How do Women Learn They Are Pregnant? The Introduction of Clinics and Pregnancy Uncertainty in Nepal*

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Abstract

The earlier a woman learns about her pregnancy status, the sooner she can make decisions about her own and infant's health. This paper examines how women learn about their pregnancy status and measures how access to pregnancy tests affects earlier pregnancy knowledge. Using ten years of individual-level monthly panel data in Nepal, we find that, on average, women learn they are pregnant in their 4.6th month of pregnancy. Living approximately a mile further from a clinic offering pregnancy tests increases the time a woman knows she is pregnant by one week (5% increase) and decreases the likelihood of knowing in the first trimester by 4.5 percentage points (16.1% decrease). Women with prior pregnancies experience the most substantial effects of distance within the first two trimesters, while, for women experiencing their first pregnancy, distance does not affect knowledge. This difference suggests that access to pregnancy tests is a binding constraint only after women's beliefs, or symptoms, about being pregnant are strong enough.

Keywords: Pregnancy Testing; Reproductive Health; Nepal

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1 Introduction

The knowledge of being pregnant is the first step in the continuum of care towards a healthy pregnancy or safe abortion (Boerma et al., 2018). The timing of learning about a pregnancy matters for some decisions (i.e., pregnancy termination) and behaviors (i.e., taking multi-vitamins, stopping smoking), and may affect health outcomes for both woman and infant. While a pregnant woman will eventually learn her pregnancy status, inferring this information correctly is not trivial and depends on the knowledge of symptoms of pregnancy, prior pregnancy experiences, and access to pregnancy testing. In this paper, we examine the process through which women learn they are pregnant and how prior experience with pregnancy and access to pregnancy tests affect the timing of learning.

To understand pregnancy uncertainty and the effects of access to pregnancy tests on earlier pregnancy status knowledge, we use ten years of data from the Chitwan Valley Family Survey (CVFS)—individual-level monthly panel data measuring reproductive behavior of married women living in Nepal (Axinn et al., 2018). Using each recorded live-birth in the data between 1997 and 2006 (1,593 births), we compare each woman's month of conception with the contemporaneous report of her pregnancy status. We examine the determinants of identifying pregnancy earlier, including experience with prior pregnancies. We then use the openings and closures of health centers in the area over time to evaluate how changes in access to pregnancy test kits at clinics affect the average time women become aware they are pregnant.

We find a strong negative relationship between distance to clinics with pregnancy tests on earlier knowledge of pregnancy status. Living above the median distance to a clinic offering pregnancy tests (approximately a mile or fifteen minutes walking) increases the time a woman knows she is pregnant by one week (5% increase). It decreases the likelihood of knowing in the first trimester by 4.6 percentage points (16.1% increase) and, in the second trimester, by 6.5 percentage points (8.5%). There is no effect of distance on overall pregnancy uncertainty for the whole sample in the third trimester.[1] To prevent confounding access to pregnancy tests with access to family planning, our data allow us to control for distance to family planning services in all of our analysis.

For women with a prior pregnancy, the impact of distance on the probability of reporting pregnancy is negative and significant in all trimesters. Moving above the median distance to a clinic with pregnancy tests, decreases the probability of reporting a pregnancy in the first, second, and third trimesters by 6.2, 12.4, and 2.5 percentage points, respectively. This result

[1] This result is consistent with the finding that distance to a hospital or clinic is associated with higher gestational age at abortion in clinics in the United States (Cunningham et al., 2017).

suggests that experience with symptoms of pregnancy may be important to utilize clinics with pregnancy tests in earlier months. Among women without prior pregnancy experience, the effect of distance on pregnancy knowledge is not significant during any trimester or overall during pregnancy, while for women with prior pregnancies, the effect is largest in the second trimester. This suggests that access to pregnancy tests is a binding constraint only after women's beliefs, or symptoms, about being pregnant are strong enough.

Our paper speaks to the literature about a woman's uncertainty about her pregnancy status. It is common for women to be unaware of their pregnancy status; in the United States, the average gestational age of detection is approximately 5.5 weeks, with 23% of women detecting it only after seven weeks of gestation (Branum and Ahrens, 2017).[2] Moreover, over 60% of adolescents who visit a clinic to take a pregnancy test has negative results (Zabin et al., 1996). In developing countries, uncertainty about one's pregnancy status may be even higher than in high-income countries (Peacock et al., 2001a). Malnutrition may cause irregular periods, hiding signs that lead to the suspicion of pregnancy (Rowland et al., 2002). Women may have less knowledge and education about reproduction (Peacock et al., 2001b), and high rates of breastfeeding and lactational amenorrhea may lead to more uncertainty because these methods are effective only under very specific conditions (Kennedy et al., 1989; Shaaban and Glasier, 2008; WHO, 1998).

