

# **Contraception in Indonesia: Village midwives facilitate switching to injectable methods**

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## **Abstract**

Indonesia established its Village Midwife Program in 1989 to combat high maternal mortality rates by addressing gaps in access to reproductive health care for rural women. Two of the program's additional goals were to (1) increase access to and utilization of family planning services and to (2) broaden the mix of contraceptives available. Data from the Indonesia Family Life Survey are used to examine the program's effect on contraceptive practice. Intent-to-treat estimates show that village midwives did not affect overall contraceptive prevalence but did affect method choice. Over time, for women using contraceptives, midwives were associated with increased odds of injectable contraceptive use, decreased odds of oral contraceptive use, and decreased odds of contraceptive implant use. Although the Government hoped that village midwives would channel women into longer-lasting methods, the women's switching behavior indicates that the program succeeded in providing additional outlets for and promoting use of contraceptive injections.

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## Introduction

Quality reproductive health care has the potential to improve outcomes for mothers, children and their families in part by empowering women with the ability to regulate their own fertility and to enhance their care during pregnancy and delivery. The 1994 International Conference on Population and Development (ICPD) fueled efforts to improve access to reproductive health care by creating international consensus that reproductive health is a right and by defining it broadly as, "...a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity, in all matters relating to the reproductive system and to its functions and processes." Further, the ICPD Programme of Action stated that men and women have the right to safe, effective, affordable, and acceptable contraceptive methods. Subsequently, provision of reproductive health care emerged as a key intervention to reduce the burden of maternal mortality, promote women's health and reproductive autonomy, improve birth outcomes, and increase family welfare in developing countries. In 2005, universal access to reproductive health care was added to the United Nations' Millennium Development goals. More recently, 2012 has been described as a "golden moment" during which a global coalition, led by The Bill & Melinda Gates Foundation, aims to achieve universal access to contraceptives by 2020 (Carr, et al., 2012).

Studies suggest that access to contraceptives has the potential to reduce maternal and child mortality by allowing for adequate birth-spacing thereby decreasing the risk of low birth-weight babies, preventing unwanted and high-risk pregnancies, and decreasing the frequency of unsafe abortions (Ahmed, et al., 2012; Cleland, et al., 2012; Glasier, et al., 2006; World Health Organization, 1995). The ability to manage fertility and the timing of births likely improves family circumstances by reducing stress on family resources including time, income, and wealth (United Nations Population Fund, 2004). Some studies demonstrate that safe and effective fertility regulation is a channel to increased economic development (Canning & Schultz, 2012; Maralani, 2008; Schultz, 2009; Schultz & Zeng, 1995). Contraceptive choice is also an essential component of reproductive and sexual rights as defined by the ICPD. Access to a variety of contraceptive methods is known to improve reproductive health outcomes including increased uptake of contraceptives, improved health outcomes, and lower rates of discontinuation (Gray, et al., 2006). Type of method chosen also affects contraceptive security for women, with those relying on short-term resupply methods being more vulnerable to disruption in the supply chain than women using implants, IUDs, or sterilization (Ross, 2003).

Contraceptive use and choice of method are affected by individual and community factors, a woman's access to reproductive health care services, and provider characteristics (Degraff et al., 1997; Jensen, 1996; Koenig, et al., 1997; Konje, et al., 1998; Lerman et al., 1989; Oddens & Lehert, 1997; RamaRao, et al., 2003; Steele et al., 1999; Stephenson et al., 2008; World Bank, 1991). Evidence is mixed on the factors most closely associated with method choice; some studies have found that provision of information about alternative contraceptive methods is most critical to method choice, while other studies have concluded that providers' recommendations are most important in determining method choice (Ekani-Bessala, et al., 1998; Konje et al., 1998; Oddens & Lehert, 1997). Other government or programmatic contextual factors may influence contraceptive practice (e.g., media messages or government-sponsored educational campaigns) (Magadi & Curtis, 2003; Oddens & Lehert, 1997; Schoemaker, 2005).

Community-based distribution (CBD) of contraceptives is a popular means of extending access to family planning services. CBD relies on nonclinical community-based family planning workers (or volunteers) and often targets rural communities that have limited access to formal health care services. CBD of contraceptives has been effective in increasing access to and use of contraceptives in Indonesia and a number of other settings (Gertler & Molyneaux, 1994; Hoke et al., 2011; Kambo, et al., 1994; Krueger, et al., 2011; McKelvey, et al., 2012; Sultan, et al., 2002; Utomo, et al., 2006; Warwick, 1986). In 1984, after a decade of contraceptive distribution through village contraceptive distribution centers, Indonesia's National Family Planning Board (BKKBN) implemented a CBD approach that employed a large network of family planning field-workers and a designated volunteer in each community. The field-workers distributed pills and condoms, visited contraceptive acceptors, recruited new acceptors, persuaded community leaders to support the BKKBN program, and coordinated BKKBN program activities through regular community visits. The community volunteers helped coordinate community outreach activities and distribute oral contraceptives and condoms on a continuous basis under the supervision of the family planning fieldworkers (Warwick, 1986). BKKBN's CBD program began to change in 2000 as decentralization occurred and has been scaled back dramatically over the last decade. After many years of successful CBD in Indonesia, village midwives were introduced, primarily to address issues of maternal mortality, but they also served as an additional source of contraceptives. This strategy hinges on the midwives' widespread availability and their intimate relationships with clients before, during, and after childbirth.

The launch of the Village Midwife Program in 1989 positioned Indonesia as an early adopter of widespread provision of reproductive health care services. A key goal of this program was to train and place village midwives throughout the country. In this study, we investigate the relationship between this program and women's use and choice of contraceptives (i.e., contraceptive practice). Our study focuses on Indonesia over the fourteen year period from 1993 to 2007 in order to exploit the fact that it is during this time that there was a massive expansion of midwifery services across the country. Using a fixed effects logit specification, which will identify the program's effect under certain assumptions, we assess the extent to which the expansion in access to midwifery services was accompanied by changes in women's contraceptive practice. Although provision of contraceptive services was one of the village midwives' core responsibilities, no previous studies have evaluated the impact of a community's access to a midwife and community contraceptive practices.

