Contraceptive Practice in Indonesia:
Did the Village Midwife Program Make a Difference?

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Abstract

Indonesia established its Village Midwife Program in 1989 to address gaps in access to reproductive health care for rural women. Two of the program's goals were to (1) improve accessibility and utilization of family planning services and to (2) enhance the mix of contraceptives available. Using data from the Indonesia Family Life Survey, this study examines the program's effect on contraceptive practice. We present intent-to-treat estimates that control for nonrandom placement of midwives using community-level fixed effects. We show that village midwives did not affect contraceptive prevalence. For women using contraceptives, midwives increased the odds of injectable contraceptive use, decreased the odds of oral contraceptive use, and decreased the 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 a preferred method type.

Introduction

The World Health Organization (WHO) estimates the global burden of maternal mortality to be 358,000 women annually with 99% of deaths occurring in the developing world (WHO, 2010). Maternal mortality is significantly influenced by the quality and availability of reproductive health care that women receive. Excellent reproductive health care acts to (1) empower a woman with the ability to regulate her own fertility and to (2) enhance her care during pregnancy and delivery and thus affects outcomes for both mother and child. The 1994 International Conference on Population and Development (ICPD) fueled the effort 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. New strategies to implement the Programme emphasized not only access to contraceptive methods, which were commonly supplied through non-clinically trained field-workers, but also access to reproductive health services provided by skilled health care workers. Thus, provision of reproductive health care emerged as a key intervention to reduce the burden of maternal mortality, promote women's health, improve birth outcomes and increase family welfare in developing countries.

Access to, and use of, contraceptives play a key role in determining the reproductive health of women. The use of midwives to supply contraceptives is a strategy used in many settings, given the midwives' intimate relationships with clients before, during and after childbirth. Community-based distribution (CBD) of contraceptives has also emerged as a means of extending access of 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. This approach to contraceptive distribution 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, Gupta, Kundu, Dhillon, & Saxena, 1994; Krueger, Akol, Wamala, & Brunie, 2011; Sultan, Cleland, & Ali, 2002; Utomo, Arsyad, & Hasmi, 2006; Warwick, 1986). A combination of midwives and community facilitators has also been used to provide reproductive health services, including provision of contraceptives, to refugees in Guinea (von Roenne et al., 2010).

Indonesia was an early adapter in wide-spread provision of reproductive health care services through the Village Midwife Program. In this study, we investigate the relationship between implementation of this government program that trained and placed village midwives throughout the country and how it affected women's use and choice of contraceptives (e.g., contraceptive practice). Our study focuses on Indonesia over the fourteen year period from 1993 to 2007 when the major expansion in midwifery services took place. 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 midwives' core responsibilities, no previous literature has explored the dynamic between village midwife availability and contraceptive practice.

Reproductive health and family planning

The benefits for women and children of providing access to family planning services are well-documented. Access to contraceptives reduces maternal and child mortality; allows for adequate birth-spacing thereby decreasing the risk of low birth-weight babies; prevents unwanted and high-risk pregnancies; and decreases unsafe abortions (Glasier, Gülmezoglu, Schmid, Moreno, & Van Look, 2006; WHO, 1995). The ability to manage fertility may also improve family circumstances by reducing stress on household resources including food, income and time (United Nations Population Fund, 2004). Scholars posit that family planning uptake with resultant smaller family size has been a channel to increased economic development (Maralani, 2008; Schultz, 2009; Schultz & Zeng, 1995).

Contraceptive choice is 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. A systematic review of this issue found greater choice of contraceptive methods to be associated with increased uptake of contraceptives, improved health outcomes, and lower rates of discontinuation (Gray, Smit, Manzini, & Beksinska, 2006). Type of method chosen also affects contraceptive security for women, with those relying on short-term resupply methods more vulnerable to disruption in the supply chain (Ross, 2003).

Factors affecting contraceptive practice

Several studies show that better access, or, access to a higher volume of providers (Stephenson et al., 2008; Degraff et al., 1997; Jensen, 1996; Steele et al., 1999; Lerman et al., 1989); provider preferences (Oddens & Lehert, 1997); and type of provider (Konje, Oladini, Otolorin, & Ladipo, 1998; Jensen, 1996) affect contraceptive use and method choice. Published data on provider characteristics also supports the existence of a link between provider quality and individual contraceptive use (Koenig, Hossain, & Whittaker, 1997; RamaRao, Lacuesta, Costello, Pangolibay, & Jones, 2003; WB, 1991). Studies are mixed in terms of whether it is provision of information or recommendations of method type by providers that affects method choice (Ekani-Bessala, et al., 1998; Konje et al., 1998; Oddens & Lehert, 1997). Other context-specific factors influence contraceptive practice through government or program design (e.g. health care policy, media messages or education campaigns) (Schoemaker, 2005; Magadi & Curtis, 2003; Oddens & Lehert, 1997).

