

Community Health Workers' Provision of Family Planning Services in Low- and Middle-Income Countries: A Systematic Review of Effectiveness

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This systematic review evaluates the strength of the evidence that community health workers' (CHW) provision of family planning (FP) services in low- and middle-income countries is effective. In a search of eight databases, articles were screened by study design and outcome measure and ranked by strength of evidence. Only randomized trials, longitudinal studies with a comparison group, and pre-test/post-test studies met inclusion criteria. A total of 56 studies were included. Of those studies with relevant data, approximately 93 percent indicated that CHW FP programs effectively increased the use of modern contraception, while 83 percent reported an improvement in knowledge and attitudes concerning contraceptives. Based on these findings, strong evidence exists for promoting CHW programs to improve access to FP services. We recommend a set of best practice guidelines that researchers and program managers can use to report on CHW FP programs to facilitate the translation of research to practice across a wide range of settings. (STUDIES IN FAMILY PLANNING 2015; 46[3]: 241–261)

Approximately 222 million reproductive-age women in developing countries have an unmet need for modern contraception (Darroch and Singh 2013). Many of these women live in rural, hard-to-reach areas, are poor, and have limited access to health care services (Sedgh et al. 2007; Darroch, Sedgh, and Ball 2011). Sub-Saharan Africa is disproportionately affected, with 60 percent of reproductive-age women (53 million out of 89 million) wanting to avoid pregnancy but not practicing modern contraception, followed by 50 percent (14 million out of 27 million) in western Asia, and 34 percent (83 million out of 246 million) in South Asia (Darroch and Singh 2013).

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Use of modern contraception prevents unintended pregnancy and allows healthy birth timing and birth spacing. The consequences of unintended pregnancy and closely spaced births can be severe for women and their children, particularly in countries that do not have access to high-quality maternal health care services and safe abortion (Saha and van Soest 2013). Eliminating the unmet need for modern methods in developing countries in 2012 would have prevented an estimated 54 million unintended pregnancies, including 21 million unplanned births and 26 million abortions (Singh and Darroch 2012). In turn, this would have averted 79,000 maternal deaths and more than one million infant deaths (*ibid.*). Improving access to modern contraception is thus an essential means of protecting the lives and well-being of women and children.

Although the need for improved access to family planning (FP) service is widely recognized, there is a severe shortage of human resources for health, particularly in low- and middle-income countries that have the highest maternal and newborn mortality (WHO 2006). Of the 57 countries that have chronic shortages of human resources for health care, 36 are in sub-Saharan Africa (WHO 2012). Within countries, health facilities and skilled health workers are disproportionately located in urban areas, despite large rural populations in many low- and middle-income countries (WHO 2006).

The lack of skilled health care workers and their maldistribution according to need will restrict access to health care in low- and middle-income countries for years to come. Even if countries immediately began training adequate numbers of physicians and nurses and ensured that they were located in areas of greatest need, it would be years before these clinical skills could be developed and delivered. Thus “task shifting,” defined as “a more rational distribution of tasks and responsibilities among cadres of health workers,” is being pursued by a growing number of countries (WHO 2012). Task shifting is a process by which certain cadres of health care workers are trained to assume new responsibilities for interventions previously performed only by more highly skilled workers (WHO 2012). By giving community health workers (CHWs) and other lower-level health workers responsibility for key services, access to health care can be greatly expanded.

CHWs are health care service providers who have typically been trained for a short period of time and lack formal medical training. They often live in the communities they serve and ideally are linked to the formal health system. In this way, they are able to extend the reach of fixed facilities, particularly among rural and marginalized populations. Increasingly, low- and middle-income countries are considering CHWs to be an effective service-delivery option for a variety of primary health care services, including FP. While studies of CHW FP program effectiveness have generally focused on the impact on modern contraceptive use and knowledge, particularly in comparison with facility-based services, effectiveness in terms of quality of care and safety has also become important as the roles and responsibilities of CHWs have expanded.

