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 is able to 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 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 5.4th month of pregnancy. Living approximately a mile farther from a clinic offering pregnancy tests increases the time they know they are pregnant by one week (a 4.5 percent increase), and decreases the likelihood of knowing in the first trimester by 3.8 percentage points (a 13.5 percent decrease). Women with prior pregnancies experience the largest effects of distance within in their first trimester; for women experiencing their first pregnancy, the largest effects of distance are in the second trimester of pregnancy, suggesting that access to pregnancy tests is a binding constraint only after women's beliefs, or symptoms, about being pregnant are strong enough. Pregnancy Testing Reproductive Health Nepal

1 Introduction

The first step in the continuum of care towards a healthy pregnancy - or safer abortions - is knowledge of being pregnant Boerma et al. (2018). For some decisions (ie., termination) and some behaviors (ie., taking multi-vitamins, stopping smoking), the timing of learning matters and may affect health outcomes for both woman and infant. While a pregnant woman, will eventually, at some point, 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.

There is a small number of studies providing suggestive evidence of pregnancy status uncertainty. In the United States, the average gestational age of detection is approximately 5.5 weeks, with 23 percent of women detecting it only after seven weeks of gestation Branum and Ahrens (2017). Moreover, over 60 percent of adolescents who visit a clinic to take a pregnancy test have 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).

Understanding the process of learning one is pregnant and effects of detection technology on knowledge may be important for decisions related to the provision of pregnancy tests. While a woman will learn of her pregnancy status sometime between conception and delivery even without access to pregnancy tests, there could be important benefits of learning one's pregnancy status earlier if women use the knowledge of their pregnancy status to optimize their behavior. For example, if negative, women can have easier access to hormonal contraception Stanback et al. (1997); if positive, they can start antenatal care Simkhada et al. (2008), or have an abortion Drey et al. (2006). However, most of the evidence on the potential benefits of earlier pregnancy detection and the scope for access to pregnancy tests to identify her status earlier is correlational **?**.

To understand pregnancy uncertainty and the effects of access to pregnancy tests on earlier 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 1996 and 2005 (1,593 births), we compare each woman's month of conception with her 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 spend not being aware of being pregnant.

We find a strong negative relationship between distance to clinics with pregnancy tests on earlier knowledge of pregnancy status. Living approximately a mile from a clinic offering pregnancy tests (0.88 miles, or about fifteen minutes walking) increases the time a woman knows she is pregnant by one week (a 4.5 percent increase), and increases the likelihood of knowing in the first trimester by 3.8 percentage points (a 13.5 percent increase).[1]

For women with a prior pregnancy, the impact of distance is significantly larger in the first trimester, suggesting experience with symptoms of pregnancy is important to utilize clinics with pregnancy tests in earlier months. Among women without prior pregnancy experience, the largest effects are in the second trimester of pregnancy, suggesting that access to pregnancy tests is a binding constraint only after women's beliefs, or symptoms, about being pregnant are strong enough.

The contribution of this work is to provide new evidence on when women learn about their

[1] This 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),

pregnancy status, and how constraints on access to pregnancy tests affect the timing. We use a high-frequency panel, 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 are also able to measure changes in access to pregnancy tests over ten years of data as new clinics open or existing clinics begin stocking pregnancy tests; we are also able to separately control for clinics offering family planning to account for possible confounding factors related to distance to clinics. To the best of our knowledge, our paper is the first to study pregnancy uncertainty using these type of data and empirical methods.

2 Research design

2.1 Setting: Chitwan, Nepal, 1997 to 2005

The data used in this study was collected between 1997 adn 2005 in the western valley of Chitwan District, in south-central Nepal. During this time, Nepal, and specially 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 a virgin forest. Due to population increase and rapid shortage of farmland, part of the area opened for farming and saw a spike in incoming migration from other regions of the country. It 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. With these changes in infrastructure, the area developed and more services became available: while the first medical provider opened in the area in 1954 Brauner-Otto et al. (2007), by 1990 there were more than 80 clinics in the region Yabiku (2004).

In relation to political changes, 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 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 below.

