
| | (0.10) | (0.09) |
| *Higher secondary* | -0.172* | -0.168* |
| | (0.07) | (0.07) |
| *College and higher* | -0.157 | -0.166 |
| | (0.10) | (0.10) |
| **State Group (Reference: Non-Empowered Action Group (EAG) state)** | | |

| | | |
|---|---|---|
| *Empowered Action Group (EAG) state* | 0.103* | 0.105* |
| | (0.05) | (0.05) |
| **Constant** | 2.070*** | 1.663*** |
| | (0.14) | (0.20) |
| **R-Square** | 0.05 | 0.06 |
| **Sample Size** | 3,776 | 3,776 |

Note: Ordered logistic regression doesn't change the results

***p < 0.001; **p < 0.01; *p < 0.05

Source: Authors' calculations from IHDS 2005 and 2012.

**Table 4:**

Log Odds from Multivariate Logistic Regression Examining Fertility Intentions and Maternal Health Declines between 2005–12

| | **Model 1** | **Model 2** |
|---|---|---|
| **Unwanted Birth** | 0.283* | 1.844* |
| | (0.14) | (0.82) |
| **Age Category (Reference Group 36-40)** | | |
| *18-20* | 0.154 | 1.360 |
| | (0.34) | (0.80) |
| *21-25* | 0.006 | 1.638* |
| | (0.31) | (0.78) |
| *26-30* | -0.012 | 1.596* |
| | (0.30) | (0.78) |
| *31-35* | 0.023 | 1.551 |
| | (0.32) | (0.85) |
| **Age Category*Unwanted birth** | | |
| *18-20* | | -1.019 |
| | | (0.87) |
| *21-25* | | -1.833* |
| | | (0.85) |
| *26-30* | | -1.773* |
| | | (0.84) |
| *31-35* | | -1.669 |

| | | |
|---|---|---|
| | | (0.92) |
| **Parity in 2005** | -0.053 | -0.034 |
| | (0.06) | (0.06) |
| **Household Asset Quintile (Reference Group: Poorest)** | | |
| *Second Quintile* | -0.047 | -0.057 |
| | (0.17) | (0.17) |
| *Third Quintile* | -0.212 | -0.232 |
| | (0.20) | (0.21) |
| *Fourth Quintile* | -0.099 | -0.110 |
| | (0.19) | (0.19) |
| *Richest* | -0.182 | -0.215 |
| | (0.22) | (0.23) |
| **Caste Group (Reference Group: Forward Caste)** | | |
| *Scheduled Castes (SC)* | -0.113 | -0.128 |
| | (0.16) | (0.16) |
| *Scheduled Tribes (ST)* | -0.200 | -0.215 |
| | (0.23) | (0.23) |
| *Other Backward Classes (OBC)* | 0.083 | 0.069 |
| | (0.13) | (0.13) |
| **Religion (Reference Group: Hindu)** | | |
| *Muslim* | 0.029 | 0.028 |

| | | |
|---|---|---|
| | (0.16) | (0.17) |
| *Other Religion* | -0.159 | -0.187 |
| | (0.24) | (0.24) |
| **Area of Residence (Reference Group: Rural)** | | |
| *Urban* | 0.236* | 0.243* |
| | (0.12) | (0.12) |
| **Education (Reference Group: Illiterate)** | | |
| *Incomplete primary* | 0.163 | 0.144 |
| | (0.23) | (0.23) |
| *Primary* | 0.078 | 0.065 |
| | (0.17) | (0.17) |
| *Secondary* | 0.203 | 0.178 |
| | (0.24) | (0.24) |
| *Higher secondary* | 0.039 | 0.036 |
| | (0.24) | (0.24) |
| *College and higher* | 0.121 | 0.082 |
| | (0.28) | (0.28) |
| **State Group (Non-Empowered Action Group (EAG) state)** | | |
| *Empowered Action Group (EAG) state* | 0.267* | 0.283* |
| | (0.12) | (0.12) |
| **Constant** | -1.409*** | -2.890*** |

| | | |
|---|---|---|
| | (0.37) | (0.8) |
| **Pseudo R Square** | 0.01 | 0.02 |
| **Sample Size** | 3,776 | 3,776 |

Source: Authors' calculations from IHDS 2005 and 2012.

**Table 5:**
Predicted values of Self-rated health in 2012 and predicted probabilities of health deteriorating between 2005 and 2012 for women with wanted and unwanted births in India, with and without using IPW estimator

| | Wanted Birth | Unwanted Birth | p value |
|---|---|---|---|
| **Without IPW** | | | |
| Self-Rated Health in 2012 | 1.97 | 2.12 | 0.000 |
| Health Worsens | 0.25 | 0.28 | 0.017 |
| **With IPW** | | | |
| Self-Rated Health in 2012 | 1.91 | 2.12 | 0.000 |
| Health Worsens | 0.21 | 0.26 | 0.014 |

Source: Authors' calculations from IHDS 2005 and 2012.