Individual-level characteristics that play a role in women's fertility choices may include demographic indicators such as age, education, and number and gender of living children. They may also include women's status in the household, husband/wife communication and agreement about family planning, women's work status, household socioeconomic status, religion, and NGO membership (Ekani-Bessala, 1998; Gubhaju, 2009; Kamal & Islam, 2010; Koc, 2000; Magadi & Curtis, 2003; Oddens & Lehert, 1997; Ozalp, Yalcin, Hassa, Erbay, & Dalan, 2000; Steele & Curtis, 2003; Stephenson et al., 2008). A woman's reason for using contraceptives also impacts her choice of method. Steele and Curtis (2003) found that women who use contraception in order to limit their family size (as opposed to space births) were more likely to use IUDs or implants (generally considered longer-lasting methods).

Community characteristics such as labor-market conditions affect contraceptive practice in terms of a woman's earning power or the proportion of women in the community who control their earnings (Degraff et al., 1997; Stephenson et al., 2008). Urbanicity, region, and levels of infrastructure development are also strong predictors of method choice across a diversity of countries (Kamal, 2010; Lehrman, Molyneaux, Moeljodihardjo, & Pandjaitan, 1989; Magadi & Curtis, 2003; Steele & Curtis, 2003). The presence of women's or other community-based organizations may also serve to influence contraceptive use through provision of information or proliferation of community-based social norms (Entwisle et al., 1996).

Indonesia's Village Midwife Program

The Village Midwife Program was introduced in 1989 to address gaps in access to reproductive health care for rural women. The main goals of the program were to expand safe motherhood promotion among the poor and hard-to-reach populations, improve accessibility and utilization of family planning services, and enhance the mix of contraceptives available to target populations. The midwives were complements to the existing CBD network, which almost universally provided access to oral contraceptives and condoms throughout the country. The midwives expanded the method mix available in many rural locations by providing access to injections and clinical contraceptive methods such as contraceptive implants and, to some extent, IUDs (WB, 1991).

The program expanded rapidly, growing the midwife workforce from approximately 5,000 in 1987 to 80,000 in 2009 (World Bank, 2010). The Indonesia Family Life Survey (IFLS), which provides longitudinal information on some 321 communities, documents the major expansion in 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 in 1993. By 1997, a major expansion had occurred and 46.3% of communities had a village midwife. By 2007, this percentage rose to 58.8%. The village midwives were initially recruited out of nursing programs and received one additional year of midwifery training. The training requirement was later amended and required the midwives to 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. For this reason, they are generally considered quasi-private providers (Frankenberg, Sikoki, & Suriastini, 2003).

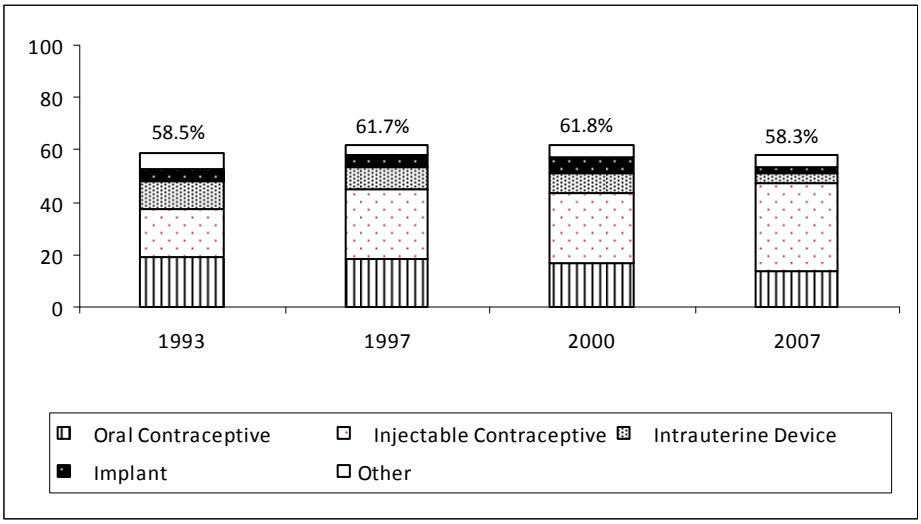
At the time, the Indonesian Family Planning Program strategy included advising women under the age of 30 to have two children, the first of which should be born after the mother had reached an age of 20 years old. Women over 30 and those with three or more children were to be advised not to have any more children. In addition to providing an additional access point for contraceptive distribution, village midwives were viewed as a vehicle for promoting 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 underutilized family planning services (e.g. uneducated women, low-income families, women in rural communities and in urban slums) and (2) in areas with low access to family planning services (e.g., poor coastal areas, transmigrational communities and poor urban communities) (WB, 1991). Since the Village Midwife Program began, the total fertility rate has dropped from 3.0 in 1991 to 2.6 in 2007 (Statistics Indonesia & Macro International, 2008).