### **Indonesia's Village Midwife Program**

The Village Midwife Program was introduced in 1989 to reduce maternal mortality by addressing gaps in access to reproductive health care for rural women. The main goals of the program were to expand safe motherhood promotion among poor and hard-to-reach populations, improve accessibility and utilization of family planning services, and enhance the mix of contraceptive products available to target populations. The village midwives were contracted by the Department of Health to complement both the community health clinic infrastructure run by the Department of Health, and the National Family Planning Board's (BKKBN's) family planning program, which provided widespread access to oral contraceptives and condoms throughout the country through the existing community-based distribution network (World Bank, 1991). The village midwives expanded the method mix available in many rural locations by providing more convenient access to injections and, to a limited extent, clinical contraceptive methods such as contraceptive implants and IUDs.

The Village Midwife Program expanded rapidly, growing the midwife workforce from approximately 5,000 in 1987 to 80,000 in 2009 (World Bank, 2010). The community survey component of the Indonesia Family Life Survey (IFLS) provides longitudinal information on 312 communities over a 15 year period from 1993 through 2007. The survey documents the major expansion in village midwife services that occurred in the two decades after the program's inception. In 1993, only 9.6% of IFLS communities had a village midwife. By 1997, a major expansion had occurred and 46.3% of IFLS communities had a village midwife. By 2007, this percentage rose to 58.8%. Most village midwives were initially recruited out of nursing programs and received one additional year of midwifery training. The training requirement was

later amended to require that village midwives attend a 3-year midwifery academy. The village midwives were guaranteed a government salary for at least three years during which time they were also expected to establish a private practice that would sustain them after their public service tenure expired. That midwives were encouraged to develop an eventually self-sustaining practice raises the possibility that midwives' faced a conflict at times between maximizing their revenue versus following government policy guidelines.

Upon entry into the program, the Village Midwives were largely in their early twenties and single. They were predominantly placed in their province of origin, although placement was generally more difficult in smaller, more remote areas. Early in the program, the midwives' practices were usually stationed at the village delivery post or, in the absence of a village delivery post, at the home of the Village Leader. The young midwives often experienced difficulty starting up their practices. Barriers cited include that community members often perceived the village midwives as too young and inexperienced to provide midwifery services, women's long-standing reliance on traditional midwives who frequently viewed the village midwives as a threat to their livelihoods, and a lack of adequate equipment and supplies. Additional challenges included gaining the community's acceptance and threats to their personal security (Frankenberg and Thomas, 2000; Hull, et al., 1998; Strauss, et al., 2009; Strauss, et al., 2004; Village Midwives, May 2011, focus group discussion). Information on the percentage of Village Midwives who provide different services is published in several other studies and indicates that the midwives provide many services related to women's reproductive health, as well as immunizations, well-child care, and a variety of acute-care services such as sick patient visits, antibiotics, and attending to wounds (Frankenberg, et al., 2003; Frankenberg & Thomas, 2001).

At the time the Village Midwife Program was established, the BKKBN's Family Planning Program advised women under the age of 30 to have only two children and to delay the first birth until after the age of 20. Women over 30 and those with three or more children were to be advised not to have any more children. In addition to providing an additional access point for contraceptive distribution, village midwives were to promote longer-lasting and/or clinical methods of contraception (i.e., IUDs and implants) for women and families who had already achieved their preferred family size. Program planners also aimed to increase access to contraceptives: (1) for specific groups who underused family planning services (e.g. women with little education, lower-income families, women who live in rural communities or in informal urban communities); and (2) in areas with limited access to family planning services (e.g., remote, poor coastal, and transmigrational communities) (World Bank, 1991).

The Village Midwife Program has been successful in improving a variety of health outcomes including women's receipt of iron tablets, use of antenatal care for certain subgroups, use of skilled birth attendant (i.e., village midwives), decreased incidence of stunting in children, increases in body mass index for women of reproductive age and in the birth weights of their children (Frankenberg, et al., 2009; Frankenberg, et al., 2005; Frankenberg & Thomas, 2001). Although no studies to date have evaluated the Village Midwife Program's effect on contraceptive use, the contraceptive prevalence rate has risen since the Program's inception from 47 percent in 1991 to 57 percent in 2007 (percent using a modern method), and the total fertility rate dropped from 3.0 in 1991 to 2.6 in 2007 (Statistics Indonesia and Macro International, 2008).<sup>1</sup> Preliminary results from the 2012 Demographic and Health Survey show, however, that contraceptive prevalence has risen only 2 percentage points for all methods and 1 percentage point for modern methods over the past decade. These preliminary results put the TFR at 2.6 and unmet need for contraception among currently married women at 11% (Statistics Indonesia, et al., 2012).

Village midwives could theoretically influence uptake or use of contraceptive methods through both supply- and demand-side channels: (1) increasing supply through increased access to a convenient distribution channel or through the availability of different or more individually-appropriate methods; and (2) by influencing demand through provision of information and counseling or through affecting women's fertility goals. The impact of village midwives may also have varied over time as the midwives became more experienced or more familiar with and accepted by the community members. To draw lessons from Indonesia's long-term investment in reproductive health in light of current challenges, we examine the Village Midwife Program's effect on contraceptive use and method choice for all ever-married reproductive-aged women and selected target populations.

## **Methods**

We use data from all four full rounds of the Indonesia Family Life Survey (IFLS), a longitudinal demographic, socioeconomic and health survey of individuals, their households and their families as well as the communities they live in. The sampling frame, which covered 13 provinces, was designed to be representative of 83% of the Indonesian population at the time of the 1993 baseline. Follow-ups have been conducted in 1997, 2000 and 2007, creating one of the longest running multilevel large-scale

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<sup>1</sup> Statistics reported are based on the Indonesia Demographic and Health Survey official statistics. Hull and Hartanto (2009) adjust for missing single women and report an adjusted fertility rate of 2.3 in 2007.

population-representative longitudinal surveys in the developing world. Our study draws on two sources of data from the survey: (1) interviews with ever-married women of reproductive age (women who are currently married, divorced, or widowed and are between the ages of 15-49), and (2) interviews with the village leader or head of the local women’s organization (coined “community informants”). Our analyses include all ever-married women who live in the sampled communities in any of the survey waves. They include the baseline age-eligible female panel respondents, respondents who age into the sample and females who join the households of panel members in the communities, typically through marriage to a male panel respondent. Women may become ineligible over time if they reach their 50<sup>th</sup> birthday, become infecund or are pregnant at the time of their interview. Further, the study is limited to women in IFLS’ 312 baseline communities.<sup>2</sup> Women who are not living in a baseline community are not included in the analysis; most of these women have not moved from the baseline community although in some cases, women have moved from one IFLS community to another IFLS community. They are included in the analyses, whether they have been found in another IFLS community or in their original baseline community. The overall re-interview rate of women in this age group was over 97% in the 2000 and 2007 survey waves (Strauss, et al., 2009).<sup>3</sup> When we condition on select individual and community characteristics, communities’ receipt of a village midwife is not significantly related to women’s migration out of study communities or loss to follow-up over the study period. Because attrition is not related to our intervention (e.g., whether or not a community has a midwife), we conclude that attrition is not likely to be a source of bias in our results.