The availability of family planning and maternity care also changed in Nepal during this time. In 2001, nine percent of women in the county delivered in a health clinic, while 18 percent did so in 2006; similarly, only 16 percent of pregnant women received ANC care prior to the fourth month of pregnancy in 2001, compared to 28 percent in 2006 ICF (2019). Another change was the legalization of abortion in 2002. Before that, abortion was strictly illegal in Nepal. The bill was a result of public and private efforts to provide a safe option to women who chose to abort. It became legal if performed within the first twelve weeks of pregnancy Thapa (2004).[2] In 2011, almost a decade after the law, less than 38 percent of Nepali women believed abortion was legal ICF (2019). Recently however, 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 percent of the abortions performed in 2014 were illegal. The fertility ratio plummeted during this period. It fell 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

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). The original sample of 1,582 households (4,646 individuals) in 151 neighbor-

[2]Abortion within eighteen weeks is allowed in the case of rape or incest, and is allowed any time during the pregnancy if the woman's or fetus' health is at risk

[3]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.

hoods were 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 three area with different characteristics at the time of the sampling (such as degree of urbanization). All residents of the sampled neighborhoods between the ages of 15 and 59, and their spouses, were surveyed and followed if they migrated. Households that moved into the CVFS area during the study were also surveyed while living there.

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. These data also contain a record of the neighborhood where each member of the household was living.

In addition to collecting general household information each month, the study team collected data 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. These data were collected directly from each woman in the household, if she was available for the interview.

The data is monthly, but the frequency of enumeration changed over time. Between 1997 and 1999, women were directly interviewed approximately ten times per year. Between 2000 and 2005, survey budget constraints and civil conflict resulted in several adaptations to the data collection. Surveys were conducted only during daylight, and the frequency of households visits was reduced from every month to every three months or less in worst times Axinn et al. (2012) – the total number of visists per year ranged from six visits in 2000, to only one visit in 2003.

2.2.2 Health Providers and Access to Pregnancy Tests

We have neighborhood-level information detailing all health service providers in the 151 neighborhoods from 1996 to 2004, which was also 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. We utilize the information in these health service provider data on availability of family planning and pregnancy test kits.

The distance from a respondents home to a health provider is measured by the geodesic distance between the centroid of the neighborhood the household is located 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, where the median is calculated as the median distance over the whole period in our sample by woman-month, and zero otherwise. XXthis is confusing to me - what do you mean by calculated over the whole period?

If, during a woman's pregnancy, the distance changes because a new clinic opened or because the woman moved to a different neighborhood, we assume the shortest distance for the entire pregnancy. For respondents living outside of these areas, we do not know the distance to health providers in their vicinity.

Table 1 presents the number, and characteristics of, health providers offering family planning services or pregnancy tests from 1996 to 2004. Out of a total of 94 health clinics in the area in 1996, 82 provided modern family planning and 24 offered pregnancy tests. From 1997, this number grew adding to a total of 103 providers offering pregnancy tests in 2004. The distance to the closest provider declines significantly over time, from 1.13 miles, on average, in 1996, to 0.48, in 2004. The median distance from a neighborhood to a pregnancy-testing clinic is 0.88 miles. This variable has a mean of 1.16 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 ever 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 status. We observe the following possible status: not pregnant, pregnant, uncertain, had a live birth, had a stillbirth, had a miscarriage, had an abortion. For any month in which a woman experiences 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 the delivery date (280 days after the beginning of the last menstrual period, or 9.2 months) Jukic et al. (2013).

We restrict our sample to women who lived in CVFS area at least for one month during her pregnancy - since we have information of clinics only in the CVFS area, this is necessary to locate the nearest clinic to a woman's residency during her pregnancy. Since the clinic data covers only 1996-2005, we include 2005 births only if the gestation started in 2004. We also consider only months when the woman was interviewed to avoid recall bias in ours estimations.

Our final sample of does not includes a woman-month observation if at that time: 1) the woman was away, 2) the woman was not interviewed; 3) the woman had undergone sterilization; or 4) the woman was not living in the study area.

Table 2 present the total sample of women - women who reported their pregnancy state, who had a live birth, and who were living in the study area for at least a period of their pregnancy. Table S5 shows the composition of the panel over the ten years of study.

On average, 3356 women were interviewed each year. Panel A also 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 sample to approximately two in the last year. On average, 74 percent of women are interviewed in a year; however, in 2003, when the conflict was worse, less than 10 percent of the sample was interviewed. In each month the woman was interviewed, she reports her pregnancy status.

2.4 Empirical Strategy

We have two main estimation approaches to understand the effects the access to pregnancy tests on knowledge of pregnancy status.

