A Mixed Methods Study of Reproductive Health Services Delivery in Rural Indonesia*

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Introduction

Delivery and funding of reproductive health services is a global challenge given limited resources and availability of skilled personnel. A growing emphasis on provision of reproductive health programs has generated interest in program design that is effective in rural and low-resource settings (United Nations Population Fund, 2010; Carr, Gates, Mitchell, & Shah, 2012). The design for delivering cost effective services has been informed by various models in multiple countries. The Indonesia Village Midwife Program is an early example of a program that provides widespread reproductive health services in a challenging environment and has improved a number of reproductive health outcomes (Frankenberg, Buttenheim, Sikoki & Suriastini, 2009; Frankenberg, Suriastini, & Thomas, 2005; Frankenberg & Thomas, 2001). Launched in 1989, the program relies on skilled midwives placed in each village around the country. The goal is to reduce maternal mortality, but the village midwives are a linchpin for safe motherhood activities while also delivering family planning and preventative care services (World Bank, 1991).

This paper reports on one piece of a larger research study that aimed to generate lessons for improving delivery of reproductive health services. This piece of the study sought to examine the relationship between provider characteristics (e.g., Village Midwives) and health outcomes (skilled birth attendance and contraceptive practice) in Indonesia over the years 1997 to 2007. The research design used a unique method to identify and test factors related to effective program implementation and service delivery--an emergent multi-phase sequential mixed methods approach. We (1) performed a descriptive analysis of program variables available in secondary survey data; (2) conducted focus groups with Village Midwives to fill gaps in our knowledge about program implementation and service delivery; and then (3) quantitatively tested whether factors related to service delivery identified in focus group discussions were associated with use of services in program communities. With this mixed methods approach, we

reframed our contextualized understanding of these emergent themes to provide a synopsis/taxonomy of factors contributing to program implementation and service delivery (qualitative). Analyses of how provider characteristics are related to changes in health services usage (quantitative) guided evidence-based policy development informed through context and local experiences. This emergent sequential design demonstrates the value of mixed methods research in implementation science and gives the Village Midwives—critical stakeholders in this process--a voice in designing effective service delivery of reproductive health services in Indonesia.

Background

The 1994 International Conference for Population and Development in Cairo, Egypt generated a consensus on the importance of reproductive health for all populations. Since that time, many new strategies have been developed to provide widespread access to reproductive health services by skilled and unskilled healthcare workers. These strategies, including the use of trained midwives and other skilled birth attendants, have yielded various results.

Promoting skilled birth attendance is established as one critical intervention for improving maternal health outcomes (United Nations Population Fund, n.d.). De Bernis and colleagues (2003) argue that skilled attendants with midwifery training are best placed to ensure the survival and safety of pregnant women and children. Licensed midwives were associated with a five-fold decrease in non-septic related maternal mortality in Sweden (Högberg, Wall & Broström, 1986). For home-based, rural births in West Africa, Ronsmans and colleagues (2003) found a significant link between decreased maternal mortality rates and use of a skilled birth attendant.

The use of midwives to supply contraceptives is a strategy used in many settings given their intimate relationships with clients before, during and after childbirth. Promoting family planning counseling for women during the postpartum period is an especially common strategy that

aligns well with midwifery services. A Cochrane review of the effect of education for postpartum women on contraceptive use found evidence that postpartum education influenced short-term contraceptive use (Lopez, Hiller, & Grimes, 2010). Studies are mixed in determining whether provision of information or recommendations of method type by providers affects contraceptive method choice (Ekani-Bessala, et al., 1998; Konje et al., 1998; Oddens and Lehert, 1997).

Women's use of reproductive health services is associated with a variety of additional provider-related factors including better access, or, access to a higher volume of providers (Stephenson et al., 2008; Degraff, Billsborrow and Guilkey, 1997; Jensen, 1996; Steele and Curtis, 1999; Lerman et al., 1989); provider preferences (Oddens and Lehert, 1997); and type of provider (Konje et al., 1998; Jensen, 1996). A small body of literature on provider characteristics supports the existence of a link between provider quality and individual contraceptive use (Koenig et al., 1997; RamaRao, et al., 2003, World Bank, 1991).

Beyond the provision and implementation of public programs, it is beneficial to understand the dynamic of provider-related factors that may also impact health services delivery and use and subsequent success (or failure) of public health programs. To ensure that scarce resources are spent on interventions that achieve access targets and are also effective in improving health outcomes, the Indonesia Village Midwife Program provides a case study to generate applications across other contexts and settings.

The Indonesian Village Midwife Program

Provision of reproductive health services in Indonesia has been, as in many developing countries, a priority for decades and yet remains a challenge, given the geographic and cultural variation within the country. The Indonesian Government (GOI) has deployed several community-based strategies using skilled and unskilled workers to confront access issues and to distribute adequate services for its population. The Village Midwife Program in Indonesia is an innovative and successful government initiative that addressed gaps in access to

3

reproductive healthcare for rural women since 1989. The goals of the program were threefold: to expand safe motherhood activities among poor and hard-to-reach populations, improve accessibility and utilization of family planning services, and enhance the mix of contraceptives available to target populations.

Initially, the Government established the Village Midwife Program by creating regional training programs for village midwives. Students in 3-year nursing schools completed an additional year of midwifery training. The midwives were then placed in villages around the country in the role of linchpin for safe motherhood activities at the village level (e.g. to reduce maternal mortality) while assuming an additional role in the delivery of family planning services by providing women with a wide range of contraceptive methods.

In 1996 the National Family Planning Board (BKKBN) changed the educational requirements for the Village Midwife Program by opening three-year midwifery academies were opened, which accepted women directly out of high school. Additionally, previously trained village midwives were also required to complete the 3-year degree program in a midwife academy. In 1997, the Government of Indonesia stopped subsidizing education for the Village Midwife Program, but, where funding is available, local governments continue to consider midwife academy graduates (prior to the Village Midwife Program, trained midwives were mainly employed in health clinics and hospitals). In 1987, only 5,000 of Indonesia's approximately 67,000 villages had a trained midwife (World Bank, 1991). By 2009, there were 80,000 midwives in Indonesia, most of whom were trained through the Village Midwife Program (World Bank, 2010).