We first examine contraceptive use for ever-married reproductive-aged woman (15-49 years) present in 1993, 1997, 2000 and 2007 who are “eligible” for contraceptive use (i.e. non-pregnant women who are still able to conceive) for a total sample of 8,531 women (16,181 women-year observations). Second, we examine contraceptive choice for each current contraceptive user over the same time period (n=5,015 women; 9,874 women-year observations).

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<sup>2</sup> IFLS defines a community as a desa (village) in rural areas or kelurahan (neighborhood or township) in urban areas. By this definition, in rural areas, the average community size is just over 3,300 people and encompasses 4.8 square kilometers. In urban areas, community sizes have three times as many people living in one third the area.

<sup>3</sup> Individuals were not tracked out of IFLS survey provinces in 1997 and therefore re-contact rates are lower for that survey wave.

### *Statistical approach*

Evaluation of health and reproductive health programs is complicated, given the multiple levels of influence (e.g., individual, household, community) on contraceptive use and method type, and general lack of comprehensive, high quality data. A key challenge confronting many evaluations is that programs are seldom randomly placed. Governments employ various targeting strategies in order to achieve different goals. They may target (1) the most accessible populations so as to achieve the largest impact; or (2) populations with low access to health services or with relatively high levels of need. While targeting is frequently essential to achieve program goals, it creates a complex statistical challenge for program evaluation. Specifically, when programs are not randomly placed, any unobserved correlation between community- or individual-level determinants of health that relate to program placement and health outcomes may bias estimates of program impact. If purposive program placement were based only on observed characteristics, this correlation would pose no significant challenge to linking program impact with health outcomes. However, if placement is based on unobserved characteristics or causes any form of migration into program communities, estimates may be biased absent methodological means to control for this endogeneity (Angeles & Guilkey, 1998; Rosenzweig & Wolpin, 1986).

One approach to identifying the impact of a midwife on choices by women in a community is to compare the behavior of women in the community before and after the midwife has been introduced with behavior of women in communities that did not receive a midwife. To the extent that everything in the community that affects contraceptive behavior is fixed during this time, other than the introduction of the midwife, then observed changes can be attributed to the introduction of the midwife. In that case, the community fixed effects estimates will absorb unobserved, fixed differences between communities and exploit the variation in the timing of the introduction of the midwife across communities to identify the casual effect of the midwife. This approach has been successfully used to evaluate the shorter-term effects of the Village Midwife program as well as the effects of other public programs in Indonesia (Frankenberg et al., 2009; Frankenberg, Suriastini & Thomas, 2005; Frankenberg & Thomas, 2001; Gertler & Molyneaux, 1994; Rosenzweig & Wolpin, 1986).

Following this strategy, we include a community fixed effect in the empirical models to control for the Government of Indonesia's placement strategy to assign village midwives to disadvantaged communities. Community-level regressions that related of the presence of a village midwife to measures of village infrastructure and socioeconomic development indicate that midwives were more likely to be



placed in rural villages with low levels of infrastructure. These results are consistent with earlier work evaluating placement of the Village Midwife Program (Frankenberg, et al., 2009; Frankenberg, et al., 2005; Frankenberg & Thomas, 2001), and confirmed that the village midwives were consistently placed in rural villages with low levels of infrastructure. We find no evidence that the placement of village midwives is significantly associated with observed fertility characteristics indicating that midwife placement was not related to levels of attained or desired fertility. Nonetheless, the results on infrastructure emphasize the importance of including community fixed effects to take into account unobserved time-invariant community-level characteristics associated with women’s contraceptive practice and a community’s receipt of a village midwife.<sup>4</sup>

However, our evaluation of the village midwife program spans a 14 year period during which time Indonesia underwent substantial change including the Asian economic crisis, the subsequent transition to democracy and increased decentralization of public services. As a result, it is important to also allow for time-varying community-level changes in the empirical models in order to better isolate the impact of the presence of village midwives in the communities on contraceptive choices. To this end, the models are extended to include time effects, one for each survey wave, and interactions between the time effects and the presence of a village midwife. These more flexible models allow the effect of the midwife program to vary over time.

Thus, our model is specified as follows:

$$Y_{ict} = \beta_0 + \beta_1 M_{ct} + \beta_2 M_{ct} * TIME + \beta_3 TIME + \beta_4 X_{it} + \beta_5 X_{ct} + (v_c + \varepsilon_{ict}) \quad [1]$$

where  $Y_{ict}$  is the outcome for woman  $i$  in community  $c$  in time  $t$ ;  $M_{ct}$  is an indicator of village midwife availability in community  $c$  at time  $t$ ;  $X_{it}$  is a set of individual-level characteristics in time  $t$  such as age, education level, etc.;  $X_{ct}$  is a set of community-level characteristics in time  $t$  such as health services, infrastructure and socioeconomic development indicators; and  $TIME$  indicates the year of survey. The error term made up of two components: (1) the  $v_c$  term is the community fixed effect and (2)  $\varepsilon_{ict}$  are unobserved time-variant factors of individual  $i$  in the community  $c$  at time  $t$ .

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<sup>4</sup> Estimates of the effect of the midwife will be biased if there are unobserved individual-specific characteristics that affect both contraceptive choices and migration into or out of communities with a midwife. We have explored the extent to which this type of selective migration contaminates the estimates by re-estimating the models placing respondents in their communities at the baseline survey. While overall these estimates are slightly less precise (because there is more measurement error in exposure to the village midwife), the magnitudes of the estimated effects are similar to those reported below and our main conclusions are not affected.