Studies show that the Village Midwife Program has been successful in improving a variety of health outcomes including women's receipt of iron tables, 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, Buttenheim, Sikoki & Suriastini, 2009; Frankenberg, Suriastini, & Thomas, 2005; Frankenberg & Thomas, 2001). However, some challenges have also emerged. A review of midwives' effectiveness in West Java found that the midwives facilitated referral effectively but lacked knowledge in clinical management of complications during delivery. This study also found that low provider coverage and levels of acceptability in the community hindered the usage of the midwives (D'Ambruoso et al., 2008). The Government's "Healthy Indonesia 2010" included a goal to increase the midwife-to-population ratio to 100 midwives per 100,000 population (WB, 2010). Today, the Village Midwife Program continues to be a mainstay of the Government of Indonesia's strategy to improve health outcomes (Hull & Mosley, 2009).

Trends in contraceptive use

In this study we use data from the IFLS, a longitudinal survey of households and communities collected in 1993, 1997, 2000, and 2007 (described further below). Figure 1 shows the percentage of women using a modern contraceptive method during each survey wave and which type of method was used by these women. These women are on average 32 years old with 7 years of education and 2.5 children. The figure is based on our analytical sample of 16,537 reproductive-aged women (14-49 years) present in 1993, 1997, 2000 and 2007 who are "eligible" for contraceptive use (i.e. non-pregnant women still able to conceive). Use of modern contraception in our study population remained fairly constant over time 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. During the survey period, the use of oral contraceptives and IUDs decreased while the percentage of women using contraceptive injections increased.

Figure 1. Prevalence and type of contraceptive use, IFLS 1993-2007 weighted estimates



We consider two separate measures of contraceptive practice in our study. First, we examine modern contraceptive use by these women 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 (either Norplant or Implanon), 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 each method type where 0 signifies "does not use this method," 1 signifies "method is used." All women in the subsample of women ages 14 to 49 who are not pregnant, able to conceive, and report using a method of contraception are included in this analysis.

Methods

We use data from all four rounds of the Indonesia Family Life Survey, a longitudinal household socioeconomic and health survey conducted by RAND and SurveyMeter. It is based on a sample of 13 out of Indonesia's 26 provinces (which account for about 83% of the populations) and spans the years 1993 to 2007, creating one of the longest running multilevel panel surveys in the developing world. Our study draws on two sources of data from the survey: (1) interviews with women of reproductive age, and (2) interviews with the village leader or head of the local women's organization (coined community informants). We include data from women in IFLS' original 312 panel communities for the years 1993, 1997, 2000 and 2007. Also included are women who have joined IFLS households in panel communities through marriage after the initial sample was drawn. Although most women appear in the study more than once, subjects may age into or out of the sample (Frankenberg & Karoly, 1995). We first examine contraceptive use for each reproductive-aged woman (14-49 years) present in 1993, 1997, 2000 and 2007 who is "eligible" for contraceptive use (i.e. non-pregnant women who are still able to conceive) for a total sample of 16,537 women. Second, we examine contraceptive choice for each current contraceptive user over the same time period (n = 9,874).

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. The primary challenge is that programs are not 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, and/or (3) populations with relatively high levels of need. While targeting is frequently essential to achieve program goals, it creates a complex statistical environment in which the evaluation of program impact must incorporate multiple levels of influence (e.g. multi-level modeling). 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 create bias in 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).