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**Appendix Tables**

**Table A1:**

Comparison between IHDS 2005-06 & NFHS 2005-06: Percentage of currently married women age 15-49 who want no more children by number of living children, according to gender of child

**NFHS 2005-06**

| | Number of living children | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 0 | 1 | 2 | 3 | 4 | 5 | 6+ | Total |
| No of living sons | | | | | | | | |
| 0 | 2.8 | 23.9 | 62.1 | 65.3 | 61.5 | 65.2 | 64.3 | 27.1 |
| 1 | na | 36.3 | 88.1 | 89.9 | 89.2 | 89 | 90.6 | 76.4 |
| 2 | na | na | 89.9 | 95.7 | 95.5 | 93.7 | 92.8 | 93.5 |
| 3 | na | na | na | 93.2 | 95.1 | 94.4 | 90.3 | 93.6 |
| 4+ | na | na | na | na | 93 | 94.1 | 88.6 | 90.7 |
| Total | 2.8 | 27.7 | 83.2 | 90.4 | 91.7 | 91.8 | 89.3 | 70.5 |

**IHDS 2005-06***

| | 0 | 1 | 2 | 3 | 4 | 5 | 6+ | Total |
|---|---|---|---|---|---|---|---|---|
| No of living sons | | | | | | | | |
| 0 | 14.82 | 40.99 | 88.69 | 95.66 | 96.27 | 97.58 | 98.09 | 80.52 |
| 1 | na | 45.47 | 91.25 | 95.89 | 95.53 | 95.59 | 97.99 | 82.84 |
| 2 | na | na | 93.18 | 98.61 | 99.29 | 99.24 | 98.3 | 97.06 |
| 3 | na | na | na | 95.98 | 99.62 | 98.59 | 99.2 | 98.09 |
| 4+ | na | na | na | na | 97.07 | 98.82 | 98.59 | 98.41 |
| Total | 13.22 | 39.2 | 88.38 | 95.54 | 96.13 | 97.52 | 98.04 | 79.97 |

*Based on a sample of women interviewed in both IHDS 1 & 2

Source: Authors' calculations from IHDS 2005 and NFHS 2005-06.

**Table A2:**

Linear Regression with lagged dependent variable models examining the impact of fertility intentions and sterilization status on self-rated health of women in 2012: Larger Sample

| | **Linear Regression** |
|---|---|
| **Sterilization and Birth Wantedness (Reference Group: Sterilized and No Unwanted Birth)** | |
| Sterilized and unwanted birth | 0.041 |
| | (0.08) |
| Not sterilized and no unwanted birth | 0.026 |
| | (0.02) |
| Not sterilized and unwanted birth | 0.075* |
| | (0.03) |
| **Self-Rated Health in 2005** | 0.079*** |
| | (0.01) |
| **Age Category (Reference Group 36-40)** | |
| *18-20* | -0.212*** |
| | (0.06) |
| *21-25* | -0.213*** |
| | (0.04) |
| *26-30* | -0.132*** |
| | (0.03) |
| *31-35* | -0.054* |
| | (0.03) |
| **Parity in 2005** | -0.018 |
| | (0.01) |
| **Household Asset Quintile (Reference Group: Poorest)** | |
| *Second Quintile* | -0.015 |
| | (0.03) |
| *Third Quintile* | -0.044 |
| | (0.04) |
| *Fourth Quintile* | -0.122** |
| | (0.04) |
| *Richest* | -0.186*** |
| | (0.04) |
| **Caste Group (Reference Group: Forward Caste)** | |
| *Scheduled Castes (SC)* | 0.000 |

| | |
|---|---|
| | (0.03) |
| *Scheduled Tribes (ST)* | -0.194*** |
| | (0.04) |
| *Other Backward Classes (OBC)* | -0.070** |
| | (0.03) |
| **Religion (Reference Group: Hindu)** | |
| *Muslim* | 0.117** |
| | (0.04) |
| *Other Religion* | -0.098** |
| | (0.04) |
| **Area of Residence (Reference Group:Rural)** | |
| *Urban* | -0.059** |
| | (0.02) |
| **Education (Reference Group: Illiterate)** | |
| *Incomplete primary* | 0.002 |
| | (0.04) |
| *Primary* | -0.042 |
| | (0.03) |
| *Secondary* | -0.141* |
| | (0.05) |
| *Higher secondary* | -0.170*** |
| | (0.04) |
| *College and higher* | -0.229*** |
| | (0.05) |
| **State Group (Non-Empowered Action Group (EAG) state)** | |
| *Empowered Action Group (EAG) state* | 0.053* |
| | (0.03) |
| **Constant** | 2.196*** |
| | (0.07) |
| **R-Square** | 0.04 |
| **Sample Size** | 16, 714 |

Note : Ordered logistic regression doesn't change the results

***p < 0.001; **p < 0.01; *p < 0.05

Source: Authors' calculations from IHDS 2005 and 2012.