More flexible models would also interact the individual- and community-level characteristics,  $X$ , with the time fixed effects. Those models suffer from lack of power to separately distinguish the effects of the introduction of village midwives from the effects of other innovations in the communities. Given that our focus is on contraceptive choices which are unlikely to be as directly affected by the introduction of roads, sewerage systems and possibly other health services as they are by the introduction of midwives, we report estimates of [1]. However, it is important to recognize that our estimates of the time-varying effects of midwives on contraceptive choices may also reflect the impact of other contemporaneous changes that occurred in the study communities.

We consider two separate outcome measures of contraceptive practice ( $Y_{ict}$ ) in our study. First, we examine whether women use any modern contraceptive by creating a binary indicator of use. A positive value for this variable indicates that the women reported using a modern contraceptive method at the time of survey, including oral contraceptives (pill), contraceptive injections (offering protection for 1, 2, or 3 months), a contraceptive implant, an intrauterine device (IUD), a diaphragm, condom (male and female), or female or male sterilization. Second, we examine contraceptive method choice by creating binary variables for commonly used method types (e.g., pills, injections, implants and IUDs). All women in this subsample of women ages 15 to 49 who are not pregnant, able to conceive, and report using a method of contraception are included in this analysis.

We estimate fixed effects logit regressions for contraceptive use and method choice and also test for differential effects by the Government's targeted subgroups of women (i.e., women who are uneducated, low-income, live in rural areas, are 30 years or older, have 3 or more children and who have achieved their ideal family size).<sup>5</sup> Fixed effects logit estimates are only defined if outcomes (and a linear combination of all covariates) vary over time at the level of the fixed effect. In our case, if a community is comprised of women whose outcomes do not vary at all over the study period, these communities do not contribute information to our estimates (i.e. communities in which no woman switches between methods during the 14-year study period). For our first outcome—contraceptive use—16,533 women and 311 out of the 312 communities contributed information. The number of women and communities contributing to estimates for contraceptive method choice vary by method

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<sup>5</sup> The estimation method weighed the benefits of a logit model relative to a multinomial logit or probit model. We selected the logit model because (1) it is straightforward to estimate and interpret logit models that include fixed effects and (2) the logit model facilitates direct comparisons of specific method types against all other method choices in contrast with estimates that are relative to an excluded category in multinomial models.

type ranging from 9,829 women in 305 communities for injectable contraceptives to 6,140 women in 164 communities for contraceptive implants. Although this strategy has been used successfully in earlier studies of the Village Midwife Program, it has several limitations. First, it does not account for time-variant unobserved community-level characteristics on which the Village Midwife Program may have been allocated, or time-variant individual-level characteristics that are not observed. Second, we cannot estimate the effects of time-invariant community characteristics that may impact our outcomes since these factors are eliminated from the model by the inclusion of the community fixed effect. Finally, the study's "intent to treat" approach means that village midwives are assigned at the community-level (and not to individuals); as such, the analyses do not measure women's direct exposure to the village midwives via use of their services (only the exposure that occurs from residing in the same village).

Results are reported as odds ratios and standard errors are adjusted for community clustering.

Significance is reported at the  $p \leq 0.05$ ,  $p \leq 0.01$ , and  $p \leq 0.001$  levels. All analyses were performed using STATA.

## **Results**

### *Trends in contraceptive use*

Figure 1 shows the percentage of women using a modern contraceptive method and the type of method used by women in our sample during each survey wave. These women are on average 32 years old with 7 years of education and 2.5 children. Use of contraception in our study population remained fairly constant between 1993 and 2007 while method mix changed substantially. The most common type of contraceptive method in 1993 was oral contraceptives followed by injectable contraceptives.

Intrauterine devices (IUDs) also made up about one-fifth of all contraceptives used at that time. Over the next 14 years, the use of oral contraceptives and IUDs decreased while the percentage of women using injectable contraception increased.

The results of estimating model [1] are presented in Tables 1-3 and Figures 2A-C.

### *Contraceptive Prevalence*

As a preliminary step, we estimated model [1] excluding the interaction term between the village midwife program and survey year (i.e., time) which provides an estimate of the overall association between the presence of a village midwife and contraceptive use during the 14 year study period. The estimate of the 'main effect' is not statistically significant indicating that when averaged across all years,

the program is not associated with contraceptive use (results not shown). However, given the important contextual changes that occurred in Indonesia over the study period, as explained above, we present results of the model that allows the program effect to vary over time. Specifically, Table 1 shows the results of a logistic regression model with community fixed effects that includes interaction terms to test for a differential effect of the village midwives on contraceptive use over time (i.e., survey year). The odds ratios of greatest interest are the interaction terms between village midwife and time; we find that the interaction effect is small in all years and below standard levels of significance, indicating that the village midwives did not affect contraceptive prevalence in any survey year. Our results also reveal that women's age and education level are significant predictors of contraceptive use. The odds ratios are highly significant, indicating that women in older age groups and with more education have higher odds of using contraceptives than women in the referent groups (women ages 15-19 and with no education). Community characteristics are not associated with contraceptive use.

Because the Government of Indonesia's strategy included a goal to reach specific demographic groups to increase the use of contraceptives, we also tested whether the Village Midwife Program had a differential effect on contraceptive use among these target groups. Women targeted by the BKKBN family planning program were either (1) viewed as least likely to accept family planning (i.e., women in rural communities, uneducated women, and women in low-income families); or (2) viewed as appropriate populations for use of long-lasting methods (i.e., women older than 30 years, with 3 or more children, or who had achieved their ideal family size). Contraceptive use among these targeted subgroups was also not associated with the presence or absence of a village midwife (results not shown).

### *Contraceptive Choice*

To estimate the village midwives' effect on women's contraceptive choice, we conducted a series of multivariate logistic regressions predicting the odds of choice of a particular method among women who used contraception, comparing women's choice in communities with and without a village midwife. The 'main effects' of these method choice models (e.g., models without an interaction term with time) indicate the influence of the village midwives on women's choice of a particular method over the entire study period. These models reveal that, overall, the village midwife program was positively associated with the choice of contraceptive injections and negatively associated with the choice of oral contraceptives (i.e., pills) for women in their communities compared with women in communities without a village midwife (results not shown). However, given the vast changes in the country over the

study period, these 'main effect' models may mask important temporal variation in the program's effect, and therefore, we present the results of model [1] that allows for the midwives' influence to vary over time (Table 2). Of primary interest are the odds ratios for the terms midwife and year, which we summarize in Table 3. We controlled for, and do not report, the same community characteristics included our analysis of contraceptive use (e.g., health services and physical infrastructure). The number of hospitals was the only community-level characteristic that significantly affected method choice; this indicator was associated with higher odds of women's use of IUDs and lower odds of injection and implant use.