We employ a commonly used method to control for these sources of endogeneity -- a fixed effects approach. This approach has been successfully used to evaluate the Village Midwife as well as other programs (Frankenberg et al., 2009; Frankenberg, Suriastini & Thomas, 2005; Frankenberg & Thomas, 2001; Gertler & Molyneaux, 1994; Rosenzweig & Wolpin, 1986), and is appropriate when bias is caused by unobserved characteristics that are constant over time at the level of the fixed effect. We include a community-level fixed effect to control for the Government of Indonesia's placement strategy to assign village midwives to disadvantaged communities. To validate this methodology, we ran a series of community-level regressions of village midwife presence on measures of women's fertility characteristics, village infrastructure and socioeconomic development. The results are consistent with earlier work evaluating placement of the Program (Frankenberg, et al., 2009; Frankenberg, et al., 2005; Frankenberg & Thomas, 2001), and confirmed that the midwives were consistently placed in rural villages with low levels of infrastructure (results not shown). These results emphasize the importance of the fixed effects estimator, which eliminates the influence of time-invariant community characteristics associated with women's contraceptive practice and a community's receipt of a village midwife. Thus, our model is specified as follows:

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

where Y_{ict} is the outcome for woman i in community *c* in time t; M_{ct} is an indicator of midwife availability in community *c* at time t; X_{it} is a set of individual-level characteristics in time *t* such as age, education, etc.; X_{ct} is a set of community characteristics in time *t* such as infrastructure and socioeconomic development indicators; and TIME indicates the year of survey. The v_c term is the community-level fixed effect. The error term has two components: (1) u_i unobserved time-invariant individual-level factors and (2) ε_{ict} unobserved time-variant factors of individual *i* in the community *c* and time *t*. We estimate fixed effects logit regressions for contraceptive use and method choice.

Fixed effects logit models can be impractical under certain circumstances given that observations are dropped if their outcomes do not 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 over the study period, these communities would not contribute information to our estimates. For our first outcome—contraceptive use—16,533 women and 311 out of the 312 communities are included. The number of women and communities contributing to estimates for contraceptive method choice vary by method type ranging from 9,829 women in 304 communities for injectable contraceptives to 6,140 women in 163 communities for contraceptive implants. Although this strategy has been validated in earlier studies of the Village Midwife Program, it has several limitations. First, it does not account for time-variant unobserved community characteristics on which the Program may have been allocated, or time-variant individual 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, characteristic of the study's "intent to treat"

approach is that midwives are assigned at the community-level (and not to individuals), so the analyses do not measure women's direct exposure to the midwives via use of their services (only the exposure that occurs from residing in the same village).

Results are reported as odds ratios and significance is reported at the $p \leq 0.05$ and $p \leq 0.001$ levels. All analyses were performed using STATA versions 10.0 and 11.0.

Results

The results of estimating model (1) are presented in Tables 1-3. Village midwives could theoretically impact uptake or usage of contraceptive methods through several channels: (1) through provision of information and counseling; (2) through increased access to a convenient distribution channel; (3) through availability of different or more individually-appropriate methods; or (4) through affecting women's fertility goals. The impact of midwives through these various channels may also have varied over time as the midwives became more familiar with and accepted by the community members.

Contraceptive Prevalence

Table 1 shows the results of a logistic model with community-level fixed effects that includes interaction terms to test for a differential effect of the midwives on contraceptive use by survey year. We find that the interaction effect is small in all years and below standard levels of significance, indicating that the midwives did not affect contraceptive prevalence in any survey year. Our results reveal that women's age and education level are significant predictors of contraceptive use while community characteristics do not appear to influence our outcome.

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 program who were viewed as least likely to accept family planning include women in rural communities, uneducated women, and women in low-income families. Based on the Government's family planning strategy, one would also expect women in the older age groups (older than 30 years) or with more than 3 children to be more strongly influenced by the village midwives to increase contraceptive use. The results of these analyses are consistent with the effect of village midwives on the general population, indicating that village midwives did not influence contraceptive use in target groups (results not shown).