Data and Methods

This study sought to generate lessons from the experience of midwives in the Village Midwife program for application in other contexts. Using an emergent multi-phase sequential mixed methods approach we asked the following research questions:

Table. 1 Description of research process and research questions

	Data source	Research questions
Phase 1 (descriptive)	IFLS	• What are characteristics of Village Midwives? • What services do they provide?
Phase 2 (descriptive)	Focus groups	• How did Village Midwives experience entry into the Program and their community? • What is the Village Midwives' role in their community? • How do Village Midwives experience the provision of services?
Phase 3 (multivariate analysis)	IFLS	• Are midwives' age, education-level, years of experience, and years of tenure in the community related to changes in the use of a skilled birth attendant? • Are midwives' age, education-level, years of experience, and years of tenure in the community related to changes in the use of contraceptives and method choice?

Study Design

The study was implemented using a multiphase emergent sequential design. First, we

generated descriptive statistics about the Village Midwife Program from interviews with Village

Midwives and community informants using the Indonesia Family Life Survey (IFLS). After

evaluating these descriptive statistics and conducting a literature review, a semi-structured

interview guide was developed for focus group discussions with Village Midwives to fill

remaining gaps in our knowledge about the program's implementation over time, the role of

Village Midwives in their communities, and any barriers or facilitating factors related to service

delivery. Information from the focus groups were intended to provide information about

implementation and evolution of the program that would inform our analytical approach in the

next phase, and to add context for the development of policy implications. In the third and last

phase of this research, a multivariate analysis examining (1) the effect of the Program on

contraceptive use and method choice (publication under review) and (2) the association

between midwife characteristics and changes in service delivery/use. This paper reports results

from one piece of this larger study; those results related to service delivery and provider

characteristics.

The aim in the first phase of the study was to evaluate the impact of the Program on reproductive health outcomes and to test whether midwife quality (as measured by observed midwife characteristics) were associated with these outcomes. Based on this analysis, reviewing the survey instruments, and conducting a literature review of the Program, gaps in knowledge about the Program and the Village Midwives' roles in their communities were identified.

In the second phase of the study, focus groups with Village Midwives were conducted to fill gaps in knowledge identified in phase 1, and to learn more about the midwives' experiences. The narrative responses and emerging codes from the qualitative analysis were synthesized and then connected to refine the research questions for phase 3, the quantitative phase of the study.

The goal of phase 3 was to understand the association between Village Midwives' personal characteristics and the health outcomes. In phase 3, a quantitative analysis relating provider characteristics to service delivery and use was conducted with a greater appreciation that observed Village Midwife characteristics encompass more depth and complexity than simple indicators of provider quality.

Quantitative survey data and methods (phases 1 and 3)

The Indonesia Family Life Survey is a longitudinal household socioeconomic and health survey conducted by RAND and SurveyMeter. It is based on a sample of 13 of Indonesia's 26 provinces and spans the years 1993 – 2007 creating one of the longest running multilevel panel surveys in the developing world. The study drew data from the IFLS in the subsample of panel communities in which interviews with Village Midwives were conducted in 1997, 2000 and 2007. The interviews are repeated cross sections from the years 1997, 2000, and 2007. Through household and community informant interviews, IFLS interviewers compile a global list of most frequently used providers in IFLS panel communities in each survey wave. A random probability

6

sample is then drawn from the global list of providers, and sampled health providers are interviewed in their place of business (Frankenberg & Karoly, 1995). For each community in which a Village Midwife is interviewed in each survey year, we linked the Village Midwives' (n=563) self-reported personal and service characteristics to (1) community socioeconomic development information and; (2) information from Indonesian women in these communities.

Phase 3 Outcomes

We measured two outcomes in each of two main service categories provided by Village Midwives: (1) birth attendance and (2) contraceptive services.

First, the study measured whether a woman's birth was attended by any skilled provider including a doctor, nurse, Village Midwife or private midwife (coined 'skilled delivery') and whether a woman's birth was attended by a Village Midwife (coined 'Village Midwife delivery'). These outcomes are binary variables indicating whether "1" a woman had a skilled provider/Village Midwife at the delivery of her child or "0" a woman did not have a skilled provider/Village Midwife at the delivery of her child. As per previous research on skilled birth attendance in Indonesia using IFLS, this study tracked births annually by using women's birth history data throughout the study period and matched women's and community characteristics to the closest full survey wave.

Likewise, we used binary choices for whether "1," a woman was using a modern contraceptive method at the time of the survey (e.g., pill, injection, IUD, implant, condoms, sterilization or intravaginal device), or "0," she was not using any modern contraceptive method. For those using a modern method, binary choice of method was used, specifically for pill, injection, IUD or implant.

Key independent variables of interest

Key independent variables included several self-reported Village Midwife characteristics drawn from the subsample of Village Midwife interviews conducted in 1997, 2000 and 2007. *Tenure* is

the number of years the Village Midwife has been in her current village. *Experience* is the

number of years the Village Midwife has been in practice in any village. Village midwife *age* is

measured continuously in years. *Midwife e*ducation is a binary indicator of the Village Midwife's

level of midwifery training: education equals"0" if the Village Midwife had up to one year of

midwifery training or "1" if the Village Midwife had three years or more of midwifery training (no

midwives had between 1 and 3 years of training).

Control variables related to skilled delivery, contraceptive use and contraceptive method choice

included individual woman's and community characteristics (socioeconomic development

indicators and availability of other service providers).

Descriptive statistics characterized Village Midwives and summarized their provision of services.