To the best of our knowledge, only three other papers have examined the relationship between earlier pregnancy detection (or earlier antenatal care utilization) and access to pregnancy tests (Hochman et al., 2012; Comfort et al., 2016; Andersen et al., 2013). As our paper, these studies find that access to pregnancy tests decrease the time to pregnancy detection and increase the take-up of services such as antenatal care and abortion. However, our paper is the first to use monthly report of pregnancy status over ten years to understand how changes in services provided by clinics in a non-controlled environment affect the timing of detection of pregnancy.

The policy implication of our study is that, understanding the process of how a woman learns of her pregnancy status can help health providers design policies or provide access to pregnancy tests that could result in healthier infants and mothers. Women can use the knowledge of their pregnancy status to optimize their behavior, such as beginning antenatal care (Simkhada et al., 2008) or having an abortion (Drey et al., 2006). Pregnancy knowledge

[2]Most studies about the timing of pregnancy uncertainty focus on women who had an abortion, and these results may not extrapolate to the whole population (Drey et al., 2006; Baum et al., 2015; Foster et al., 2008; Saavedra-Avendano et al., 2018). The timing a woman suspects her pregnancy varies widely; for example, Ingham et al. (2008) report that the median time to suspect pregnancy, among women getting an abortion, is 52.5, and the interquartile range is equal to 21–79 days. In our sample, women detect their pregnancy with 4.6 months, on average, and 71.2% of women interviewed in the second month of their pregnancy are not aware of their status.

is important for women to receive early antenatal care, which is correlated with healthy pregnancy outcomes (Hueston et al., 2003; Ratzon et al., 2011). In developing countries, only half (48%) of women receive early antenatal care (Moller et al., 2017); earlier pregnancy detection may not only help women seek earlier care (Morroni and Moodley, 2006; Lamina, 2013) but also help them adopt healthy prenatal behaviors. Earlier pregnancy detection also enables women to begin making plans for delivery and motherhood or to make earlier decisions about abortion—earlier abortions are associated with lower rates of complications and mortality (Grossman et al., 2008).

This paper is organized as follows: Section 2 presents the research design: the setting of our study, the data, and the sample used in the analysis. Section 3 describes the empirical approach to estimate the effect of distance to clinics with pregnancy tests on pregnancy knowledge. Section 4 presents the results, including the effect of distance on overall pregnancy uncertainty and uncertainty by trimester. Section 5 concludes.

2 Research design

In this section, we describe the setting of the study, the data used in the analysis, and how the analytical sample was selected.

2.1 Setting: Chitwan, Nepal, 1997 to 2006

The data used in this study were collected between 1997 and 2006 in the western valley of Chitwan District in south-central Nepal. During this time, Nepal, and particularly Chitwan, went through many changes in regard to its economic and political development, access to reproductive health care, and fertility.

Until 1950, Chitwan was mainly uninhabited and covered by virgin forests. Due to population increase and rapid shortage of farmland in other parts of Nepal, beginning in the mid-1950s, the Nepalese government cleared the forests for farming and eradicated malaria in part of Chitwan, which saw a spike in incoming migration from other regions of the country (Axinn and Yabiku, 2001). At the same time, Chitwan remained mostly isolated from the rest of the country until the construction of all-weather roadways connecting the region with the rest of the country and with India—the first one was built in 1979. Other roads followed, and by 1980s, Narayanghat, the largest town in Chitwan, had become a transportation hub. With these changes in infrastructure, the population grew, the area developed, and more services became available: the first medical provider opened in the area in 1954 (Brauner-Otto et al., 2007), and by 1990 there were more than 80 clinics in the region (Yabiku, 2004).

From 1996 to 2006, Nepal faced an armed conflict between the government and the Communist Party of Nepal (Maoist). The study area was not affected by this conflict until around 2000. From then until 2006, daily activities were affected by bomb blasts, gun battles, and conflict-related fatalities. We describe the effect of the civil conflict on our data and empirical strategy below.