Because the effect of midwife availability on contraceptive choice depends on the time period in which it is estimated (e.g., the interaction term positions the time variable as an effect modifier), the odds ratios associated with midwife availability and time in Table 2 may not be directly interpreted. Therefore, Table 3 provides odds ratios for the interaction between village midwife availability and time on contraceptive method choice, taking into account the joint variance of the interaction terms midwife and time. These estimates indicate the odds of women's choice of a contraceptive method in communities with and without a village midwife by survey year, compared to women in communities without a midwife in 1993 (the referent group). It may be that access to a village midwife was less influential in early years of the program when village midwives were relatively unknown to the community: women may have been less inclined to seek a village midwife's services or trust her to provide contraceptive counseling and supplies. A priori, as the program matured, women may have become more comfortable with village midwives, and the village midwives may also have become more skilled in obtaining clients. We found that village midwives had significant influence on the use of hormonal resupply methods in later years of the program. Village midwives were highly associated with use of contraceptive injections in their communities in 2007; women in communities with a village midwife in 2007 had 1.67 times higher odds of using contraceptive injections than women in communities without a midwife in 1993. At the same time, women in communities with a village midwife had lower odds of pill use in 2000 (OR=0.70) and 2007 (OR=0.71) and of implant use in 2007 (OR=0.42) than women in communities without a village midwife in 1993. The prevalence of IUDs was not affected by the presence or absence of a village midwife in any year.

#### *Contraceptive choice among targeted groups*

A goal of the Family Planning Program was to reach specific demographic groups to promote longer-lasting methods (WB, 1991). Thus, we tested whether village midwives had a differential effect on

contraceptive choice among these target groups. Based on the Government's strategy, one would expect women in communities with a village midwife who are older than 30 years, have achieved their ideal family size (i.e., do not want any more children), or have 3 or more children to have greater odds of using long-lasting methods (i.e., IUDs and implants) than women in communities without a village midwife. Our subgroup analyses reveal that, similar to the reproductive-aged population as a whole, women in targeted groups in communities with a village midwife had higher odds of injection usage and lower odds of pill use compared with non-targeted women in communities without a village midwife (Figures 2A-C). Further, the presence of village midwives had no effect on IUD or implant usage among targeted Indonesian women studied. In contrast, in communities without a midwife, women in targeted groups had lower odds of injection use and higher odds of IUD use than other women.

## **Discussion**

An earlier study showed that the Village Midwife Program had a positive effect on the use of reproductive health services including use of a skilled birth attendant, receipt of iron tablets, and the use of antenatal care (Frankenberg et al., 2009). This study uses a multi-level framework to examine the effect of the Village Midwife Program on contraceptive prevalence and method choice in Indonesia over a 14-year period and demonstrates that village midwives influenced contraceptive methods used by women. In communities with a village midwife, women had significantly higher odds of using injectable contraceptives and significantly lower odds of using oral contraceptives. Although placement of village midwives in rural communities has enhanced the supply and method mix of contraceptives available to all women, the Government of Indonesia targets specific subgroups of women for use of long-lasting methods (i.e., IUDs and implants). The village midwives also influenced targeted subgroups of women to switch from oral to injectable contraceptives as opposed to switching to IUDs or implants. These outcomes are consistent with known incentive structures; provision of injectable contraceptives is a source of supplemental income for the village midwives, the majority of whom staff a private practice outside of their public duties (Hull and Mosley, 2009). It is also possible that increased use of injectable contraceptives may be attributed to women's preference irrespective of financial incentives faced by midwives. A trend toward injectable contraceptive use is not unique to Indonesia and is especially prevalent in Sub-Saharan Africa (Sieber, Bertrand & Sullivan, 2007). In Kenya, Magadi and Curtis (2003) found notably higher levels of injectable use among rural, uneducated women and women with less exposure to family planning media messages. In Madagascar, a pilot study of CBD of contraceptives showed an increase in prevalence of contraceptives, specifically of injectables (Hoke et al., 2011). A Demographic Health Surveys (DHS) Comparative Report provides data on method mix for several other

Southeast and South Asian countries. Injectable contraceptives are far more prevalent among modern contraceptive users in Indonesia (49%) than in other countries in the region (ranging from 1% in Vietnam to 39% in Cambodia) (Khan, et al., 2007).

While longer-lasting than oral contraceptives, injectable contraceptives are considered hormonal resupply methods and are associated with higher rates of discontinuation and odds of unwanted births in Indonesia when compared with IUDs and implants (Statistics Indonesia & Macro International, 2008; Steele & Curtis, 2003; Withers, et al., 2012) and leave women vulnerable to disruption in the supply chain (Ross, 2003). Contraceptive discontinuation, which rose between the 2002 and 2007, is of growing concern in Indonesia and elsewhere. According to the Indonesia 2007 DHS, the most common reasons for discontinuation among married women were health concerns, side effects, and the desire to become pregnant (Statistics Indonesia & Macro International, 2008). Although least frequently targeted by family planning programs, the portion of women who discontinue use (and do not wish to become pregnant) may be served by village midwives through education and counseling about health concerns and side-effects.

As previously noted, the relatively infrequent use of implants and IUDs indicates that the midwives have not been effective advocates for these methods of contraception. In fact, targeted women in communities without a village midwife had higher odds of IUD use than any other group of women. Meeting the need of women who desire these long-acting methods could result in a substantial reduction in unplanned pregnancies, maternal and infant mortality and morbidity (Wickstrom and Jacobstein, 2011). The issue of IUD and implant promotion and use may be a difficult for several reasons. One study noted that women may prefer contraception that does not require a pelvic exam, especially in conservative communities (Warwick, 1986). Research from the 1990s also indicates that some women had problems getting providers at public health clinics to remove implants and IUDs upon request, especially prior to their expiration (Hull, 1998). These women were at times directed to private clinics where they may have faced higher fees for removal of the implant/IUD. Such barriers could potentially be addressed through interventions to improve compliance with removal and expiration dates, such as standard guidelines for education and counseling upon insertion about timely removal for women, and mandates for public clinics to provide these services upon request. Further, provider incentives for promoting IUDs and implants are not aligned with the Government's targets. Indonesian women also lack access to high quality sterilization services, especially in remote areas, which, given the

method's cost-effectiveness and efficacy at preventing unwanted pregnancies (Cleland, et al., 2006), is also a disadvantage for Indonesian women who want to stop childbearing.