Contraceptive Choice

To estimate the midwives' effect on women's contraceptive choice, a series of multivariate logistic regressions was conducted predicting the odds of choice of each method, conditional on any use, comparing women's choice in communities with and without a midwife. Table 3 shows the results of these analyses. The interaction effect of village midwife and time (e.g., survey year) indicates whether village midwives were influential in affecting women's choice of contraceptive methods differentially by survey year (Table 4, panel 1). It may be that access to a midwife was less influential in early years of the program when midwives were relatively unknown to the community: women may have been less inclined to seek a 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 midwives, and the 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. Midwife availability was highly associated with use of contraceptive injections in their communities in 2007; women in communities with a midwife in 2007 had 1.66 times higher odds of using contraceptive injections. At the same time, midwives were associated with lower odds of oral contraceptive use in 2000 (OR=0.29) and

2007 (OR=0.28) and of implant use in 2007 (OR=0.58). The prevalence of IUDs was not affected by the presence or absence of a village midwife.

Contraceptive choice among targeted groups

Because the Government of Indonesia's strategy included a goal to reach specific demographic groups to promote longer-lasting methods, we also 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 midwife communities 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 longer-lasting methods in midwife communities (i.e., IUDs and implants). Our analyses reveal that presence of a midwife had a similar impact on these targeted groups of women compared to the reproductive-aged population as a whole, increasing the odds of injectable usage and decreasing the odds of oral contraceptive usage (Table 3, panel 2). The presence of village midwives had no effect on IUD or implant usage among targeted Indonesian women.

Table 1. Multivariate logistic regression with community-level fixed effects showing the relationship between contraceptive use, village midwife availability and selected individual and community characteristics in Indonesia, 1993-2007

Characteristic	Log-odds	
Community has village midwife	0.01	(0.13)
Survey Year		
1997	0.173	(0.076)
1997*midwife	-0.01	(0.15)
2000	0.171*	(0.075)
2000* midwife	-0.11	(0.15)
2007	-0.145	(0.082)
2007*midwife	0.16	(0.15)
Women's Characteristics		
Age		
20-24 years	0.611**	(0.094)
25-29 years	0.842**	(0.091)
30-34 year	0.842**	(0.091)
35-39 years	0.745**	(0.093)
40-44 years	0.537**	(0.096)
45-49 years	0.212	(0.108)
Education		
1-5 years	0.502**	(0.070)
6-9 years	0.743**	(0.070)
10-12 years	0.517**	(0.081)
13-19 years	0.32*	(0.10)
Household in top 50% real per capita expenditures	0.036	(0.056)
Community Characteristics		
Hospitals (#)	0.002	(0.019)
Public Health Clinics (#)	0.003	(0.007)
Community Health Posts (#)	-0.001	(0.006)
Private Providers (#)	0.004	(0.005)
Main road is paved (%)	0.124	(0.090)
Community has public phone (%)	-0.004	(0.06)
Households predominantly have private toilet facility (%)	-0.071	(0.06)
Community has public sewer (%)	0.001	(0.05)
Obs.	16,537	
Fixed effects (#)	312	
LR Chi-squared	343	

Indicates a statistically significant estimate ($p \leq 0.05$); ** indicates a statistically significant estimate ($p \leq 0.001$).

Standard errors reported in parentheses to the right of each estimate.

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

Table 2. Multivariate logistic regressions with community-level fixed effects showing the relationship between contraceptive method choice, village midwife availability and selected individual and community characteristics in Indonesia, 1993-2007