The availability of family planning and maternity care also changed in Nepal during this time. In 2001, the earliest year this information is available, nine percent of women in the country delivered in a health clinic, while 18% did so in 2006; similarly, only 16% of pregnant women received ANC care prior to the fourth month of pregnancy in 2001, compared to 28% in 2006 (ICF, 2019). Another change was the legalization of abortion in 2002. Before that, abortion was strictly illegal in Nepal; it became legal if performed within the first twelve weeks of pregnancy, with some exceptions (Thapa, 2004). However, in 2011, almost a decade after the law, less than 38% of Nepali women believed abortion was legal (ICF, 2019). Recently, abortions have been increasing, especially in more developed areas (ranging from 21 to 59 per 1,000 women aged 15–49) (Puri et al., 2016). The estimates of illegal abortions—by definition, performed after 12 weeks of pregnancy, however, is still high: 58% of the abortions performed in 2014 were estimated to be illegal. The fertility ratio plummeted during this period, falling from 4.6 births per woman in 1996, to 3.1 in 2006 (WHO and the United Nations Population Division, 2015).[3]

2.2 Data

We use two main datasets in the analysis: the Chitwan Valley Family Study, used to construct the pregnancy knowledge outcomes, and the Health Providers data, used to build the distance to clinics with pregnancy tests and family planning services.

2.2.1 Chitwan Valley Family Study

The data used in this study comes from the Chitwan Valley Family Study (CVFS) (Axinn et al., 2007). A sample of 1,582 households (4,646 individuals) in 151 neighborhoods was selected to be part of the study in 1997. Each neighborhood consisted of 5 to 15 households surrounded by farmland. The study area includes three sampling strata corresponding to

[3]The maternal mortality ratio (MMR) also dropped during this period. In 1996, Nepal had one of the highest MMR in the world (631 per 100,000 live births); In 2006, the MMR had been reduced to 425 per 100,000 live births (WHO and the United Nations Population Division, 2015). The ideal number of children for married women fell from 2.9, in 1996, to 2.4 in 2006; the ideal number of children for men also fell, but at a slower pace, reaching 2.4 in 2006.

three areas with different degrees of urbanization.

From 1997 to 2006, enumerators regularly visited each household to record any major changes in the household's structure, such as pregnancies, births, marriages, divorces, and living arrangements. All residents of the sampled neighborhoods between the ages of 15 and 59 and their spouses were surveyed. These data also contain a record of the neighborhood where each member of the household was living, and members were followed if they migrated. Households that moved into the CVFS area during the study were also surveyed while living there.

In addition to collecting general household information each month, the study team collected data directly from each woman of reproductive age (18–49) about her pregnancy status and any pregnancy-related events such as miscarriages, abortions, still-births, or live-births.

The data are monthly, but the frequency of enumeration changed over time, as shown in Table 1. Between 1997 and 1999, households were interviewed approximately ten times per year. Between 2000 and 2005, survey budget constraints and civil conflict resulted in several changes to the data collection process. Surveys were conducted only during daylight, and the frequency of household visits was reduced, so the total number of visits per year ranged from six visits in 2000 to only one visit in 2003 (Axinn et al., 2012).

2.2.2 Health Providers and Access to Pregnancy Tests

We use neighborhood-level information detailing all health service providers in the 151 neighborhoods from 1997 to 2005, collected in the CVFS (Axinn et al., 2018). The data contain the geographical location of each provider, its year of opening and closure, and information on infrastructure, personnel, and services. It includes separate availability of family planning and pregnancy test kits.

The distance from a respondent's home to a health provider is measured by the geodesic distance between the centroid of a household's neighborhood and the exact location of the clinic. For each household, we calculate the minimum distance to a clinic offering pregnancy tests and to a clinic offering family planning services. We then create a binary variable equal to one if the woman lives in a neighborhood where the distance to the closest clinic is above the median distance, and zero otherwise. The median distance is calculated in our sample for each woman-month observation.

We assume the shortest distance to a clinic for the entire pregnancy if, during a woman's pregnancy, the distance changes (because a new clinic opened or because the woman moved to a different neighborhood).[4] For respondents living outside of these areas, we do not know

[4]This happens in 210, or 2.57%, of woman-months. In most cases, the woman moves out of the region of

the distance to health providers in their vicinity.

Table 2 presents the number and characteristics of health providers offering family planning services or pregnancy tests from 1997 to 2005. Out of a total of 94 health clinics in the area in 1997, 82 provided modern family planning, and 24 offered pregnancy tests. From 1997, the number of providers offering pregnancy tests grew to a total of 103 in 2005. The distance to the closest provider declines significantly over time, from 1.13 miles, on average, in 1997, to 0.48, in 2005. The median distance from a neighborhood to a pregnancy-testing clinic is 0.92 miles. This variable has a mean of 1.20 miles, and the smallest distance is 0.01 miles, while the largest is 4.81 miles.