Although not directly measured in the analyses, issues related to the supply chain for clinical methods may also present challenges. IFLS data revealed that less than half of the village midwives provided IUD services. Importantly, women may not be willing to switch to less popular method types (e.g., IUDs and implants) if methods are inconvenient to obtain or they are not confident in their ability to obtain follow-up services related to clinical methods. IUDs and implants in particular place especially high demands on the service delivery system that require skilled and carefully trained providers, a functioning logistics system, attention to counseling and provision of complete information for clients, easy access to providers that may remove the implants/IUDs on demand, and ideally, a sophisticated follow-up system to notify clients of the need for removal (Fisher, et al., 1997). Sterilization, while highly effective, is seldom used in Indonesia, and also requires significant health care investments and infrastructure. Although significant investments have been made in the Indonesian health system to ensure access for all populations, disparities remain that affect the availability of such services required for consistent and high quality provision (and removal) of clinical methods in non-urban areas.

Our results differ from research in other settings that have shown contraceptive prevalence to be responsive to improvements in service availability (Gray, et al., 2006; Jain, 1989). The limited impact of the Indonesia Village Midwife Program on contraceptive prevalence may be due to a number of factors. It is possible that the long history of family planning field-worker services in Indonesian communities already reached the population of women most easily influenced by increases in service availability prior to our survey data being collected. An earlier study by Gertler and Molyneaux (1994) indicated that supply-side constraints (e.g., service availability) were not a factor in fertility decline at that time and that future gains in contraceptive prevalence were likely to be most affected by interventions that promoted increases in demand (rather than interventions that expanded the distribution system such as the Village Midwife Program has done). Their hypothesis is consistent with this study's findings and points to a need for additional strategies to increase contraceptive prevalence by addressing unmet need through targeted, demand-side interventions.

The results of this study imply that increases in access to family planning services in Indonesia may have reached a saturation level, wherein contraceptive uptake is no longer responsive to additional service inputs. As early as the mid-1980s, the contraceptive distribution system, although limited in method



mix, was extensive and highly responsive to increases in demand (Gertler & Molyneaux, 1994). Increases in access to additional family planning service providers with capacity to provide clinical methods (i.e., village midwives) have not increased prevalence. Although many early programs targeting family planning in Indonesia and in other settings found contraceptive demand responsive to changes in supply during the 1970s and 1980s, evidence about this relationship since that time has been mixed (Frankenberg et al., 2009).

More research is needed to understand influences on contraceptive uptake in health systems where contraceptive supply no longer constrains women's ability to obtain a contraceptive method. Although some women may not desire to use contraceptives (or the contraceptive method available to them if the range of methods is limited), Indonesian women classified as having "unmet need" are appropriate targets for policy intervention. While accessing contraceptives may not be a barrier for Indonesian women, other reasons may inhibit contraceptive use for women with unmet need. According to the 2007 Indonesia DHS, Indonesian women with unmet need who do not intend to use contraceptives in the future cite method-related concerns as a major reason for not using contraception (e.g., fear that it will cause side effects or affect their health). A small proportion of these women indicate they "want as many children as possible" (10.2%), the woman or her husband is opposed (17.2%), or the woman lacks knowledge (8.9%) (Statistics Indonesia and Macro International, 2008). Education and counseling by village midwives has potential to address unmet need among women with method-related concerns. However, the village midwives are mainly demand-based providers and a more assertive means for identifying and reaching women with unmet need may be necessary.

## **Conclusion**

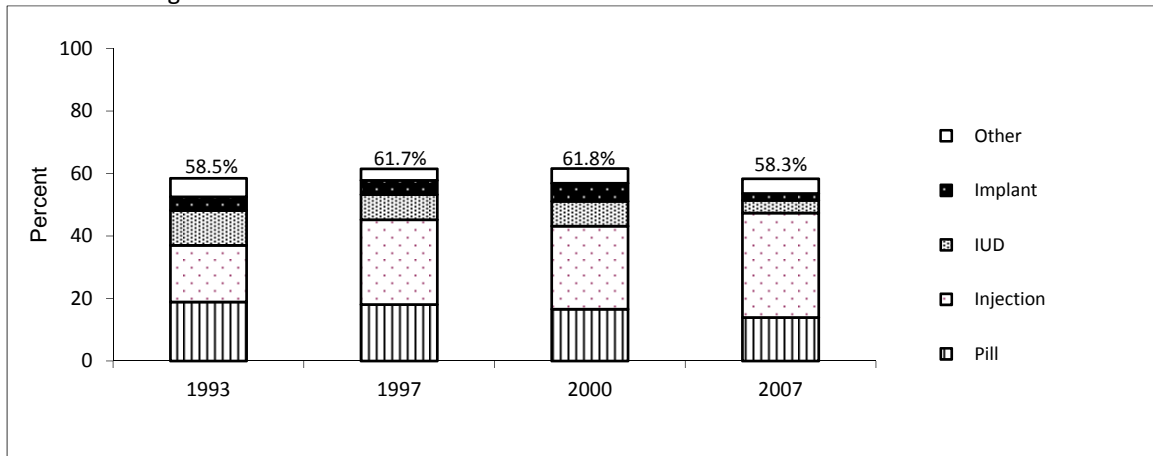
This study analyzes a well-known and highly successful program in Indonesia whose goal is to improve access to reproductive health care for women in underserved areas. By exploiting the temporal variation in implementation of the Village Midwife Program and the longitudinal nature of the IFLS, this study examined the effect of the Village Midwife Program on contraceptive use and method choice. The main policy implications of these analyses is that the Village Midwife Program has provided women with a reliable contraceptive source for injectable contraceptive methods and that midwives have facilitated women's switching from oral to injectable methods. However, the evidence suggests there remains a substantial population of women for whom IUDs and implants may be more appropriate and possibly desirable. The predominant use of hormonal contraceptives (i.e., pills, injections) in Indonesia is of concern to policy-makers because of (1) their relatively high failure and discontinuation rates and (2) the

large share of women for whom long-lasting methods are thought to be more appropriate (Syarif, et al., 2010; Hull and Mosley, 2009). Efforts are currently under way to promote long-lasting method types through training for doctors and midwives and community-based events (BKKBN, April 3 2012; BKKBN, May 23 2012; BKKBN, July 13, 2012; Syarif, 2010). Midwives might be encouraged to begin discussions about post-partum contraceptive use with women whose babies they have delivered, particularly if these mothers are interested in stopping childbearing, or in a lengthy delay of a subsequent pregnancy.