Multivariate logistic analyses controlling for community fixed effects evaluated whether midwife

characteristics were associated with changes in service utilization/health behavior within their

communities. Because women's education is such an important predictor of birth attendance in

Indonesia (Frankenberg, Buttenheim, Sikoki and Suriastini, 2009), outcomes varied by women's

education, by including an interaction term of women's education (in years) with each midwife

characteristic. Odds ratios are reported for multivariate models. Statistical significance at the

$p<0.05$ and $p<0.001$ levels are noted. All analyses were performed using STATA software,

version 12.

Qualitative data and methods (phase 2)

Qualitative data on program implementation and service delivery were collected during four

focus group discussions with Village Midwives (n=17 midwives) carried out by the authors in

one district of central Java in 2011. A semi-structured interview guide was developed by the

focus group team that was designed to explore implementation and programmatic issues.

SurveyMeter, an Indonesian research foundation, piloted the interview guide in December,

2010. The interview guide was revised and SurveyMeter recruited a convenience sample of

village midwives based on their geographic location (e.g., a rural area) and level of experience

in the Village Midwife Program. Focus groups were conducted by the focus group team and administered by SurveyMeter staff in Bahasa Indonesia. Each focus group was comprised of 4-5 village midwives and lasted between 1-2 hours. Verbal informed consent was obtained from each midwife prior to the focus group discussion. The discussions were audio-recorded, transcribed, and translated from Bahasa Indonesia into English. Transcripts from two of these focus groups were available for analysis and coded using Atlas.ti software. Major themes based on the survey instrument were examined and emergent themes were identified during analysis to generate additional codes.

Results

The following section is organized in order of the sequence of our study. We first present descriptive analysis of the survey data, followed by results from the focus group discussions, and ending with the quantitative multivariate analysis.

Phase 1: Descriptive analysis of survey data

To characterize the Village Midwives in our sample, we used self-reported information from provider interviews in 1997 through 2007. Information about village midwives' characteristics and service provision are provided in Table 1. The average age of the midwives was 26 years in 1997. The majority of village midwives had received a junior associate's degree (1-year midwifery training) at that time, which was the basic educational requirement in the early years of the program. This educational requirement increased to a 3-year midwifery degree program in 1996, and by 2007, 31.4% of these midwives had completed this training. The midwives largely practiced in their province of origin with their practices either stationed at the village delivery post or in their own home. They spent approximately 8 hours a week providing family planning-related services.

Village midwives provided a wide variety of services in their communities beyond reproductive health services (Table 1). Reproductive health services were provided almost universally over time (i.e., prenatal care and delivery, family planning visits) with provision of delivery and family planning counseling services increasing from 1997 to 2000 and remaining high. The village midwives also routinely provided contraceptive pills and injections. There was a drop in provision of contraceptive pills in 2000, which recovered by 2007. Provision of contraceptive injections increased significantly from 1997 to 2000 and remained almost universal. Rates of IUD and implant provision (and removal) generally increased over time, although IUD insertion fell in 2007. There was a significant increase in implant services from 1997 to 2000, although a change in the survey questionnaire may have picked up additional services in later years that were not applicable in 1997.

Midwives also provided general health services--mainly sick patient visits—including sick patient exams, injections and medications, suturing of lacerations and wound care (Table 1). By 2007, services for suturing and wound care fell from earlier years. A minority of midwives also began offering inpatient services over the ten-year period (e.g., kept patients overnight), increasing significantly from 7% in 1997 to 20.1% in 2000. Provision of midwife services did not vary consistently by education level or by urban/rural location (results not shown).

The IFLS women's questionnaire provides information on birth attendance and contraceptive use for women in study communities over the survey period. Skilled birth attendance as a share of all births increased over time from 42% between 1993 and 1997 to 68.8% between 2001 and 2007. Village midwives' share of deliveries averaged 11% of all skilled births attended over the period. Contraceptive use remained fairly constant ranging from 61.7% in 1997 to 58.3% in 2007.

Phase 2: Focus group results

The results from focus group discussions are grouped by service type--either skilled delivery or contraceptive provision--with a focus on research question number three, "*How do Village Midwives experience the provision of services?"* We highlight major emergent codes and illustrative responses for each code, and provide a summary of relevant results.

This study identified one relevant major theme and two subthemes that emerged from discussions with the Village Midwives related to service delivery. The subthemes were further divided into categories to allow for coding of additional nuances throughout the discussion.

Major theme: Service delivery. This is a broad code, defined as issues related to a midwife's service delivery, such as what services she provides and why, which services are most popular, her experience providing these services etc.

Subtheme 1: Factors that create barriers for service provision.

a) Factors related to midwife characteristics
b) Factors related to clients
c) Other factors

Subtheme 2: Factors that facilitate service provision.

a) Factors related to midwife characteristics
b) Factors related to clients
c) Other factors

<u>Skilled delivery</u>

Table 3 provides examples of results that fell within our major theme and that are related to skilled birth attendance. Village midwives indicated that they attended births with low frequency, due to the rurality and low population density of the areas in which they were placed. At the onset of the program, and early in their placement in a village, several midwives remarked that it took a long time to become known and trusted in the village. One midwife noted that she was not hired to attend a delivery until she had been in the village for one year. Cultural acceptance

11

may have been one barrier to service delivery; the midwives indicated that villagers say that because they are young and have never even had their own children, the midwives do not have adequate experience to delivery their babies. Further, the women in these communities had long-standing relationships with the traditional midwives, who were threatened by the competition. The Village Midwives reported that it was illegal for traditional midwives to attend births without a skilled provider and thus, traditional midwives were less of a barrier over time.

Young, inexperienced Village Midwives expressed anxiety about attending births due to the risk of experiencing a complication that resulted in death. The Indonesian government in this geographic area follows up on maternal deaths via audit, which are generally intended to identify contributing factors that may be avoided in future deliveries (Supratikto, Wirth, Achadi, Cohen, & Ronsmans, 2002).

Lack of functioning equipment at start-up in a new village presented challenges to the midwives, whether they began early in the Program's history or more recently. Several of the midwives had been provided broken equipment, while others had not been given any equipment. Several midwives also noted that they did not have a formal place to practice early in their tenure. If a village did not have a village clinic (poliklink desa), they sometimes practiced in the village hall of the home of the village head.