	Injection		Pill		IUD		Implant		Other modern method	
Characteristic	Log-odds		Log-odds		Log-odds		Log-odds		Log-odds	
Community has village midwife	-0.19	(0.19)	0.10	(0.20)	0.26	(0.30)	0.65*	(0.32)	0.12	(0.42)
Survey Year										
1997	0.47**	(0.10)	-0.01	(0.11)	-0.63**	(0.13)	0.07	(0.22)	-0.52*	(0.21)
1997*Midwife	0.28	(0.21)	-0.24	(0.22)	-0.27	(0.32)	-0.50	(0.37)	-0.05	(0.47)
2000	0.46**	(0.10)	-0.01	(0.11)	-0.93**	(0.14)	0.62*	(0.21)	-0.40	(0.21)
2000*Midwife	0.38	(0.21)	-0.47*	(0.22)	-0.22	(0.33)	-0.58	(0.37)	-0.07	(0.47)
2007	0.92**	(0.12)	-0.13	(0.13)	-1.51**	(0.17)	0.22	(0.31)	-0.33	(0.23)
2007*Midwife	0.71**	(0.22)	-0.45*	(0.22)	-0.51	(0.34)	-1.52**	(0.43)	-0.37	(0.47)
Women's Characteristics										
Age										
20-24 years	0.01	(0.14)	-0.01	(0.16)	0.65	(0.38)	0.03	(0.27)	-0.57	(0.68)
25-29 years	-0.26	(0.14)	0.15	(0.15)	0.95*	(0.37)	0.27	(0.26)	0.24	(0.62)
30-34 year	-0.57**	(0.14)	0.21	(0.15)	1.34**	(0.37)	0.50*	(0.26)	0.75	(0.61)
35-39 years	-0.93**	(0.14)	0.18	(0.16)	1.68**	(0.37)	0.20	(0.27)	2.04**	(0.60)
40-44 years	-1.34**	(0.15)	0.28	(0.16)	1.99**	(0.37)	0.41	(0.28)	2.25**	(0.61)
45-49 years	-1.87**	(0.18)	0.32	(0.19)	2.37**	(0.39)	0.47	(0.32)	2.49**	(0.62)
Education										
1-5 years	0.21	(0.11)	-0.31*	(0.12)	-0.04	(0.16)	-0.20	(0.17)	0.59*	(0.28)
6-9 years	0.37**	(0.11)	-0.47**	(0.12)	-0.03	(0.16)	-0.45*	(0.17)	0.58*	(0.28)
10-12 years	0.18	(0.12)	-0.55**	(0.13)	0.57**	(0.17)	-0.80**	(0.22)	0.98**	(0.30)
13-19 years	0.01	(0.15)	-0.91**	(0.18)	0.94**	(0.20)	-1.47**	(0.41)	1.36**	(0.33)
Top 50% real per capita expenditures	-0.012	(0.076)	0.022	(0.083)	0.04	(0.13)	-0.09	(0.16)	0.03	(0.19)

Continued…

Table 2. Multivariate logistic regressions with community-level fixed effects showing the relationship between contraceptive method choice, village midwife availability and selected individual and community characteristics in Indonesia, 1993-2007 cont…

	Injection		Pill		IUD		Implant		Other modern method	
	Log-odds		Log-odds		Log-odds		Log-odds		Log-odds	
Community Characteristics										
Hospitals (#)	-0.07*	(0.027)	0.054	(0.029)	0.081*	(0.040)	-0.127*	(0.057)	0.030	(0.058)
Public Health Clinics (#)	-0.014	(0.009)	0.002	(0.010)	0.005	(0.010)	0.002	(0.023)	0.010	(0.015)
Community Health Posts (#)	-0.004	(0.008)	0.011	(0.009)	-0.011	(0.010)	-0.013	(0.024)	-0.002	(0.014)
Private Providers (#)	0.002	(0.008)	-0.005	(0.009)	0.000	(0.009)	0.019	(0.027)	-0.010	(0.018)
Main road is paved (%)	0.08	(0.12)	0.10	(0.13)	-0.19	(0.19)	-0.24	(0.21)	-0.43	(0.31)
Community has public phone (%)	0.085	(0.086)	-0.078	(0.093)	-0.09	(0.13)	-0.03	(0.17)	-0.14	(0.19)
Households predominantly have private toilet facility (%)	0.140	(0.083)	-0.068	(0.089)	-0.07	(0.14)	-0.08	(0.15)	-0.02	(0.22)
Community has public sewer (%)	-0.036	(0.069)	0.072	(0.075)	-0.09	(0.11)	0.04	(0.13)	-0.28	(0.15)
Obs	9,829		9,506		7,497		6,143		6,083	
Pseudo R2	0.175		0.149		0.272		0.154		0.197	

*Indicates a statistically significant estimate (p≤0.05); **Indicates a statistically significant estimate (p≤0.001).
Coefficients reported as log-odds; standard errors reported in parentheses to the right of each estimate.
Source: Indonesia Family Life Survey, 1993, 1997, 2000, and 2007.