2.4.1 Woman-Pregnancy-Level Analysis

Our first approach is to estimate the following using observations at the woman level, where each observation is a pregnancy:

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

$ReportPreg_{ihp}$ indicates either the month when the woman learned she was pregnant, ranging from 1 to 9, or a binary variable indicating if she knew she was pregnant in her first trimester.[4] This second outcome restricts the sample to women who were interviewed at least once during their first trimester. when the woman reported her pregnancy, from month one to nine. $DistPT_{hp}$ measures the distance from neighborhood h to the nearest health center that offers pregnancy tests during pregnancy p of woman i. $DistFP_{hp}$ is the distance to the closest clinic offering contraceptive methods. θ_{ihp} are age fixed effects. η_{ihp} are fixed effects for the number of interviews during pregnancy. γ_{si} are strata-by-year fixed effects.

To isolate the effect of distance to pregnancy tests on pregnancy uncertainty, a potential confounder is access to family planning methods. 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. We specifically control for this effect by adding a variable that captures proximity to family-planning clinics - a binary variable equal to one if the woman lives in a neighborhood where the distance to the closest clinic offering contraceptive methods is above the median distance, where the median is calculated as the median distance over

[4] This implicitly assumes that the month a woman reports she is pregnant coincides with the month she detects it. In multiple contexts, this is not true: women may conceal their pregnancy until birth, or until a certain stage of gestation Peacock et al. (2001a); Stokes et al. (2008). We believe this problem is not large in our data because the survey is administered in privacy, and, with monthly visits, enumerators build a relationship of trust with participants Axinn et al. (2007). But due to our research design, which relies on exogenous distance to a health center to identify the effect of distance to pregnancy-testing on uncertainty, even if women conceal their pregnancy status, this does not bias our estimates, as long as distance to a clinic is not systematically correlated with time to reveal the pregnancy status.

the whole period in our sample by woman-month, and zero otherwise.

We add age fixed effects, since uncertainty about pregnancy varies with sexual activity and experience, which is correlated with age. For the analysis at the pregnancy level, we consider age at the beginning of the pregnancy.

As we consider only months in which women are interviewed in the sample, we control for the number of times during pregnancy she was interviewed, which ranges from one to nine. This eliminates the effect 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. We add month-of-pregnancy the interview is conducted as control for the same reason.

We include strata-by-year fixed effects to account for possible changes specific to an area over time that could be correlated with pregnancy uncertainty or the access to clinics. This includes trends 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.

2.4.2 Woman-Pregnancy-Month-Level Analysis

We also estimate Eq 1 at the woman-month level:

$$ReportPreg_{ihm} = \alpha + \beta_1 DistPT_{hm} + \beta_2 DistFP_{hm} + \theta_{ihm} + \eta_{ihp} + \rho_{ihm} + \gamma_{si} + \epsilon_{ihm} \quad (2)$$

where $ReportPreg_{ihm}$, as in Eq 1, is a variable capturing when the woman learned about her pregnancy, but in this case it is a binary variable equal to one if woman i living in neighborhood h knew she was pregnant in month m of her pregnancy. We also use a second measure to capture knowledge about the pregnancy in the first trimester - an indicator variable that equals one if the woman knows she is pregnant, while restricting our sample to women interviewed during the first trimester.

$DistPT_{hm}$ is a measure of distance as defined above, but in this case allowed to vary monthly. θ_{ihm} are month-of-pregnancy fixed effects (from one to nine), which account for which month of gestation the woman was at the time of the interview. The remaining variables are constructed as described for Eq 1; age is measured at the beginning of pregnancy.

The standard errors of all estimations are clustered at the neighborhood level, since this is the source of variation in the distance to the nearest health center.

3 Results

3.1 Pregnancy Status

Table 2 Panel B shows the observed pregnancy status over time, by women. Across all years, we observe, on average, the reported pregnancy status of 2,496 women (74 percent of the sample), although this varies from almost 87 percent in 1996 to 75 percent in 2005. From these, on average 254.7 report a live birth in a year - which corresponds to eight percent, on average, of the women interviewed.

Fig 1 shows the distribution of reported pregnancy states over time. Over a year, on average 10 percent of women report being pregnant at least once. A live birth is reported, on average, by 4 percent of women - this percentage of time a pregnancy status is reported in relation to a live birth is lower than what would be otherwise expected (8/9 of the time) because interviews do not happen in every month of gestation.

The next most common status is uncertain, which is also reported at least once by 4 percent of women. The remaining status of having a miscarriage, a stillbirth or an abortion is reported by less than 1 percent. Similar statistics are found in Panel B, but considering the distribution of pregnancy status over the months women were interviewed.