Provision of contraceptives

Village midwives indicated that cultural acceptance of clinical family planning methods was low, especially implants and IUDs. They reported that they frequently recommended these methods, but that women rarely accepted them. Further, one midwife indicated that she did not stock IUDs and would have to order one in advance of service provision. Midwives also cited that women often did not adhere to guidelines for timeliness of implant removal, necessitating midwife referral of women to a higher level medical facility for removal of the tool. The majority of women obtain injectable contraceptives from the midwives.

Local requirements also dictate which services the village midwives may provide, whether at the public health clinic or in her own practice. According to the midwives, these requirements have changed over time and are locally regulated. For example, a new certification is required for the midwives to insert IUDs in the public health clinic. Some more recently trained village midwives received this certification during their training program, while others had to obtain it independently.

Phase 3: Results from the Indonesia Family Life Survey

Results from coding and analyzing the focus groups helped refine and inform the research questions in this last, quantitative phase of research. Results are reported from the IFLS by research question: first for skilled birth attendance and secondly for contraceptive use.

Do midwife characteristics influence prevalence of skilled delivery or Village Midwife delivery in their communities?

Village midwife discussions pointed to midwife age, tenure, and experience as important factors in use (or non-use) of her services. Therefore, conditional on a Village Midwife's availability in the community at the time of delivery, we tested whether Village Midwife characteristics were associated with (1) the use of any skilled attendant at delivery and (2) the use of a Village Midwife for delivery. We found that Village Midwife experience, tenure and age are associated with higher odds of skilled birth attendance for women in the midwives' communities (Table 5). Specifically, with increasing Village Midwife experience, tenure in the community, and age, women had higher odds of employing a skilled attendant at delivery. For women in a midwife's village with no education, a one-year increase in Village Midwife experience is associated with 1.09 times higher odds of using a skilled birth attendant (OR=1.09), a one-year increase in Village Midwife tenure is associated with a 1.10 times higher odds of using a skilled birth attendant (OR=1.10), and a one-year increase in midwife age is associated with 1.07 times higher odds of using a skilled birth attendant (OR=1.07). Conditional on using a skilled

attendant, the Village Midwives' characteristics are not associated with use of a Village Midwife at delivery (results not shown).

Do midwife characteristic influence prevalence of contraceptives or method choice in their communities?

Our qualitative research also pointed to issues related to service delivery for long-lasting methods including cultural acceptance and supply-chain issues. Because it is important for women to be educated about and have access to the most appropriate contraceptive methods, we tested whether certain midwives' characteristics were related to contraceptive outcomes. For example, we sought to determine whether more experienced midwives were perhaps more effective in promoting contraceptive use or if older midwives were associated with use of long-lasting, and perhaps more personally salient, method types for women in their communities. Therefore, conditional on the community having a Village Midwife, we tested whether midwives' characteristics affected contraceptive use and method choice. Table 6 reports the results of multivariate logistic regression models with community-level fixed effects examining the relationship between midwife characteristics and contraceptive prevalence. We found that Village Midwife tenure and having a 3-year degree were marginally and positively associated with contraceptive use (p=0.053 for each). For women with no education, a one-year increase in a Village Midwife's tenure is associated with 1.02 times higher odds of contraceptive use.

Our findings also indicate a relationship between midwife education level and midwife age with contraceptive method choice. Tables 7 and 8 provide results of models that test whether midwife characteristics affected method choice, conditional on any modern method use. Midwife education level (having a 3-year degree) was associated with lower odds of women's use of IUDs and pills and positively associated with the odds of women's use of injections compared to women in communities with midwives that had a 1-year degree (Table 7). In communities where the Village Midwife had a 3-year degreed, women with no education had a lower odds of IUD

14

(OR=0.21) and pill use (OR=0.48) and higher odds of injection use (OR=1.71) compared to women with no education in communities where the Village Midwife was less educated. A one year increase in Village Midwife age was associated with 1.06 times higher odds of implant use (Table 8). Neither Village Midwife experience nor tenure in the community was associated with contraceptive method choice (results not shown).

Discussion

The following section provides a synthesis of results by service area, and a description of how information from the focus groups enriched and contextualized results from the phase 3 quantitative analysis.

Skilled birth attendance

Focus group discussion indicated that potentially important explanatory variables are personal characteristics of village midwives, such as age and tenure in the community. For example, the midwives indicated that early-on, the women in their communities did not trust Village Midwives to provide services because they were young and in some cases had not yet had any of their own children. Therefore, we tested whether midwife characteristics were related to women's use of a skilled birth attendant. We found that Village Midwife experience, tenure and age were associated with of use of a skilled birth attendant in their communities.

Findings from both datasets support significant challenges may exist early in a Village Midwife's tenure in her community, but results also suggest that some of these challenges may be attenuated over time. Although it is not evident that women are increasingly employing the midwives for delivery, the midwives were associated with increased uptake of skilled attendance, indicating positive spill-over effects of the Program.

It is also possible that women chose their birth attendant based on other provider and service characteristics not measured. Some focus group comments related to the community's

acceptance of the Village Midwife and point to other important provider characteristics, such as their confidence in her skills (e.g., previous positive or negative delivery experiences) and integration into the community (e.g., level and frequency of participation in community activities). A review of cultural factors related to maternal mortality and care-seeking behavior during pregnancy and delivery also identified a number of other cultural factors that may be at play; for example, fear of appearing weak, distaste for provider insensitivity, and adversarial relationships between midwives and traditional birth attendants (Evans, 2012). Additional studies have found patient satisfaction to be influenced by factors not evaluated in this study, such as patient-centeredness and client-patient interaction, efficiency, short wait times, and availability of supplies (Abdel-Tawab and RamaRao, 2010; Al-Qutob and Nasir, 2008; Hutchinson, Do and Agha, 2011).