Table 3. Summary of interaction effects predicting the differential effect of village midwives on contraceptive method choice by time and target population 1993-2007

	Interaction with time				Interaction with target population		
	1993	1997	2000	2007	Women ages 30+	Achieved ideal family size	Family has 3+ children
Oral Contraceptives	1.10	0.88	0.71*	0.72*	0.81*	0.75*	0.79*
	[0.64, 1.56]	[0.68, 1.08]	[0.53, 0.88]	[0.52, 0.92]	[0.63, 0.98]	[0.61, 0.90]	[0.63, 0.96]
Injectable Contraceptives	0.83	1.08	1.20	1.66*	1.29*	1.25*	1.27*
	[0.49, 1.18]	[0.83, 1.33]	[0.91, 1.49]	[1.23, 2.08]	[1.04, 1.53]	[1.03, 1.46]	[1.04, 1.50]
Contraceptive Implant	1.87	1.15	1.06	0.42*	1.17	1.25	1.15
	[0.62, 3.13]	[0.59, 1.71]	[0.55, 1.58]	[0.03, 0.81]	[0.75, 1.59]	[0.82, 1.62]	[0.67, 1.62]
Intrauterine Device	1.30	0.98	1.02	0.75	1.05	1.08	1.03
	[0.44, 2.15]	[0.60, 1.36]	[0.62, 1.42]	[0.43, 1.07]	[0.76, 1.33]	[0.77, 1.39]	[0.75, 1.29]

Interaction effects report as odds ratios; *indicates statistically significant interaction effect ($p \leq 0.05$).
Note: 95% confidence intervals bootstrapped and reported below each estimate.

Discussion

An earlier study showed that the Village Midwife Program had an effect on the use of reproductive health services including use of a skilled birth attendant, receipt of iron tables, and the use of antenatal care (Frankenberg et al., 2009). This study uses a multi-level framework to examine the effect of the Program on contraceptive prevalence and method choice in Indonesia over a 14-year period.

Because one of the village midwives' core services is provision of contraceptive methods, it was anticipated that the village midwives would also have an influence on contraceptive prevalence in the communities that they serve. However, there is no evidence to support this hypothesis. Even though village midwives did not affect overall contraceptive prevalence, had they reached some of the Government's target populations, one might argue that this component of the Village Midwife Program was partially successful. However, this was also not the case. Our analysis of the influence of village midwives on targeted populations found that the program had no effect on women's contraceptive use among these groups (e.g., low-income, rural, and less educated women).

Our results differ from research in other settings that have shown contraceptive use to be responsive to improvements in service availability (Gray, Smit, Manzini, & Beksinska, 2006; Jain, 1989). The Indonesian program may not have affected contraceptive use for a number of reasons. It is possible that the long history of family planning field-worker services in Indonesian communities has already reached the population of women most easily influenced by increases in service availability. An earlier study by Gertler and Molyneaux (1994) indicated that supply-side constraints were not a factor in fertility decline at that time; increases in education and socioeconomic development drove increases in contraceptive use. Gertler and Molyneaux also posited that future gains in the contraceptive prevalence rate were likely to be most effective through interventions that promoted increases in demand rather than interventions that simply expanded the distribution system (such as the Village Midwife Program has done). Similarly, research elsewhere in the Philippines found family planning outreach to be more effective than availability of family planning clinics in increasing contraceptive prevalence (DeGraff et al., 1997).

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., midwives) have not increased prevalence. Although many early family planning programs 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 family planning supplies. Under such circumstances, the remainder of women classified as having "unmet need" may not be open to contraceptives for reasons other than accessibility. Women with unmet need have either (1) discontinued use of contraceptives or (2) simply do not use contraceptives. Addressing unmet need among these two groups may require separate strategies. In Indonesia, contraceptive discontinuation, which rose between 2002/2003 and 2007, occurred most frequently among women using pills, condoms, and injections, respectively. The most common reasons for discontinuation in 2007 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 due to health concerns and side-effects may be most easily served by village midwives through education and counseling. While family planning field-workers and community volunteers have been providing counseling about these issues, a skilled and clinically trained provider may be a more appropriate point of reference for these women.

Similarly, Indonesian women who are nonusers and 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 & Macro International, 2008). Education and counseling by village midwives also has potential to address some of these 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.

Placement of village midwives into rural communities has enhanced the supply and method mix of contraceptives available to these women. This study demonstrates that village midwives have influenced women's contraceptive method choice. Under these circumstances, women have chosen to move away from oral contraceptives and move into the use of injectable contraceptives. These outcomes are aligned with known incentive structures; provision of injectable contraceptives is a source of supplemental income for the midwives, the majority of whom staff a private practice outside of their public duties (Hull and Mosely, 2009). Several other possibilities may explain this behavior: women may be more satisfied with injectable contraceptives; or changes in preference may be attributable to other unknown reasons. However, a trend toward injectable contraceptive use is not unique to Indonesia. For example, 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).