2.3 Analytical Sample: Ever-Pregnant Women

Our sample involves married women who had a live birth during our study period. To determine a woman's pregnancy status, we use the monthly data that asked each woman about her pregnancy statuses. We observe the following possible status: not pregnant, pregnant, uncertain, had a live birth, stillbirth, miscarriage, or abortion. Appendix Table 1 shows the distribution of pregnancy statuses over the months women were interviewed.

For any month in which a woman reports a live birth, we code each of the prior nine months (including the one when the birth was reported) as that the woman is pregnant. Although some variation of gestation duration exists among women, the nine-month duration is an estimate based on the calculation of average delivery dates (280 days after the beginning of the last menstrual period, or 9.2 months) (Jukic et al., 2013).[5]

Because we only have information of clinics in the CVFS area, we restrict our sample to women who lived in the CVFS area (i.e., one of the 151 neighborhoods) for at least one month during her pregnancy. Since the clinic data covers only 1997-2005, we include 2006 births only if the pregnancy started in 2005. We only consider months when the woman was interviewed about her pregnancy status directly by enumerators.

Table 1 presents the total sample of women, which ranges from 3,033 women in 1997 to 3,528 in 2006. Panel A reports the average number of times a woman was interviewed each year, which varies from almost ten times a year in the first year of the study to approximately

the study at some point during gestation.

[5]Our definition of the reported month of pregnancy implicitly assumes that the month a woman reports she is pregnant coincides with the month she detects it. This is not necessarily true in all contexts; for example, qualitative studies in developed countries find that women may conceal their pregnancy until birth or until a certain stage of gestation (Peacock et al., 2001a; Stokes et al., 2008). Because the survey in our study was administered in privacy by female interviewers, and the interviews occurred frequently over time to build rapport with respondents, women may have felt comfortable to answer truthfully (Axinn et al., 2007). Regardless, even if women were to misreport their pregnancy status, as long as the distance to a clinic is not systematically correlated with time to reveal the pregnancy status, our estimates of the effect of distance to clinics on pregnancy uncertainty will not be biased.

two times in 2006. On average, 3356 women were interviewed 5.5 times each year; in 2004, when the civil conflict was at its peak, the average number of interviews reached a low of 1.20 times per year. Appendix Table 2 shows how the sample composition change over the ten years of the study, indicating how many women leave and join the survey in each year.

Table 1, Panel B, shows the average observed pregnancy status over time by women. Across all years, we observe, on average, the reported pregnancy status of 2,496 women (74% of the total sample of women interviewed). It varies from 94% in 1998, the second year of the survey, to 9% in 2004, during the peak of the conflict discussed in Section 2. From these women, on average, 254.7 of the women interviewed (8%) report a live birth in a year.

Panel B shows how the sample size changes when we apply the necessary exclusion restrictions for our analysis: considering only women who were directly interviewed by an enumerator in that year, who had a live birth, and who lived in CVFS for at least part of her pregnancy, so we can assign her a distance to a clinic.[6]

3 Empirical Strategy

In this section, we present the two main estimation approaches to understand the effects of access to pregnancy tests on pregnancy status knowledge. First, we measure the effect of distance to pregnancy tests on overall pregnancy uncertainty, where each observation is a pregnancy, and the main outcome is the month a woman learned about her pregnancy.[7] Second, we measure the effect of distance to pregnancy tests on pregnancy uncertainty by trimester; in this case, each observation is a month of pregnancy when a woman was interviewed. We run three separate regressions, one for each trimester, where the main outcome is if a woman is aware of her pregnancy in that trimester.

3.1 Overall Pregnancy Uncertainty

Our first approach is to estimate the following using observations at the woman-pregnancy level:

$$ReportPreg_{iph} = \alpha + \beta_1 DistPT_{iph} + \beta_2 DistFP_{iph} + \theta_{iph} + \eta_{iph} + \gamma_{iph} + \epsilon_{iph} \tag{1}$$

[6] When the outcome of interest is the month a woman detected her pregnancy we have an additional restriction: we need to observe a month when the woman knew she was pregnant. This is not necessary when the outcome is a binary variable equal to one if the woman knew she was pregnant in that trimester. The change in sample size is shown in the last two rows in Table 1, Panel B.

[7] After filtering our sample according to the factors described in Section 2, most women who remain in our sample have only one live birth (65%). The remaining have among two and five live births.

$ReportPreg_{iph}$ indicates the month of gestation when a woman i during pregnancy p and living at a neighborhood h reports she was pregnant; this number ranges from 1 to 9. $DistPT_{iph}$ equals one if neighborhood h is located above the median distance to a clinic with pregnancy tests, and zero otherwise. In Appendix Table 3, we show that our results are robust to using a continuous measure of distance.