Several younger, less experienced Village Midwives expressed anxiety about attending births due to the risk of experiencing a complication resulting in death and the maternal death audit process. This anxiety may be compounded by the infrequency with which they are able to practice their skills (reported once per month in some areas). Research in the U.K. has shown that although newly equipped midwives may possess skills to work autonomously, they may lack confidence in key practice areas (Skirton, Stephen, Cooper, Avis and Fraser, 2012). Concerns about the midwives' ability to maintain professional competence in managing deliveries has been raised in several other studies as well, although the reported volume of deliveries are much higher (Heywood, Harahap, Ratminah & Elmiati, 2010; Makowiecka, Achadi, Izati & Ronsmans, 2008).

Contraceptive use and method choice

Focus group discussion provided the midwives' perspectives on reasons for method choice among their clients and barriers to long-term method provision and use. Although the Village Midwives are trained to provide a variety of method types, the discussion also illuminated the

midwives' focus on contraceptive injections and reasons for it, ranging from changing government regulations and supply logistics, to client non-adherence to recommended use guidelines (e.g., extending the use of implants past the recommended time horizon). Trends evident in IFLS data show that injectable contraceptives are the most popular method type with increasing prevalence over the study period. Indeed, the Indonesian Village Midwives are associated with switching from oral contraceptives to injectables in their communities (Weaver, Frankenberg, Thomas, Fried, Wheeler and Paul, 2012).

In addition, Village Midwives with more education (i.e., a 3-year Midwifery Degree) are significantly associated with higher odds of injection use and lower odds of IUD and pill use for women in their communities, suggesting that they recommend are more likely to recommend injections. In theory, more highly educated midwives should be well-versed in the benefits of long-term method use for their clients. The missing link between the midwives' formal training in reproductive health and the health behavior of women in the midwives' communities is indicative of misaligned incentives in the health system and cultural resistance to long-lasting method types. It appears that, over time, Village Midwives' role in contraceptive services provision has become synonymous with provision on injections. Realigning incentive structures to promote delivery of a broader range of contraceptive methods and reduce logistical barriers to long-term method provision could address many of these factors.

Village Midwife age was also associated with higher odds of implant use for women in their communities. Focus group discussions did not provide any context for this relationship. However, this welcome finding could be leveraged to increase promotion of long-term methods by older Village Midwives with more research into the dynamic driving this relationship.

Conclusion

This study used a multi-phase emergent sequential mixed methods approach to connect findings from focus groups with Village Midwives to refine our research questions and to enrich our understanding of the local context. Village Midwife age, experience, tenure and education level are related to the reproductive health outcomes of women in their communities. Understanding the context behind these associations aids in the development of operationally relevant research questions and recommendations that are quantitatively driven and informed by local experiences.

The results highlight the importance of providers' characteristics influence on health-seeking behavior and sheds light on the drivers behind these relationships in Indonesia. Further, the study illustrates that relationships between providers' characteristics and health outcomes may be outcome-specific; Village Midwife characteristics that influenced skilled delivery in large part did not influence contraceptive use outcomes.

Program designs that are able to sustain experienced providers within communities, especially in rural and remote areas, may have a powerful effect on health behaviors and subsequent health outcomes of the populations they serve. Older, more experienced and tenured midwives were relatively more effective in promoting skilled birth attendance among women in their communities. Clearly the Program's effectiveness in maintaining providers in their communities over time has had an effect on the choices women are making during the delivery of their babies.

The Village Midwife program was designed to encourage retention of midwives' in their communities by incentivizing them to cultivate private practices that would maintain them past the horizon of the Program, confirmed in focus group descriptions. However, the midwives participating in the study almost universally aimed to attain permanent government posts (PNS positions), which are mainly located in public health clinics and hospitals. Achieving such

18

positions would take the midwives out of their communities for employment at a public health clinic or hospital. The study is limited in that we only have information from Village Midwives who have stayed in the Program, leaving unanswered questions about potential reasons for departure.

One approach to placing providers in rural areas has been to require newly trained providers to locate in "high-need" or remote areas for a period of time. These programs may help to attain short-term access goals, however, these results suggest that programs that provide access to experienced providers and/or continuity with the same provider over a longer period of time are more effective in improving health outcomes. Simply providing access to a trained provider is not enough.

The strategy that the Government implemented to encourage Village Midwives to stay in their communities (e.g., to establish private practices) may also be the structure that has driven such a dramatic increase in the use of contraceptive injections over time. Moreover, increasing education requirements for the Village Midwives has also resulted in a dynamic where these more highly educated providers are associated with higher odds of injection use among women in their communities, further skewing the method mix. Program planners should carefully consider incentive structure and possible implications when devising solutions for reproductive health provision and promotion.

For Village Midwives just beginning their practice, mentoring with a senior midwife could help new Village Midwives to gain experience and to meet community members in a professional setting. Local regulations vary regarding practicum or apprenticeship requirements and thus a mentorship strategy would require planning that is tailored to each locality. Based on discussion from our focus groups, mentorship for up to one year may be necessary to ease their transition into independent practice and for new midwives to maintain competence in clinical skills.

Additional participation in district- or subdistrict-level audit reviews may alleviate the concerns the young midwives have about the process (Supratikto, et al., 2002).

Moving forward, the Indonesia Village Midwife Program has much success to build on and several challenges to overcome. Interviews with the Village Midwives informed the quantitative analyses, to refine and deepen our understanding of the way provider characteristics have influenced service delivery in Indonesia. The use of a mixed methods approach in implementation science has the potential to enrich program planning and provide practical solutions and applications for other contexts.