Village midwives were originally intended to improve localized access to long-lasting, clinical methods for women (World Bank, 1991). However, the low prevalence of implants and IUDs indicates that this effect did not occur. Updated research is needed to identify demand-side factors affecting lack of uptake of clinical methods (e.g., cultural acceptance). Although not directly addressed in this study, demand-side research to identify reasons for non-use among women with unmet need could also assist policy-makers to develop a targeting strategy to increase the overall contraceptive prevalence rate. Serving these women may require a different approach, potentially including coordination between village midwives, field-workers, community volunteers and other health care workers.

These results may inform Indonesian policy-makers and family planning program managers as they implement new solutions to promote clinical methods among appropriate populations and to increase the contraceptive prevalence rate. Although the Indonesian Government's strategy to increase access to reproductive health service providers and additional contraceptive method types has allowed some women to switch method types, the results from Indonesia differ from the results of studies conducted in other settings where availability of additional method types has increased overall contraceptive prevalence (Gray, et al., 2006; Jain, 1989). In the Indonesian context, increasing access to additional services and counseling has not affected contraceptive prevalence. These results highlight the importance of context (e.g., cultural and social factors), which affect reproductive health outcomes and should also be considered by policy-makers seeking to improve reproductive health. Increasing provision of contraceptive services and the mix of methods available have not resulted in increased prevalence. Demand-side issues related to acceptance and use of the varying contraceptive method types may be the key factors determining lack of additional contraceptive uptake and could be useful for appropriate and effective targeting.

**Figure 1.** Contraceptive prevalence and method choice over time among Indonesian women in our study, IFLS 1993-2007 weighted estimates



Source:

Indonesia Family Life Survey 1993, 1997, 2000 and 2007.

**Table 1** The relationship between contraceptive use, village midwife availability and other selected individual and community characteristics in Indonesia: odds ratios from logistic regression with community fixed effects, 1993-2007

Characteristic	Odds ratio
Community has village midwife	1.03
<i>Survey Year</i>	
1993 (reference)	--
1997	1.20*
1997*midwife	0.97
2000	1.18*
2000* midwife	0.89
2007	1.03
2007*midwife	1.15
<i>Women's Characteristics</i>	
<i>Age</i>	
15-19 years (reference)	--
20-24 years	1.91***
25-29 years	2.27***
30-34 year	2.16***
35-39 years	1.94***
40-44 years	1.52***
45-49 years	1.08
<i>Education</i>	
0 years (reference)	--
1-5 years	1.66***
6-9 years	2.09***
10-12 years	1.70***
13-19 years	1.42**
Household in top 50% real per capita expenditures	1.03
<i>Community Characteristics</i>	
Hospitals (#)	1.01
Public Health Clinics (#)	1.00
Community Health Posts (#)	1.00
Private Providers (#)	1.00
Main road is paved (%)	1.13
Community has public phone (%)	1.00
Households predominantly have private toilet facility (%)	0.93
Community has public sewer (%)	1.00
Obs.	16,181
Fixed effects (#)	312
Pseudo R-squared	0.0866

\*Significant at  $p \leq 0.05$ ; \*\*  $p \leq 0.01$ ; \*\*\*  $p \leq 0.001$ .

Note: odds ratios represent the change in odds of contraceptive use based on a one-unit change in the predictor variable; standard errors adjusted for clustering at the community level.

Source: Indonesia Family Life Survey, 1993, 1997, 2000, and 2007.

**Table 2.** The relationship between contraceptive method choice, village midwife availability and other selected individual and community characteristics in Indonesia: odds ratios from logistic regressions with community fixed effects (community characteristics not reported), 1993-2007

Characteristic	Injection	Pill	IUD	Implant	Other modern
Community has village midwife	0.82	1.11	1.29	1.91	1.17
<i>Survey Year</i>					
1993 (reference)	--	--	--	--	--
1997	1.61**	0.99	0.53***	1.06	0.58
1997*Midwife	1.32	0.79	0.76	0.61	0.94
2000	1.61***	0.97	0.40***	1.85**	0.65
2000*Midwife	1.46	0.63	0.79	0.56	0.94
2007	2.55***	0.86	0.23***	1.26	0.71
2007*Midwife	2.03**	0.64	0.57	0.22***	0.68
<i>Women's Characteristics</i>					
<i>Age</i>					
15-19 years (reference)	--	--	--	--	--
20-24 years	0.98	1.01	1.96	1.04	1.49
25-29 years	0.74*	1.18	2.65*	1.33	3.75
30-34 years	0.55***	1.26	3.89**	1.68	6.15
35-39 years	0.38***	1.22	5.47***	1.23	22.87
40-44 years	0.25***	1.35	7.49***	1.53	28.51
45-49 years	0.15***	1.40	10.93***	1.63	36.06
<i>Education</i>					
0 years (reference)	--	--	--	--	--
1-5 years	1.23	0.73*	0.97	0.83	1.83
6-9 years	1.45**	0.62***	0.97	0.65*	1.85
10-12 years	1.19	0.57***	1.78*	0.45**	2.67
13-19 years	1.01	0.40***	2.60**	0.23**	3.85
Top 50% real per capita expenditures	0.99	1.03	1.02	0.91	1.02
Obs. (# fixed effects)	9,814 (305)	9,492 (288)	7,484 (233)	6,132 (164)	6,025 (194)
Pseudo R2	0.175	0.149	0.272	0.153	0.200

Note: odds ratios represent the change in odds of method choice based on a one-unit change in the predictor variable; standard errors adjusted for clustering at the community level. \*Significant at  $p \leq 0.05$ ; \*\*  $p \leq 0.01$ ; \*\*\*  $p \leq 0.001$ .

Source: Indonesia Family Life Survey, 1993, 1997, 2000, and 2007.

**Table 3.** The effect of village midwives on contraceptive method choice over time: the odds of contraceptive choice in communities with a village midwife over time by method type compared to contraceptive choice in communities without a village midwife in 1993, 1993-2007

	1993	1997	2000	2007
Pill (midwife * year)	1.11	0.88	0.70**	0.71*
Injection (midwife * year)	0.82	1.07	1.19	1.67***
Implant (midwife * year)	1.91	1.17	1.08	0.42*
IUD (midwife * year)	1.29	0.98	1.02	0.74

\*Statistically significant interaction effect at  $p \leq 0.05$ ; \*\*  $p \leq 0.01$ ; \*\*\*  $p \leq 0.001$ .