To isolate the effect of distance to pregnancy tests on pregnancy uncertainty, we consider access to family planning methods as a potential confounder. The literature shows that proximity to women's health clinics affects the take-up of services, such as preventive care, and contributes to a decline in fertility rates (Lu and Slusky, 2016; Rossin-Slater, 2013; Bailey, 2012). Therefore, access to contraception could itself affect women's uncertainty by decreasing the risk of being pregnant, and affect our main estimates due to omitted-variable bias. We specifically control for the distance to family-planning clinics with $DistFP_{iph}$, which equals one if the woman lives in a neighborhood where the distance to the closest clinic offering contraceptive methods is above the median distance, and zero otherwise.

We add age fixed effects, θ_{iph}, since uncertainty about pregnancy may vary with sexual activity and experience, which are correlated with age. We consider age at the first month of pregnancy.

We also control for the number of times during pregnancy a woman was interviewed with fixed effects η_{iph}. This controls for the fact that women interviewed more times are more likely to be interviewed more to the end of the pregnancy, and therefore more likely to be aware of their state.[8]

We include strata-by-year fixed effects, γ_{iph}, to account for possible changes specific to an area over time that could be correlated with pregnancy uncertainty or the access to clinics. These fixed effects control for annual changes in the infrastructure of a strata—such as the improved roads and opening of new schools—and in demographic aspects of a strata—such as changes in the typical family size and age of first birth.

The main identifying assumption to estimate the effect of distance to clinics with pregnancy tests on pregnancy uncertainty is that, after controlling flexibly for a woman's age, the number of times she is interviewed during her pregnancy, unobservable characteristics of the location where she lives that may vary across years, and distance to family-planning services, the distance to a clinic offering pregnancy tests is exogenous. A threat to validity is if, after controlling for the variables mentioned above, other unobservable factors that affect pregnancy uncertainty vary systematically with the distance to clinics with pregnancy tests. For example, the opening of new roads, or new schools, could be positively correlated with

[8]In Appendix Table 4 we show that our results are robust to not controlling for the number of times during pregnancy a woman was interviewed.

the location decision of clinics and also with the location where more educated households decide to live. If a woman living in such households is more likely to be aware of her pregnancy status, and if such changes are not captured by our strata-year fixed effects, it can bias our estimates.

3.2 Pregnancy Uncertainty by Trimester

To capture the effect of distance to clinics with pregnancy tests on pregnancy uncertainty by trimester, we estimate a model similar to Equation 1, but at the woman-month level. For each trimester, we estimate the following model:

$$ReportTrimester_{imph} = \alpha + \beta_1 DistPT_{imph} + \beta_2 DistFP_{imph} + \theta_{imph} + \rho_{imph} + \gamma_{si} + \epsilon_{imph} \quad (2)$$

where $ReportTrimester_{imph}$ is a binary variable equal to one if a woman i during month m of pregnancy p living in neighborhood h reported being pregnant. We estimate Equation 2 separately for each trimester, and in each estimation, we restrict our sample to women interviewed during that trimester.

$DistPT_{imph}$ is a measure of distance as defined above, but in this case, allowed to vary monthly. θ_{imph} are age fixed effects. ρ_{imph} are month-of-pregnancy fixed effects, which account for the month of pregnancy when the woman was interviewed. We control for the month of interview because a woman is more likely to know and report her pregnancy as it advances. γ_{iph} are strata-by-year fixed effects, as in Equation 1.

We cluster the standard errors of all estimations of Equation 1 and 2 at the neighborhood level since this is the source of variation in the distance to the nearest health center.

4 Effect of Distance to Clinics with Pregnancy Tests

In this section, we present the impact of distance to clinics with pregnancy tests on pregnancy uncertainty. First, we show the effect of distance on the whole pregnancy, measured at the woman-pregnancy level. Second, because the estimate may mask important heterogeneity across pregnancy term (i.e., first, second, or third trimester), we show the effect of distance by trimesters, measured at the woman-month level. For the same reason, we present all results separately by women prior experience with pregnancy.

4.1 Effect of Access to Pregnancy Tests on Overall Pregnancy Uncertainty

Table 3 presents the estimates from Equation 1, showing the effects of distance to a clinic with pregnancy tests on the month a woman learned she was pregnant, controlling for the distance to a clinic with family planning, the woman's age, the number of times she was interviewed during pregnancy, and strata-by-year unobservable and constant characteristics. In Column 1, we see that going from below to above the median distance to access pregnancy tests increases by 0.23 months the time women report their pregnancy, or by 5%.

While the estimate in this first column of the average effect of distance is moderately large and statistically significant, the magnitude of the coefficients masks important heterogeneity across prior experience with pregnancy.