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Appendix – Figures and Tables

Figure 1. Births in our study's sample communities, 1994-2007 Indonesia Family Life Survey (n=3,113)
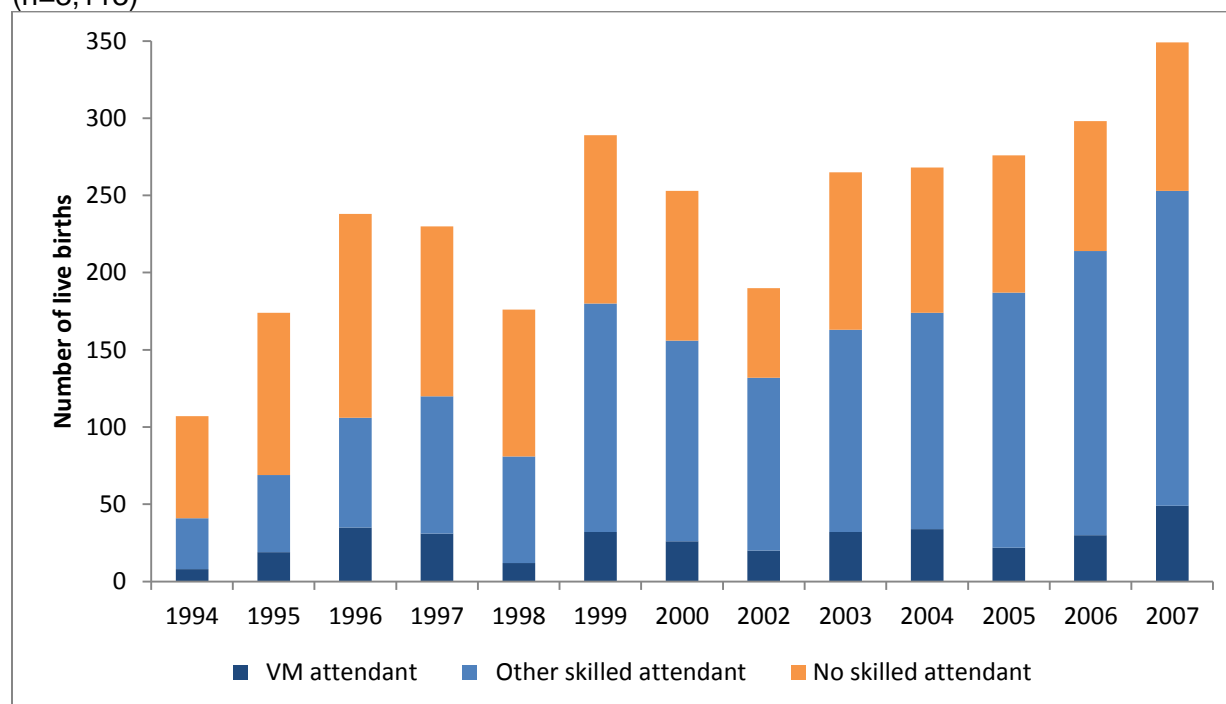
Table 1. Summary statistics for Village Midwives, 1997-2007 Indonesia Family Life Survey

	1997	2000	2007
Village Midwife Characteristics			
Age (years)	26.2	27.9	33.8
Education			
1 year midwifery training (%)	96.6	94.1	63.6
3 years midwifery training (%)	.	0.5	31.4
Tenure in village (years)	2.5	3.6	7.6
Experience (years)	3.5	5.6	8.0
Midwife is certified as Bidan Delima (%)	.	.	15.9
Midwife originates from same province (%)	85.4	89.8	89.6
Midwife has another job (%)	72.0	84.4	91.4
Public health center/subcenter (%)	63.7	72.6	73.2
For-profit government health facility (%)	22.1	0.0	0.0
Midwife place of practice (%)			
Village delivery post (polindes)	44.0	41.4	39.6
Village leader's office	14.7	4.8	5.9
Other	13.4	10.8	18.3
Own house	9.6	25.3	29.6
Public health clinic (puskesmas)	8.9	10.2	6.8
Hours/week spent delivering family planning services	.	8.5	8.2
Number of observations	157	186	220

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

Table 2. Breadth of Village Midwife service provision, 1997-2007 Indonesia Family Life Survey

	1997	2000	2007
Reproductive Health Services (%)			
Prenatal care	98.7	98.3	99.1
Delivery	91.0	98.3*	97.3
Family planning check-up/counseling	82.6	95.6*	94.5
Family planning side effects	84.0	90.1	92.7
Contraceptives (%)			
Pills	91.7	80.1*	95.5*
Injections	94.9	100.0*	99.1
IUD			
insertion	41.7	49.2	38.6*
removal	41.9	45.0	45.0
Implant			
insertion	25.6	43.6*	45.5
removal	0.3	47.5*	53.2
General Health Services (%)			
Exams, injections and medication	97.4	99.4	79.1
Change wound dressing	84.0	89.4	82.3*
Stitching wounds (first stitch)	76.9	78.3	69.5*
Check up/health exam	10.3	3.9*	7.7
Inpatient	7.1	20.1*	17.7
Number of observations	157	186	220

*Indicates a statistically significant difference over the previous survey year ($p < 0.05$).
Source: Indonesia Family Life Survey, 1997, 2000 and 2007.

Table 3. Barriers and facilitating factors related to skilled birth attendance, according to Village Midwife focus groups, May 2011

	Village Midwives' comments
Barriers	
Related to midwife characteristics	"We get much money, but it also makes us nervous." "… it is high risk."
Related to clients	She was young and single and had a hard time impressing the community that she was a capable midwife …The villagers did not have confidence in her because she was young, unmarried. They used to say : "she has never given birth, how could she help in delivery"
Other barriers	After almost 6 months waiting she helped delivery. It took one year before she delivered her first baby. "There is also childbirth equipment, but they were broken. Finally I bought some on my own. In the beginning, the Village Midwife got equipments quota, I only continued from the previous midwife."
Facilitating factors	
Related to midwife characteristics	She finds it easier here because… she is already married with one child, so within 2 days in the village she was asked to help with a delivery "A midwife is ready in 24 hours."
Related to clients	
Other facilitating factors	

Table 4. Barriers and facilitating factors related to provision of contraceptives, according to Village Midwife focus groups, May 2011