The predominant use of hormonal contraceptives (i.e., pills, injections) in Indonesia is of concern to policy-makers (Syarief, S., BKKBN, 2010; Hull and Mosely, 2009). The midwives were originally intended to provide an additional source of longer-lasting, clinical methods for women where none previously existed (World Bank, 1991). However, the low prevalence of implants and IUDs indicates that the midwives have not been an effective vehicle for this change. Further research is needed to understand demand-side factors (e.g., cultural acceptance) affecting uptake of these clinical methods.

Although women appear to prefer these method types, oral and injectable contraceptives are associated with higher rates of discontinuation for women in need of contraception. Even though a 2003 study of Indonesian women found that contraceptive failure was lowest among users of IUDs and injectables, the risk of contraceptive abandonment was highest for users of pills, injectables and condoms (Steele & Curtis, 2003). Further, women 35 years and older in their study were significantly more likely to switch or abandon use of injectables or oral contraceptives. The authors posit there may be greater health concerns among older women regarding use of hormonal methods later in life.

As previously noted, the relatively infrequent use of implants and IUDs indicates that the midwives have not been effective advocates for these for these methods of contraception. The issue of IUD and implant promotion may be a difficult topic for Indonesian women for several reasons. Studies note that women may prefer contraception that does not require a pelvic exam, especially in particularly conservative communities (Warwick, 1986). Early in the implementation of the Government's Family Planning Program, there were also claims of coerced use of IUDs, specifically in East Java (Warwick, 1986). Anger or suspicion regarding this type of intervention by Government officials may still linger in certain populations. 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 presumably faced higher service fees for removal of the implant/IUD. These 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.

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, Prihartono, Tuladhar, & Hoesni, 1997). 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.

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 also examined the effect of the program on contraceptive use and method choice. The main policy implication of these analyses is that the Village Midwife Program has served to provide women with a reliable source for switching contraceptives from oral to injectable methods. There remains a substantial population of women for whom IUDs and implants may be more appropriate. Further, it is clear that serving women with unmet need may require a different approach, potentially including coordination between village midwives, field-workers, community volunteers and other health care workers. Additional demand-side research and informed, targeted interventions could address these issues. Further research on the Village Midwife Program could also reveal alternative channels of influence of the Program on women's reproductive health. Specifically, were the midwives influential in reducing contraceptive discontinuation? Have they affected women's knowledge about the benefits of family planning or their fertility preferences (e.g., their ideal family size)?

These results may inform Indonesian policy-makers as they seek new solutions to address unmet need in the country and to reach their targets for high-need populations. Growth in contraceptive prevalence has stagnated over the last 10 years and has even declined among uneducated women between the years 2003-2007 (Statistics Indonesia & Macro International, 2008). Unmet need has also increased along with an increase in abortions for unwanted pregnancies (Statistics Indonesia & Macro International, 2008). Although the Government 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 vary from studies in other settings where availability of additional method types has increased prevalence (Gray, Smit, Manzini, & Beksinska, 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 political factors), which affect reproductive health outcomes and should also be considered by policy-makers seeking to improve reproductive health.

This study provides several insights from the Indonesian experience that may be useful for family planning program managers in other contexts. First, it has demonstrated that increasing service availability may only be effective to a certain market saturation point, whereby alternative strategies to increase contraceptive prevalence for high-need populations may be required. Contraceptive use increased dramatically during the early years of the Indonesian Family Planning Program, but by the 1980s, scholars posited that availability of supply no longer directly influenced contraceptive use (or fertility) as markets were already saturated with service outlets that provided contraceptive services (Gertler & Molyneaux,

1994). 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 under such circumstances.

A second lesson relates to the dynamic between demand for and supply of contraceptives. In Indonesia, availability of additional service providers with skills to provide clinically-based methods (i.e., increased supply) has not resulted in increased uptake for these services (i.e., increased demand). This result highlights the importance of the dynamic between service providers, women, and the contexts in which they interact. Increasing provision of contraceptive services and the mix of methods available are important first steps in reaching target populations with access to these method types. However, also important are demand-side issues related to acceptance and use of the varying contraceptive method types for appropriate and effective targeting. The lessons outlined here are applicable in other settings where family planning program managers seek an integrated approach to increase contraceptive prevalence, to reach women with unmet need, and to promote clinical methods for appropriate populations.

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