We examine this further in columns 2 and 3 of Table 3. We see the effect of distance to pregnancy tests on knowledge about pregnancy is coming from women who have previous experiences with pregnancy. Moving from below to above the median of distance to clinics with pregnancy tests increases the month women with prior pregnancies report being pregnant by 0.52, or 11.2%. The effect is not significant for women in their first pregnancy. In Appendix Table 3 we show that our results are robust to a different definition of distance to a clinic with pregnancy tests.[9]

4.2 Effect of Access to Pregnancy Tests on Pregnancy Uncertainty by Trimester

We now look for differences in the effect of access to pregnancy tests on pregnancy uncertainty by trimester of pregnancy. We care about the effect by trimester for two reasons: we expect women to be more likely to report a pregnancy as gestation advances, and the health benefits of detecting a pregnancy earlier are larger.

Table 4 shows the effect of distance to clinics with pregnancy tests on the probability of reporting a pregnancy in each trimester. If access to pregnancy matters, we expect the coefficient to be negative, which is the opposite of what we expected in Table 3—where the outcome was the month the pregnancy was reported.

Column 1 of Table 4 shows that moving above the median of distance to clinics with pregnancy tests decreases by 4.5 percentage points the probability a woman knows she is

[9] Appendix Table 3 shows the results when distance to a clinic with pregnancy tests is defined as the logarithm of the distance in miles, controlling for the logarithm of the distance to a clinic offering family planning services. The effect is still positive but not significant for all women, and positive and significant for women with prior pregnancies.

pregnant in the first trimester. This reduction in knowledge corresponds to a 16.1% decrease in the mean of 28% of women who know their status at this point of pregnancy.

In columns 2 and 3, we explore potential heterogeneities in this effect by women's previous experience with pregnancies. The results follow the pattern we found in the overall pregnancy results in Table 3: the distance to clinics offering pregnancy tests is a binding constraint only to women who have had previous pregnancies. Column 2 of Table 4 shows that living above the median distance to clinics with pregnancy tests decrease the probability women with prior pregnancies know they are pregnant in the first trimester by 6.2 percentage points—a decrease of 25.2% from the mean. Column 3 shows that the effect is not significant for women in their first pregnancy.

Columns 4–6 and 7–9 show the effect of distance to clinics with pregnancy tests on knowledge in the second and third trimester, respectively. The effect of distance on all women and on women with prior pregnancies is larger in the second trimester; it represents a decrease on the probability of knowing about pregnancy in the second trimester of 6.5 percentage points (or 8.5%) for all women, and of 12.4 percentage points (or 16.8%) for women with prior pregnancies.

In the third trimester, the effect of distance to clinics with pregnancy tests is negative but not significant for all women, and negative but smaller than in other trimesters for women with prior pregnancies—equal to a decrease of 2.5 percentage points in the probability of knowing she is pregnant (or 2.5%).

Table 4 presents two main results. First, the distance to clinics with pregnancy tests do not affect women in their first pregnancy. These women would have had less experience with knowing the signs and symptoms of pregnancy in the early months and would be less likely to act upon beliefs to go to a clinic with a pregnancy test. Thus, the effects of distance in all trimesters are statistically insignificant (with wide confidence intervals). Second, Table 4 also shows that the distance constraint binds the most for women in the earlier months of pregnancy. In the last trimester of pregnancy, the need to access a clinic to confirm a pregnancy is smaller since other signs of pregnancy are likely more evident.

5 Conclusion

In this paper, we provide new evidence on when women learn about their pregnancy status, and how constraints on access to pregnancy tests affect the timing of learning. We use a novel high-frequency dataset over ten years in Nepal, where women are asked monthly about their pregnancy status. These unique data allow us to measure uncertainty about pregnancy more accurately than with retrospective reports. We also measure changes in access to pregnancy tests over ten years of data as new clinics open or existing clinics begin stocking pregnancy tests, separately controlling for clinics offering family planning to account for possible confounding factors related to distance to clinics.

We find that women who live farther from a clinic with pregnancy tests report later their pregnancy. By increasing the distance to a health center with pregnancy tests from less to more than 0.92 miles (median distance), women increase by one week the time they report their pregnancy. The likelihood of knowing their pregnant status in the first trimester also decreases by 4.5 percentage points, or by 16.1%. These effects differ by a woman's previous experience with pregnancies and by trimester; the distance constraint is binding the most for women with previous pregnancies, and especially in the first trimesters of pregnancy. These results show that access to clinics with pregnancy tests is a binding constraint when symptoms, or beliefs, are strong enough to motivate a woman to confirm her pregnancy.