	Village Midwives' comments
Barriers	
Related to midwife characteristics	"We are still afraid use IUD." "IUD is difficult to take down."
Related to clients	"The most women are afraid to use IUD." "It [IUD] is still taboo." "There is gossip about implant and IUD." …"A woman's IUD failed and she got pregnant. When the baby was coming out, the IUD was stuck on the baby's head."
Other barriers	"The midwives who don't have a certificate are not permitted to implant IUD. The IUD implantation isn't permitted in integrated health post. It must be done in public health clinic." "There are too many forms that have to be filled. The expectant mother from the first time menstruation, how many times come to check, and also the immunization." "First payroll of the center through the DKK [district health office]. From that time for 1.5 years has not been paid from department." The traditional birth attendant feel threatened with her presence because she used to attend all deliveries in the village.
Facilitating factors	
Related to midwife characteristics	"[midwife services are] Cheap and nearby." "Both of us get the certificates [to provide IUDs and implants] from the campus when we in the [midwife] academy." "…the woman had known [us] from examination of pregnancy until delivery"
Related to clients	
Other facilitating factors	"… we also participate in public activities, so we become inhabitants in that village." "The patients who come [to us], rarely get in debt with us. … There was a patient who brought bananas." "We can provide any services in PHC (public health clinic)" "Sometimes not only the patients come [to our office], but we are called to a patient." "According to patient preference, for example for family planning pills, there are [many] kinds of pills, sometimes a woman can't find the right pill at the public health center, so she came to midwife and is able to choose."

Table 5. The relationship between Village Midwife characteristics and use of any skilled birth attendant in communities with a Village Midwife, 1997-2007 Indonesia Family Life Survey

	Midwife Characteristic							
	Experience Odds (SE)		Tenure Odds (SE)		Age Odds (SE)		3-year degree Odds (SE)	
Midwife characteristic	1.097*	(0.038)	1.104*	(0.038)	1.070*	(0.026)	0.81	(0.31)
Woman's education (yrs)	1.279**	(0.041)	1.272*	(0.038)	1.33**	(0.12)	1.234**	(0.023)
Midwife characteristic* woman's education	0.9958	(0.0041)	0.9964	(0.0040)	0.9977	(0.0028)	1.005	(0.049)
Woman's age								
14-19 yrs (omitted)								
20-29 yrs	0.83	(0.17)	0.85	(0.17)	0.84	(0.17)	0.83	(0.17)
30-49 yrs	0.98	(0.20)	0.98	(0.20)	0.99	(0.20)	0.97	(0.20)
Income in top 50%	1.22	(0.22)	1.22	(0.22)	1.19	(0.21)	1.26	(0.22)
Hospitals (#)	1.07	(0.10)	1.06	(0.10)	1.08	(0.10)	1.08	(0.10)
Public Health Clinics (#)	0.850**	(0.043)	0.834**	(0.042)	0.847**	(0.042)	0.839**	(0.041)
Village Health Posts (#)	0.912	(0.048)	0.914	(0.048)	0.927	(0.049)	0.924	(0.048)
Private providers (#)	1.076	(0.042)	1.063	(0.041)	1.070	(0.041)	1.049	(0.040)
Village has public phone	1.24	(0.26)	1.17	(0.24)	1.21	(0.25)	1.17	(0.24)
HHs have private toilet	0.82	(0.15)	0.75	(0.14)	0.83	(0.15)	0.89	(0.17)
Village has public sewer	0.89	(0.16)	0.90	(0.16)	0.86	(0.16)	0.91	(0.17)
Birth year (not reported)								
Interaction effect	1.092*	(0.035)	1.100*	(0.034)	1.067*	(0.024)	0.81	(0.28)
Fixed effects (#)	137		136		138		135	
Observations (#)	2,819		2,831		2,848		2,799	
Chi^2	392.56 (0.00)		396.53 (0.00)		392.71 (0.00)		372.07 (0.00)	

*(**) Indicates a statistically significant estimate, p≤0.05 (p≤0.001).

Coefficients reported as odds ratios; standard errors reported in parentheses to the right of each estimate.

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

Table 6. The relationship between Village Midwife characteristics and contraceptive use in communities with a Village Midwife, 1997-2007 Indonesia Family Life Survey

	Midwife Characteristic							
	Experience		Tenure		Age		3-Year Degree	
	Odds (SE)		Odds (SE)		Odds (SE)		Odds (SE)	
Midwife characteristic	1.016	(0.017)	1.035*	(0.017)	1.020	(0.013)	1.45	(0.28)
Woman's education (yrs)	1.036*	(0.014)	1.048**	(0.013)	1.080*	(0.042)	1.026*	(0.010)
Midwife Characteristic* woman's education	0.998	(0.002)	0.994*	(0.002)	0.998	(0.001)	0.978	(0.022)
Woman's age								
14-19 years (omitted)	.	.	.	.	.	.	.	.
20-29 years	1.72**	(0.21)	1.72**	(0.21)	1.74**	(0.21)	1.68**	(0.20)
30-49 years	1.51**	(0.18)	1.52**	(0.18)	1.55**	(0.18)	1.49**	(0.18)
Income in top 50%	1.07	(0.10)	1.076	(0.101)	1.06	(0.10)	1.08	(0.10)
Hospitals (#s)	1.050	(0.047)	1.048	(0.046)	1.057	(0.047)	1.056	(0.047)
Public Health Clinics (#)	0.971	(0.019)	0.971	(0.019)	0.973	(0.019)	0.972	(0.019)
Village Health Posts (#)	0.980	(0.021)	0.980	(0.021)	0.980	(0.021)	0.985	(0.021)
Private providers (#)	0.987	(0.020)	0.988	(0.020)	0.985	(0.020)	0.981	(0.020)
Village has public phone	0.832	(0.086)	0.827	(0.085)	0.838	(0.086)	0.834	(0.086)
HHs have private toilet	0.967	(0.090)	0.967	(0.090)	0.967	(0.089)	0.958	(0.090)
Village has public sewer	0.973	(0.086)	0.978	(0.086)	0.970	(0.086)	0.967	(0.086)
Year								
1997 (omitted)	.	.	.	.	.	.	.	.
2000	0.923	(0.081)	0.924	(0.080)	0.900	(0.078)	0.924	(0.079)
2007	0.95	(0.10)	0.96	(0.10)	0.89	(0.11)	0.896	(0.093)
Interaction	1.013	(0.016)	1.029	(0.015)	1.018	(0.012)	1.41	(0.25)
Fixed effects (#)	182		180		183		178	
Observations (#)	6,813		6,815		6,883		6,727	
Chi^2	40.65 (0.000)		47.13 (0.000)		42.11 (0.000)		40.56 (0.000)	