Women in villages without a midwife in 1993 are the referent group.

Interaction effects reported as odds ratios.

**Figures 2A-C.** The effect of village midwives on contraceptive method choice in target populations: the odds of contraceptive choice for targeted groups in communities with and without a village midwife compared to non-targeted groups in communities without a village midwife, 1993-2007

Figure 2A. Adjusted odds of contraceptive choice for women 30 years and older in communities with and without a village midwife (compared to women under 30 years old in communities without a village midwife)

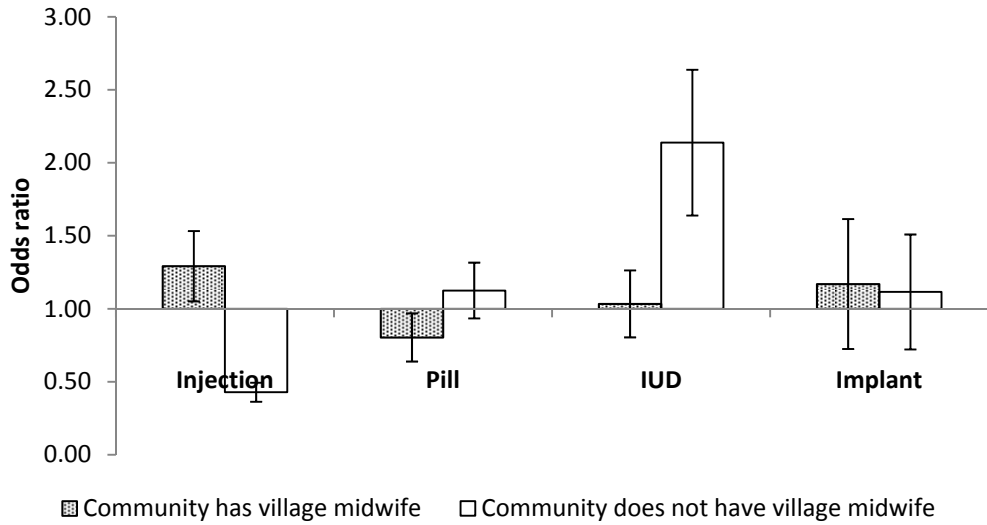


Figure 2B. Adjusted odds of contraceptive choice for women who have achieved their ideal family size in communities with and without a village midwife (compared to women who want more children in communities without a village midwife)

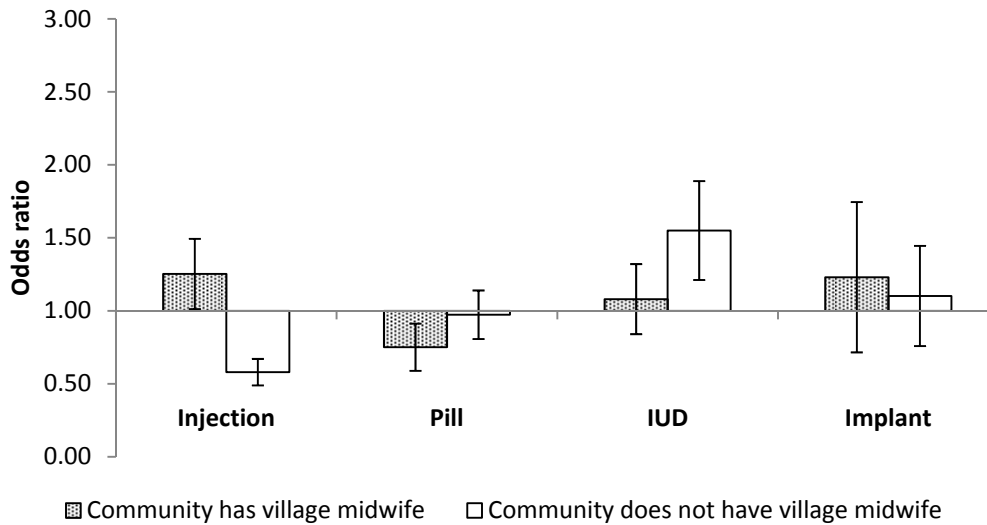
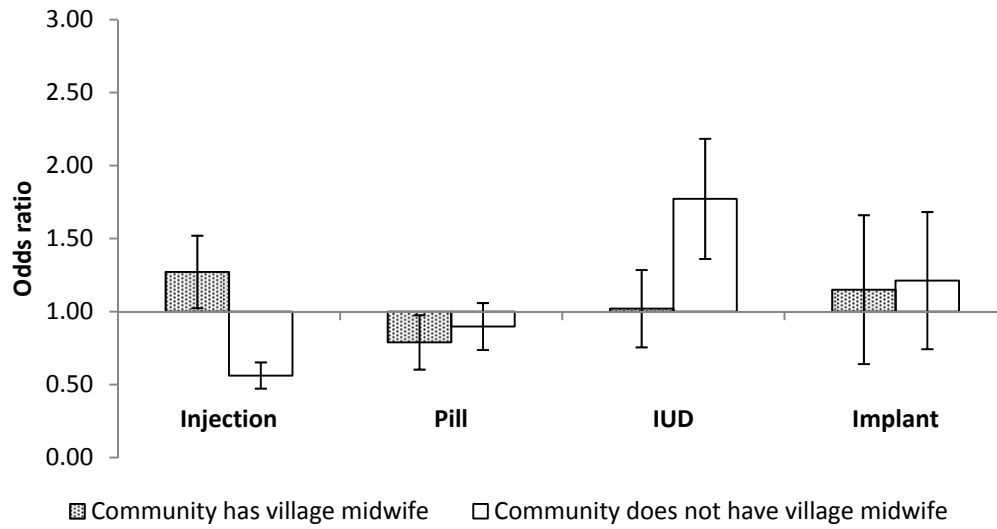


Figure 2C. Adjusted odds of contraceptive choice for women with three or more children in communities with and without a village midwife (compared to women with 0-2 children in communities without a village midwife)



Women in communities without a village midwife and not in the target population (e.g., 15-29 years old, wants more children, has 0-2 children) are the referent group in each model. Error bars represent 95% confidence interval for each estimate.



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