A back-of-the-envelope calculation helps to estimate this impact in terms of health outcomes. According to Caughey et al. (2008), having the first-trimester obstetric ultrasound (OBUS) at 12 weeks of gestation or less decreases the rate of post-term pregnancy (42 weeks or longer) by 27% when compared to having it from week 13–24 of gestation. Assuming that a woman that learns of her pregnancy in the first trimester also gets her OBUS in the first trimester, living within 0.92 miles from a clinic with pregnancy tests decreases the probability of post-term pregnancy by 1.2%. This reduction in post term pregnancy has further effects on the health of the mother and the fetus since the risk of complications increase with gestation beyond 40 weeks—e.g., the risk of cesarean delivery increases by 100% and of neonatal sepsis increases by 50% (Alexander et al., 2000).

Our study covers a period of high maternal mortality ratio in Nepal, which is still an important issue in many other countries. Our results show that access to clinics with pregnancy tests is an important constraint for pregnancy awareness. Since pregnancy testing is a relatively inexpensive technology, improving its availability has the potential to affect pregnancy knowledge, and in the end, to improve the woman and the infant's conditions during gestation and beyond.

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Table 1: Sample of Women by Year

	Year									
	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Panel A: Married Female Respondents										
Sample	3033	3296	3278	3364	3402	3558	3590	3024	3486	3528
Times Interviewed per Year (Avg)	9.76	8.67	10.05	9.23	5.84	3.11	3.04	1.20	2.41	2.18
Panel B: Observed Pregnancy Status										
Observed Pregnancy Status	2630	3096	2683	2642	2681	2826	2891	267	2597	2646
Had a Live Birth	220	323	345	268	286	288	252	191	191	183
Living in CVFS during Pregnancy	183	227	224	184	215	223	207	91	111	85
Observed Month of Pregnancy Detection	181	216	223	179	202	190	170	54	103	75

Notes: This table shows the total sample of married female respondents in the data, in panel A, and the sample used in our analysis, in panel B. The third row in panel B corresponds to our main sample of women when the outcome is knowledge by trimester. The last row in panel B corresponds to our main sample of 1,593 woman-pregnancies when the outcome is month of detection. The small difference between these two last rows corresponds to women who were interviewed at some point during pregnancy when they did not know their status, but were not interviewed again; therefore they cannot be part of the sample when the outcome is month of pregnancy detection.

Table 2: Sample of Health Providers by Neighborhood and Year

	Year								
	1997	1998	1999	2000	2001	2002	2003	2004	2005
Total Clinics	94	96	106	108	113	128	133	142	168
Total Clinics with Pregnancy Tests (PT)	24	27	34	34	43	59	66	78	103
Distance to PT Clinics (Miles)	1.128	1.093	1.006	1.016	0.865	0.739	0.711	0.583	0.478
Total Clinics with Family Planning (FP)	82	84	93	95	102	117	119	129	154
Distance to FP Clinics (Miles)	0.599	0.625	0.623	0.624	0.585	0.532	0.505	0.490	0.440
Correlation Distance to FP and PT Clinics	0.496	0.481	0.538	0.532	0.571	0.652	0.659	0.915	0.942

Notes: This table shows the total number of any type of health provider, the total number of health providers offering pregnancy tests, and the total number offering family planning services. The distance is the average distance from a clinic to the centroid of neighborhoods in our sample. The health provider data for 2006 is not available.

Table 3: Impact of Distance to Clinic with Pregnancy Tests on Overall Pregnancy Knowledge

	Month Reported Pregancy		
	All women	Prior Pregnancies	No Prior Preg.
	(1)	(2)	(3)
Distance to Pregnancy Tests	0.227**	0.515***	-0.184
	(0.112)	(0.177)	(0.329)
Distance to Family Planning	0.074	-0.149	0.482
	(0.117)	(0.194)	(0.315)
Observations	1,593	636	308
Adjusted R-squared	0.112	0.148	0.106
Mean Dependent Var.	4.591	4.613	4.617

Notes: This table shows the result of three separate regressions. All columns include strata-year fixed effects, number-of-interviews-during-pregnancy fixed effects, and age fixed effects. We have information of prior pregnancies for 944 woman-pregnancy, which affects the sample size in columns 2 and 3. Standard errors are clustered at the neighborhood level.