3.2 Effects of Distance to Pregnancy Tests

3.2.1 Woman-Pregnancy-Level Analysis

Table 3 presents the estimates from Eq 1, showing the effects of distance to a clinic with pregnancy tests on the month a woman learned she was pregnant. In Column 1, we see that going from below to above the median distance to access pregnancy tests decreases the likelihood of knowing one's true status by 5 percentage points, or 7.4 percent.

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 pregnancy term (ie. first, second, or third trimester) and prior experience with pregnancy.

We examine this further in the columns 2 and 3 of Table 3. We see the effect of distance to pregnancy tests on knowledge about pregnancy is coming mainly from women who have previous experiences with pregnancy. Moving above the median of distance to clinics with pregnancy tests decreases by 8.3 percentage points. The effect is negative but not significant for women in their first birth.

We find even similar effects when we measure the effect of distance on knowing in the first trimester. Living in a neighborhood above the median distance to a pregnancy-testing clinic decreases by 3.8 percentage points the likelihood that women know they are pregnant early on. Considering the average of 28 percent women who know this early of their pregnant status, this represents a decrease of 13.6 percent in that average.

In column 5, restricting the sample to women who have experience with previous pregnancies, the effect is larger: a 5.6 decrease in the probability of knowing in the first trimester if the woman lives above the median distance to a pregnancy-testing clinic.

We find similar heterogeneities across pregnancy terms and prior experience with pregnancy. Columns 2 and 5 show that the effect of distance is negative on knowledge for women with previous experience with pregnancies. In the first trimester, living at a neighborhood above the median of distance to a pregnancy-testing clinic decreases by 5.6 percentage points the probability that a woman knows she is pregnant in the first trimester, if the woman has previous experience with pregnancy. Off of a base of probability of being aware of pregnancy of 24.6 percent in this population, this means an increase of 22.7 percent.

3.2.2 Woman-month-level analysis

Table 4 presents the estimates from Eq 2, which shows the effects of distance to a clinic with a pregnancy test on the probability of knowledge of being pregnant in a given month. The results are consistent when we use the logarithm of distance to the closest clinic offering pregnancy tests. The outcome in columns 1-3 is the month the woman learned and, therefore, we expect a positive coefficient if living more distant from a clinic offering pregnancy test kits delays the knowledge of a pregnancy. In columns 4-6, the outcome of interest is an indicator variable equal to one if the woman knew in the first trimester; therefore, we expect a negative coefficient if the distance to a clinic offering pregnancy test kits delays the knowledge of pregnancy.

On average, going from below to above the median distance to a clinic with a pregnancy test increases the month that she learns her status by about 0.21, or, about one week. This is a 4.5 percent delay in learning ones pregnancy status off of a base of 4.6 months. The result is again stronger for women with previous pregnancies - 0.51 months, or about two weeks.

To illustrate the differential effects of distance on pregnancy knowledge, figures 2 and 3 graph the coefficient of the indicator variable of above-the-median distance to a clinic with a pregnancy test. Each coefficient of woman's knowledge was estimated in a separate model conditioning on the month of pregnancy the interview was conducted. The regressions follow our main specification in Eq 1. We graph these separately by women with and without prior pregnancies.

First, Fig 2, among women who have had a prior pregnancy, shows that the effect of distance on knowing one's pregnancy status is largest in the second trimester of pregnancy (-0.138), declining in the last trimester of pregnancy. In other words, the distance constraint binds the most for these women in earlier months of pregnancy.

In contrast, Fig 3 presents the same estimates among women without prior pregnancy experience. These women would have had less experience with knowing the signs and symptoms of pregnancy in 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 the first trimester are statistically insignificant (with wide confidence intervals), and the distance constraint does not bind until the third trimester.

4 Discussion

This study estimates the effects of access to pregnancy tests on pregnancy uncertainty. Using unique monthly data of pregnant women over ten years in Nepal, we find that women who live in the most distant places are the most affected by the lack of access to pregnancy-testing clinics. By decreasing the distance to a health center from less to more than 0.88 miles (median), women decrease the month they become aware of their status by one week, and the likelihood of knowing in the first trimester by 3.8 percentage points, or by 13.57%.

These effects are different by experience with previous pregnancies and trimester of pregnancy, with distance constraints binding for most women with previous experience in earlier months of pregnancy.