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

Table 7. The relationship between Village Midwife education level and contraceptive method choice among women using any modern method in communities with a Village Midwife, 1997-2007 Indonesia Family Life Survey

	IUD Odds (SE)		Implant Odds (SE)		Pill Odds (SE)		Injection Odds (SE)	
Midwife has 3-yr degree (D3)	0.18*	(0.15)	2.18	(1.08)	0.43*	(0.14)	1.87*	(0.50)
Woman's education (yrs)	1.034	(0.022)	0.934*	(0.021)	0.933**	(0.014)	1.066**	(0.014)
D3*woman's education	1.151*	(0.086)	0.853*	(0.066)	1.124**	(0.041)	0.914*	(0.028)
Woman's age								
14-19 years (omitted)	·	·	·	·	·	·	·	·
20-29 years	2.05	(1.16)	1.38	(0.46)	0.79	(0.16)	1.05	(0.19)
30-49 years	5.41*	(3.06)	1.74	(0.57)	0.93	(0.18)	0.55**	(0.10)
Income in top 50%	0.99	(0.30)	0.96	(0.23)	1.21	(0.18)	0.86	(0.11)
Hospitals (#)	1.09	(0.13)	0.86	(0.11)	1.222*	(0.088)	0.847*	(0.053)
Public Health Clinics (#)	1.012	(0.039)	0.959	(0.052)	0.929*	(0.032)	1.012	(0.025)
Village Health Posts (#)	1.012	(0.050)	1.068	(0.061)	1.007	(0.033)	0.982	(0.028)
Private providers (#)	1.086	(0.068)	0.991	(0.047)	0.979	(0.028)	0.999	(0.026)
Village has public phone	0.72	(0.23)	0.86	(0.24)	1.07	(0.18)	1.11	(0.16)
HHs have private toilet	0.73	(0.22)	0.78	(0.18)	0.92	(0.14)	1.23	(0.16)
Village has public sewer	0.83	(0.19)	1.43	(0.35)	1.05	(0.14)	0.92	(0.11)
Year								
1997 (omitted)	·	·	·	·	·	·	·	·
2000	0.75	(0.17)	1.49*	(0.29)	0.644**	(0.085)	1.23	(0.14)
2004	0.33**	(0.10)	0.32**	(0.08)	0.63*	(0.10)	2.65**	(0.38)
Interaction effect	0.21*	(0.16)	1.86	(0.82)	0.48*	(0.14)	1.71*	(0.42)
Fixed effects (#)	94		94		161		172	
Observations (#)	2,322		2,694		3,854		4,041	
Chi^2	100.43 (0.00)		143.42 (0.00)		66.99 (0.00)		283.99 (0.00)	

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

Table 8. The relationship between Village Midwife age and contraceptive method choice among women using any modern method in communities with a Village Midwife, 1997-2007 Indonesia Family Life Survey

	IUD Odds (SE)		Implant Odds (SE)		Pill Odds (SE)		Injection Odds (SE)	
Midwife age	0.93	(0.04)	1.06*	(0.03)	0.99	(0.02)	1.01	(0.02)
Woman's education (yrs)	0.819*	(0.080)	1.05	(0.10)	0.885	(0.058)	1.169*	(0.066)
Midwife age* woman's education	1.009*	(0.003)	0.996	(0.003)	1.002	(0.002)	0.996	(0.002)
Woman's age								
14-19 years (omitted)	.	.	.	.	.	.	.	.
20-29 years	2.13	(1.22)	1.36	(0.45)	0.82	(0.16)	1.03	(0.18)
30-49 years	5.76*	(3.30)	1.69	(0.56)	0.97	(0.19)	0.537*	(0.094)
Income in top 50%	1.01	(0.31)	0.88	(0.22)	1.20	(0.18)	0.88	(0.11)
Hospitals (#)	1.10	(0.14)	0.89	(0.12)	1.226*	(0.087)	0.857*	(0.053)
Public Health Clinics (#)	1.026	(0.040)	0.961	(0.052)	0.932*	(0.032)	1.010	(0.025)
Village Health Posts (#)	1.038	(0.051)	1.070	(0.060)	1.009	(0.033)	0.976	(0.027)
Private providers (#)	1.086	(0.066)	1.006	(0.050)	0.977	(0.027)	0.996	(0.025)
Village has public phone	0.69	(0.22)	0.86	(0.24)	1.07	(0.18)	1.11	(0.16)
HHs have private toilet	0.72	(0.22)	0.79	(0.18)	0.93	(0.14)	1.21	(0.15)
Village has public sewer	0.83	(0.19)	1.48	(0.36)	1.03	(0.14)	0.93	(0.11)
Year								
1997 (omitted)	.	.	.	.	.	.	.	.
2000	0.89	(0.22)	1.29	(0.26)	0.638**	(0.085)	1.25	(0.15)
2004	0.35*	(0.12)	0.233**	(0.066)	0.59*	(0.10)	2.96**	(0.46)
Interaction effect	0.938	(0.034)	1.057*	(0.026)	0.992	(0.017)	1.003	(0.016)
Fixed effects (#)	99		96		165		176	
Observations (#)	2,402		2,736		3,950		4,135	
Chi^2	103.42 (0.00)		142.71 (0.00)		59.17 (0.00)		286.64 (0.00)	

*(**) Indicates a statistically significant estimate, p≤0.05 (p≤0.001).

Coefficients reported as odds ratios; standard errors reported in parentheses to the right of each estimate.

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