**Table A3:**

Log Odds from Multivariate Logistic Regression Examining Fertility Intentions and Sterilization Status and Maternal Health Declines between 2005–12: Larger Sample

| | Logistic Regression |
|---|---|
| **Sterilization and Birth Wantedness (Reference Group: Sterilized and No Unwanted Birth)** | |
| Sterilized and unwanted birth | 0.407* |
| | (0.19) |
| Not sterilized and no unwanted birth | -0.018 |
| | (0.06) |
| Not sterilized and unwanted birth | 0.075 |
| | (0.09) |
| **Self-Rated Health in 2005** | |
| **Age Category (Reference Group 36-40)** | |
| *18-20* | -0.263 |
| | (0.15) |
| *21-25* | -0.430*** |
| | (0.10) |
| *26-30* | -0.200** |
| | (0.08) |
| *31-35* | -0.087 |
| | (0.07) |
| **Parity in 2005** | -0.093** |
| | (0.03) |
| **Household Asset Quintile (Reference Group: Poorest)** | |
| *Second Quintile* | 0.049 |
| | (0.09) |
| *Third Quintile* | -0.091 |
| | (0.10) |
| *Fourth Quintile* | -0.073 |
| | (0.10) |
| *Richest* | -0.084 |
| | (0.11) |

| | |
|---|---|
| **Caste Group (Reference Group: Forward Caste)** | |
| *Scheduled Castes (SC)* | -0.057 |
| | (0.08) |
| *Scheduled Tribes (ST)* | -0.240* |
| | (0.11) |
| *Other Backward Classes (OBC)* | 0.037 |
| | (0.07) |
| **Religion (Reference Group: Hindu)** | |
| *Muslim* | 0.100 |
| | (0.09) |
| *Other Religion* | -0.157 |
| | (0.11) |
| **Area of Residence (Reference Group:Rural)** | |
| *Urban* | 0.032 |
| | (0.06) |
| **Education (Reference Group: Illiterate)** | |
| *Incomplete primary* | 0.122 |
| | (0.10) |
| *Primary* | 0.003 |
| | (0.07) |
| *Secondary* | -0.009 |
| | (0.12) |
| *Higher secondary* | -0.116 |
| | (0.12) |
| *College and higher* | -0.245 |
| | (0.15) |
| **State Group (Non-Empowered Action Group (EAG) state)** | |
| *Empowered Action Group (EAG) state* | 0.224*** |
| | (0.06) |
| **Constant** | -0.755*** |
| | (0.16) |
| **R-Square** | 0.01 |
| **Sample Size** | 16,714 |

***p < 0.001; **p < 0.01; *p < 0.05

Source: Authors' calculations from IHDS 2005 and 2012.

**Table A4:**

Number of children alive, desired number of children and child deaths by birth wantedness for those who have atleast one birth between 2005 & 2012 (in percentage).

| | **Wanted Birth** | **Unwanted Birth** | **Overall** |
|---|---|---|---|
| **No of Children Alive in 2005 (in %)** | | | |
| 0 | 22.78 | 5.42 | 12.56 |
| 1 | 53.07 | 27.17 | 37.83 |
| 2 | 12.4 | 28.4 | 21.81 |
| 3 | 3.24 | 18.69 | 12.33 |
| 4 and more | 8.52 | 20.33 | 15.46 |
| **No of Additional Children desired in 2005 (in %)** | | | |
| 0 | 0 | 68.12 | 40.07 |
| 1 | 50.41 | 24.44 | 35.13 |
| 2 | 37.52 | 7.32 | 19.75 |
| 3 | 7.67 | 0.12 | 3.23 |
| 4 and more | 4.39 | 0 | 1.81 |
| **No of Children Alive in 2012 (in %)** | | | |
| 0 | 0.22 | 0.57 | 0.43 |
| 1 | 11.94 | 0.86 | 5.42 |
| 2 | 60.86 | 16.86 | 34.98 |
| 3 | 19.03 | 31.26 | 26.23 |
| 4 and more | 7.95 | 50.44 | 32.95 |
| **No of Children died between 2005 and 2012(in %)** | | | |
| 0 | 90.64 | 79.48 | 84.08 |
| 1 | 8.02 | 14.44 | 11.8 |
| 2 and more | 1.33 | 6.08 | 4.12 |

Source: Authors' calculations from IHDS 2005 and 2012.