We can estimate what the impact means in terms of health outcomes using back-of-the-envelope calculation, and assuming that a woman that learns of her pregnancy earlier also gets ANC her first obstetric ultrasound (OBUS) earlier. According to Caughey et al. (2008), having the OBUS at 12 weeks of gestation or less decreases the rate of postterm pregnancy (42 weeks or longer) by 27% when compared to having it from week 13-24 of gestation. This means that living closer to a clinic offering pregnancy tests decreases the probability of postterm pregnancy by 3.6% (0.135*0.27). Several complications for the fetus and the mother increase with gestation beyond 40 weeks - the risk of cesarean delivery increases by 100%, and neonatal sepsis also increases by 50%, among others Alexander et al. (2000).

5 Limitations

The main limitation of our study is the small sample size. To obtain the pregnancy status variable, since we consider only women interviewed in a month of pregnancy; and, to obtain the distance to a health clinic, we also limited the sample to women living in the study area during pregnancy.

6 Conclusion

Access to pregnancy-testing clinics is a relevant constraint in providing women with information about their pregnancy status; when women have access to this technology, they learn earlier and reduce their uncertainty. Our results also suggest that the constraint on access becomes binding only when symptoms, or beliefs, are strong enough to motivate women to confirm the pregnancy. Women who have had prior pregnancies are more affected by distance to a clinic in the second trimester, when the signs are more persistent, or stronger. For women in the first pregnancy, no clear pattern of the effect of the distance through out gestation is found.

This study covered a period in Nepal of high maternal mortality ratio, which is still an important issue in many other countries. Although Nepal has a specific context of the conditions under which women usually become pregnant, it presents common constraints with developing countries. The results of this study present evidence that access to clinics that provide pregnancy tests is a relevant constraint in pregnancy awareness. Since pregnancy testing is a relatively costless technology, improving its availability has the potential to affect pregnancy knowledge, and in the end to improve the women and the fetus' conditions during gestation.

Supporting information

S1 Table

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References

Alexander, J. M., McIntire, D. D., and Leveno, K. J. (2000). Forty weeks and beyond: pregnancy outcomes by week of gestation. *Obstetrics & Gynecology*, 96(2):291–294.

Axinn, W. G., Ghimire, D., and Williams, N. E. (2012). Collecting survey data during armed conflict. *Journal of official statistics*, 28(2):153.

Axinn, W. G., Thornton, A., Barber, J. S., and Murphy, S. (2018). Ghimire, dirgha j., fricke, thomas e.(thomas earl),... massey, douglas s. chitwan valley family study: Changing social contexts and family formation, nepal, 1996-2008. *Ann Arbor, MI: Inter-university Consortium for Political and Social Research [distributor]*, pages 06–25.

Axinn, W. G., Thornton, A., Barber, J. S., Murphy, S. A., Ghimire, D., Fricke, T., Matthews, S., Dangol, D., Pearce, L., Biddlecom, A., et al. (2007). Chitwan valley [nepal] family study: Changing social contexts and family formation.

Bailey, M. J. (2012). Reexamining the impact of family planning programs on us fertility: evidence from the war on poverty and the early years of title x. *American Economic Journal: Applied Economics*, 4(2):62–97.

Boerma, T., Requejo, J., Victora, C. G., Amouzou, A., George, A., Agyepong, I., Barroso, C., Barros, A. J. D., Bhutta, Z. A., Black, R. E., Borghi, J., Buse, K., Aguirre, L. C., Chopra, M., Chou, D., Chu, Y., Claeson, M., Daelmans, B., Davis, A., DeJong, J., Diaz, T., El Arifeen, S., Ewerling, F., Fox, M., Gillespie, S., Grove, J., Guenther, T., Haakenstad, A., Hosseinpoor, A. R., Hounton, S., Huicho, L., Jacobs, T., Jiwani, S., Keita, Y., Khosla, R., Kruk, M. E., Kuo, T., Kyobutungi, C., Langer, A., Lawn, J. E., Leslie, H., Liang, M., Maliqi, B., Manu, A., Masanja, H., Marchant, T., Menon, P., Moran, A. C., Mujica, O. J., Nambiar, D., Ohiri, K., Park, L. A., Patton, G. C., Peterson, S., Piwoz, E., Rasanathan, K., Raj, A., Ronsmans, C., Saad-Haddad, G., Sabin, M. L., Sanders, D., Sawyer, S. M., da Silva, I. C. M., Singh, N. S., Somers, K., Spiegel, P., Tappis, H., Temmerman, M., Vaz,

L. M. E., Ved, R. R., Vidaletti, L. P., Waiswa, P., Wehrmeister, F. C., Weiss, W., You, D., and Zaidi, S. (2018). Countdown to 2030: tracking progress towards universal coverage for reproductive, maternal, newborn, and child health. *The Lancet*, 391(10129):1538–1548.