Table 4: Impact of Distance to Clinic with Pregnancy Tests on Pregnancy Knowledge by Trimester

	Knew in First Trimester			Knew in Second Trimester			Knew in Third Trimester		
	All women	Prior Preg.	No Prior Preg.	All women	Prior Preg.	No Prior Preg.	All women	Prior Preg.	No Prior Preg.
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Distance to Pregnancy Tests	-0.045**	-0.062**	0.015	-0.065**	-0.124***	-0.002	-0.005	-0.025**	0.033
	(0.020)	(0.030)	(0.059)	(0.028)	(0.042)	(0.058)	(0.009)	(0.012)	(0.026)
Distance to Family Planning	-0.039*	-0.034	-0.100*	0.014	0.044	-0.060	0.013	0.007	0.010
	(0.021)	(0.032)	(0.059)	(0.027)	(0.044)	(0.054)	(0.008)	(0.011)	(0.025)
Observations	2,792	1,324	557	2,732	1,305	537	2,632	1,280	511
Adjusted R-squared	0.146	0.145	0.207	0.089	0.106	0.163	0.027	0.048	0.052
Mean Dependent Var.	0.28	0.246	0.266	0.769	0.736	0.769	0.974	0.976	0.967

Notes: This table shows the result of nine separate regressions. All columns include strata-year fixed effects, month-of-interview fixed effects, and age fixed effects. Standard errors are clustered at the neighborhood level. We have information of prior pregnancies for a smaller share of woman-month pairs, which affects the sample size in the results splitting women by their experience with prior pregnancies. Each column is conditional on the woman being interviewed in that trimester. Standard errors are clustered at the neighborhood level.

Appendix

Table 1: Pregnancy Status Over Time

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Not pregnant	0.930	0.922	0.913	0.928	0.947	0.958	0.962	0.936	0.964	0.968
Pregnant	0.046	0.047	0.056	0.044	0.032	0.031	0.027	0.053	0.028	0.024
Live birth	0.008	0.010	0.012	0.008	0.007	0.001	0.002	0.005	0.003	0.001
Uncertain	0.015	0.021	0.019	0.019	0.014	0.009	0.009	0.005	0.005	0.006

Notes: This table shows the distribution of reported pregnancy status by woman-month she was interviewed. The following pregnancy status are omitted from the table because they represented less than 0.10% in a year: stillbirth, abortion, and miscarriage.

Table 2: Sample Composition

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
1997	2630	2531	1978	1855	1746	1670	1620	123	1390	1304
1998		565	445	123	70	52	49	12	44	38
1999			260	123	56	40	29	3	19	16
2000				541	209	105	75	7	54	45
2001					600	248	135	13	73	53
2002						711	313	30	121	99
2003							670	34	190	135
2004								45	28	19
2005									678	435
2006										502

Notes: This table shows the composition of the sample over the period of analysis. The total in each column is the total number of women with observed pregnancy status, which corresponds to the first row in Panel B, Table 1. Each row corresponds to the year a cohort joins the sample.

Table 3: Impact of Distance (Log) to Clinic with Pregnancy Tests on Overall Pregnancy Knowledge

	Month Reported Pregancy		
	All women	Prior Pregnancies	No Prior Preg.
	(1)	(2)	(3)
Distance to Pregnancy Tests (log)	0.075	0.208*	0.067
	(0.057)	(0.108)	(0.225)
Distance to Family Planning (log)	-0.082	-0.189	-0.047
	(0.074)	(0.147)	(0.276)
Observations	1,593	636	308
Adjusted R-squared	0.109	0.142	0.098
Mean Dependent Var.	4.591	4.613	4.617

Notes: This table shows the result of three separate regressions. All columns include strata-year fixed effects, number-of-interviews-during-pregnancy fixed effects, and age fixed effects. We have information of prior pregnancies for 944 woman-pregnancy, which affects the sample size in columns 2 and 3. Standard errors are clustered at the neighborhood level.

Table 4: Impact of Distance to Clinic with Pregnancy Tests on Overall Pregnancy Knowledge not Controlling for Number of Interviews During Pregnancy

	Month Reported Pregancy		
	All women	Prior Pregnancies	No Prior Preg.
	(1)	(2)	(3)
Distance to Pregnancy Tests	0.179	0.315*	-0.175
	(0.122)	(0.188)	(0.295)
Distance to Family Planning	0.072	-0.046	0.549*
	(0.128)	(0.192)	(0.300)
Observations	1,593	636	308
Adjusted R-squared	0.109	0.142	0.098
Mean Dependent Var.	4.591	4.613	4.617

Notes: This table shows the result of three separate regressions. All columns include strata-year fixed effects and age fixed effects. The difference to Table 3 is that we do not control for number-of-interviews-during-pregnancy fixed effects. We have information of prior pregnancies for 944 woman-pregnancy, which affects the sample size in columns 2 and 3. Standard errors are clustered at the neighborhood level.