Branum, A. M. and Ahrens, K. A. (2017). Trends in timing of pregnancy awareness among us women. *Maternal and child health journal*, 21(4):715–726.

Brauner-Otto, S. R., Axinn, W. G., and Ghimire, D. J. (2007). The spread of health services and fertility transition. *Demography*, 44(4):747–770.

Caughey, A. B., Nicholson, J. M., and Washington, A. E. (2008). First-vs second-trimester ultrasound: the effect on pregnancy dating and perinatal outcomes. *American journal of obstetrics and gynecology*, 198(6):703–e1.

Cunningham, S., Lindo, J. M., Myers, C. K., and Schlosser, A. (2017). How far is too far? new evidence on abortion clinic closures, access, and abortions. *NBER Working Paper*, (w23366).

Drey, E. A., Foster, D. G., Jackson, R. A., Lee, S. J., Cardenas, L. H., and Darney, P. D. (2006). Risk factors associated with presenting for abortion in the second trimester. *Obstetrics & Gynecology*, 107(1):128–135.

ICF (2019). The dhs program statcompiler. Funded by USAID. Accessed on June 12 2019.

Jukic, A. M., Baird, D. D., Weinberg, C. R., McConnaughey, D. R., and Wilcox, A. J. (2013). Length of human pregnancy and contributors to its natural variation. *Human reproduction*, 28(10):2848–2855.

Kennedy, K. I., Rivera, R., and McNeilly, A. S. (1989). Consensus statement on the use of breastfeeding as a family planning method. *Contraception*, 39(5):477–496.

Lu, Y. and Slusky, D. J. (2016). The impact of women's health clinic closures on preventive care. *American Economic Journal: Applied Economics*, 8(3):100–124.

Peacock, N. R., Kelley, M. a., Carpenter, C., Davis, M., Burnett, G., Chavez, N., and Aranda, V. (2001a). Pregnancy discovery and acceptance among low-income primiparous women: a multicultural exploration. *Maternal and child health journal*, 5(2):109–118.

Peacock, N. R., Kelley, M. A., Carpenter, C., Davis, M., Burnett, G., Chavez, N., Aranda, V., Project, C. S. N., et al. (2001b). Pregnancy discovery and acceptance among low-income primiparous women: a multicultural exploration. *Maternal and Child Health Journal*, 5(2):109–118.

Puri, M., Singh, S., Sundaram, A., Hussain, R., Tamang, A., and Crowell, M. (2016). Abortion incidence and unintended pregnancy in nepal. *International perspectives on sexual and reproductive health*, 42(4):197.

Rossin-Slater, M. (2013). Wic in your neighborhood: New evidence on the impacts of geographic access to clinics. *Journal of Public Economics*, 102:51–69.

Rowland, A. S., Baird, D. D., Long, S., Wegienka, G., Harlow, S. D., Alavanja, M., and Sandler, D. P. (2002). Influence of medical conditions and lifestyle factors on the menstrual cycle. *Epidemiology*, pages 668–674.

Shaaban, O. M. and Glasier, A. F. (2008). Pregnancy during breastfeeding in rural egypt. *Contraception*, 77(5):350–354.

Simkhada, B., Van Teijlingen, E. R., Porter, M., and Simkhada, P. (2008). Factors affecting the utilization of antenatal care in developing countries: Systematic review of the literature. *Journal of Advanced Nursing*, 61(3):244–260.

Stanback, J., Thompson, A., Hardee, K., and Janowitz, B. (1997). Menstruation requirements: a significant barrier to contraceptive access in developing countries. *Studies in family planning*, 28(3):245–250.

Stokes, E., Dumbaya, I., Owens, S., and Brabin, L. (2008). The right to remain silent: a qualitative study of the medical and social ramifications of pregnancy disclosure for gambian women. *BJOG: An International Journal of Obstetrics & Gynaecology*, 115(13):1641–1647.

Thapa, S. (2004). Abortion law in nepal: the road to reform. *Reproductive Health Matters*, 12(sup24):85–94.

WHO (1998). The world health organization multinational study of breast-feeding and lactational amenorrhea. ii. factors associated with the length of amenorrhea. *Fertility and Sterility*, 70(3):461–471.

WHO, UNICEF, U. W. B. G. and the United Nations Population Division (2015). Trends in maternal mortality: 1990 to 2015. *World Bank Publications*.

Yabiku, S. T. (2004). Marriage timing in nepal: Organizational effects and individual mechanisms. *Social forces*, 83(2):559–586.

Zabin, L. S., Emerson, M. R., Ringers, P. A., and Sedivy, V. (1996). Adolescents with negative pregnancy test results: an accessible at-risk group. *Jama*, 275(2):113–117.

Figure 1: Pregnancy Status Over Time

Figure 2: Effect of Distance to Clinic on Knowing - Women with Prior Pregnancies

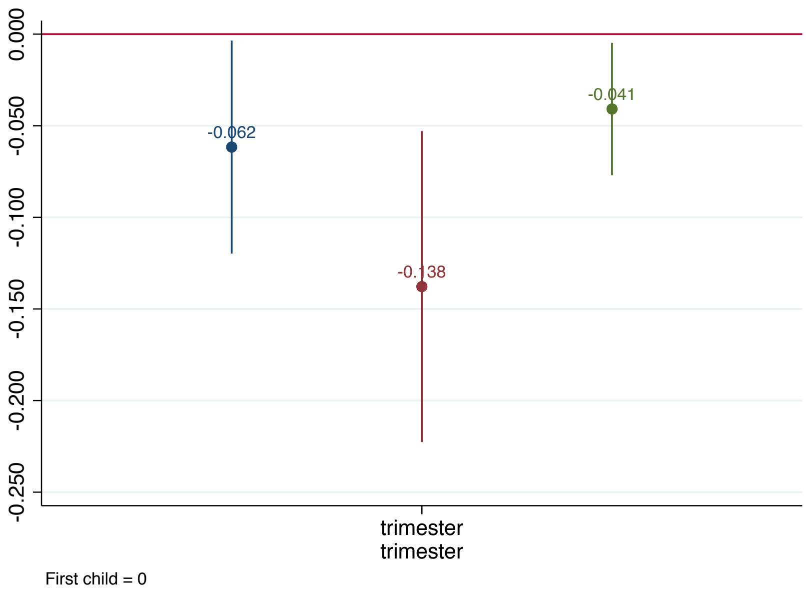

Figure 3: Effect of Distance to Clinic on Knowing - Women with no Prior Pregnancies

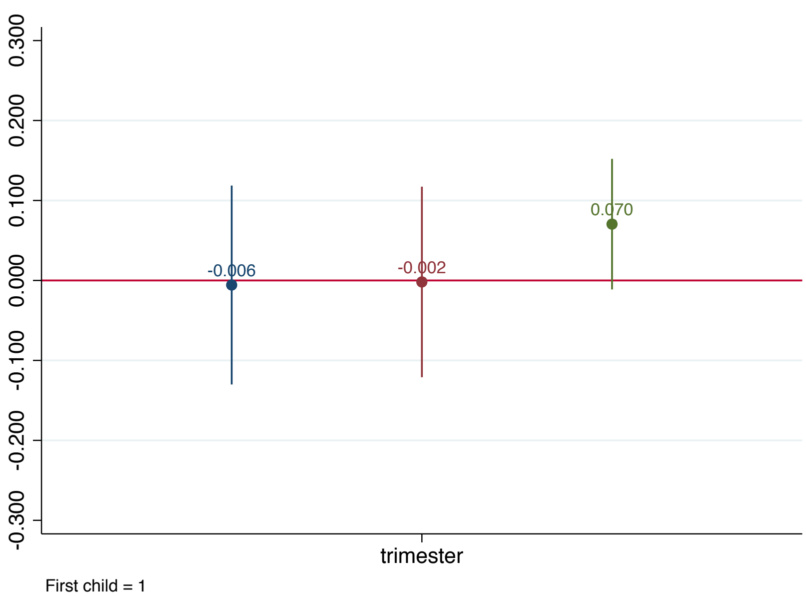

Table 1: **Sample of Health Providers by Neighborhood and Year**

	Year								
	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total clinics	94	96	106	108	113	128	133	142	168
Total clinics with contraceptives	82	84	93	95	102	117	119	129	154
Percent	0.872	0.875	0.877	0.880	0.903	0.914	0.895	0.908	0.917
Distance (Miles)	0.599	0.625	0.623	0.624	0.585	0.532	0.505	0.490	0.440
Total clinics with pregnancy tests	24	27	34	34	43	59	66	78	103
Percent	0.255	0.281	0.321	0.315	0.381	0.461	0.496	0.549	0.613
Distance (Miles)	1.128	1.093	1.006	1.016	0.865	0.739	0.711	0.583	0.478
Correlation distance FP and PT clinics	0.496	0.481	0.538	0.532	0.571	0.652	0.659	0.915	0.942

Notes: The neighborhood data is only available until 2004.

Table 2: **Sample of Women by Year**

	Year									
	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Panel A: Married Female Respondents										
Sample	3033	3296	3278	3364	3402	3558	3590	3024	3486	3528
Number 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										
Total with observed pregnancy status	2630	3096	2683	2642	2681	2826	2891	267	2597	2646
Total women with live birth	220	323	345	268	286	288	252	191	191	183
Sample living in CVFS during pregnancy	183	227	224	184	215	223	207	91	111	85

Table 3: **Impact of Distance to Clinic with Pregnancy Test on Pregnancy Knowledge (Woman-Pregnancy Level)**

	Month learned about pregnancy			Knew in first trimester		
	All women	Prior pregnancies	No prior preg.	All women	Prior pregnancies	No prior preg.
	(1)	(2)	(3)	(4)	(5)	(6)
Distance pregnancy tests	0.212*	0.510***	0.001	-0.031	-0.061	0.012
	(0.118)	(0.178)	(0.323)	(0.030)	(0.043)	(0.097)
Distance contraception	0.084	-0.125	0.323	-0.026	-0.033	-0.068
	(0.120)	(0.189)	(0.315)	(0.029)	(0.044)	(0.087)
Constant	4.961***	5.074***	5.252***	1.326***	1.368***	1.144***
	(0.174)	(0.455)	(0.524)	(0.043)	(0.094)	(0.135)
Observations	1,593	636	308	1,176	531	232
Adjusted R-squared	0.102	0.150	0.074	0.203	0.172	0.157
Mean dep. var.	4.591	4.613	4.617	.463	.405	.448

Notes: This table reports results from six separate regressions. All columns include strata-year fixed effects, number-of-interviews-during-pregnancy fixed effects, and age fixed effects. Standard errors are clustered at the neighborhood level. We have information of prior pregnancies for 1208 woman-pregnancy, which affects the sample size in columns 2 and 3. Columns 4-6 are conditional on the woman being interviewed in the first trimester.

Table 4: **Impact of Distance to Clinic with Pregnancy Test on Pregnancy Knowledge (Woman-Month Level)**

	Knew about pregnancy			Knew in first trimester		
	All women	Prior pregnancies	No prior preg.	All women	Prior pregnancies	No prior preg.
	(1)	(2)	(3)	(4)	(5)	(6)
Distance pregnancy tests	-0.050***	-0.083***	-0.012	-0.038**	-0.056*	-0.015
	(0.016)	(0.024)	(0.043)	(0.019)	(0.029)	(0.061)
Distance contraception	0.002	0.028	-0.048	-0.052***	-0.027	-0.085
	(0.016)	(0.026)	(0.041)	(0.019)	(0.032)	(0.058)
Constant	0.908***	0.823***	0.708***	0.806***	0.685***	0.581***
	(0.030)	(0.058)	(0.078)	(0.051)	(0.081)	(0.113)
Observations	8,156	3,909	1,605	2,792	1,324	557
Adjusted R-squared	0.028	0.024	0.052	0.071	0.058	0.089
Mean of dep. var.	.668	.649	.657	.28	.246	.266

Notes: This table reports results from six separate regressions. All columns include strata-year fixed effects, number-of-interviews-during-pregnancy fixed effects, and age fixed effects. Standard errors are clustered at the neighborhood level. We have information of prior pregnancies for 1208 woman-pregnancy, which affects the sample size in columns 2 and 3. Columns 4-6 are conditional on the woman being interviewed in the first trimester.

Table 5: **Percentage of woman who appear in the sample again in another year.**

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
2053	2596	0.94	0.73	0.71	0.67	0.64	0.62	0.05	0.53	0.50
2054		515	0.68	0.24	0.14	0.10	0.10	0.02	0.09	0.08
2055			250	0.50	0.23	0.17	0.12	0.01	0.08	0.06
2056				540	0.39	0.19	0.14	0.01	0.10	0.08
2057					598	0.41	0.23	0.02	0.12	0.09
2058						711	0.44	0.04	0.17	0.14
2059							670	0.05	0.28	0.20
2060								43	0.63	0.44
2061									678	0.64
2062										499

Notes: The sample of women includes births in 2005 but whose gestation started in 2004. It includes all women, even if not pregnant. The neighborhood data go only until 2004.