For decades, CHWs have provided birth control pills and condoms through household visits. Community-based programs that promote access to FP services first emerged in Asia in the late 1950s before being replicated in Africa and Latin America in the 1960s (Foreit 1998). In some contexts, the convenience of CHWs' outreach services and the close relationships and trust they develop in communities may result in a greater impact on FP indicators than that achieved by facility-based services alone. Several systematic reviews indicate that CHWs can safely and effectively provide key primary, maternal, and newborn health care services,

including immunizations, tuberculosis treatment, contraceptive counseling, and provision of injectable contraceptives (Lewin et al. 2010; Glenton et al. 2011; Malarcher et al. 2011; Perry and Zulliger 2012; WHO 2012).

The ideal scope of responsibility for CHWs remains controversial, with national policies varying in the degree to which they allow CHWs to provide more complex FP services. In the past, CHWs have only been allowed to refer women to facilities for longer-term methods such as implants, injectable contraceptives, and intrauterine devices (IUDs). However, growing evidence suggests that CHWs can safely provide injectables, and there is a subsequent movement, particularly in sub-Saharan Africa, to begin allowing them to do so (Malarcher et al. 2011). The national health policy guidelines of countries such as Madagascar, Nigeria, Rwanda, and Uganda now allow CHWs to provide injectable contraceptives (Olawo et al. 2013). Malarcher and colleagues (2011) conducted a systematic review of CHW provision of injectables, primarily intramuscular depot-medroxyprogesterone acetate (DMPA). They found that appropriately trained CHWs were competent in screening clients, safely providing DMPA injections, and offering counseling on side effects, and that clients reported high levels of satisfaction. In recognition of both this evidence base and the continued concern of some key stakeholders regarding quality of care and potential adverse events, WHO (2012) recommends that CHW provision of injectable contraceptives should be considered when accompanied by targeted monitoring and evaluation.

CHW FP programs in diverse political, social, and economic contexts have been implemented and evaluated for decades with varying degrees of methodological rigor. Several systematic reviews focusing on the effectiveness of community-based FP services have been published, including WHO's 2012 recommendations on CHW delivery of FP promotion and injectable contraceptives (other methods such as contraceptive pills and condoms were not addressed), as well as Malarcher and colleagues' (2011) review of CHW provision of injectable contraceptives. In addition to these systematic reviews, a vast body of programmatic research is available. Only a small number of rigorous evaluations of CHW FP programs have been conducted, however, and they are often limited in scope (Foreit and Raifman 2011). Divergent definitions of CHWs and the use of a wide range of FP indicators hinder efforts to synthesize and analyze the evidence on CHW FP effectiveness. To our knowledge, this study is the first systematic review to evaluate the strength of the evidence that CHW provision of all modern contraceptive methods in low- and middle-income countries is effective. This study also provides an overview of key program components of more rigorously evaluated CHW FP programs.

METHODS

A systematic review of the peer-reviewed CHW FP literature in eight databases was undertaken (CENTRAL, CINAHL, EMBASE, Global Health (Ovid), Ovid Medline, Popline, Web of Science/Scopus, and WHOLIS), in addition to a search of gray literature through key organization websites, Google, and the reference lists of included articles. The search strategy used a combination of terms linking the concepts of community health worker and family planning or maternal/reproductive health (see supplemental Table S1 for complete search term string)*

*Supplemental tables are available at the supporting information tab at wileyonlinelibrary.com/journal/sfp.

and was not restricted by year of publication. Community health workers were defined in this review as those who provided outreach health care services but who lacked extensive medical training (nurses, midwives, and traditional birth attendants [TBAs] were included in light of significant variation in the quality and duration of training, but all physicians were excluded). Only seven studies included nurses, midwives, or TBAs as part of the CHW cadre, while all other studies evaluated CHWs without any formal medical training.

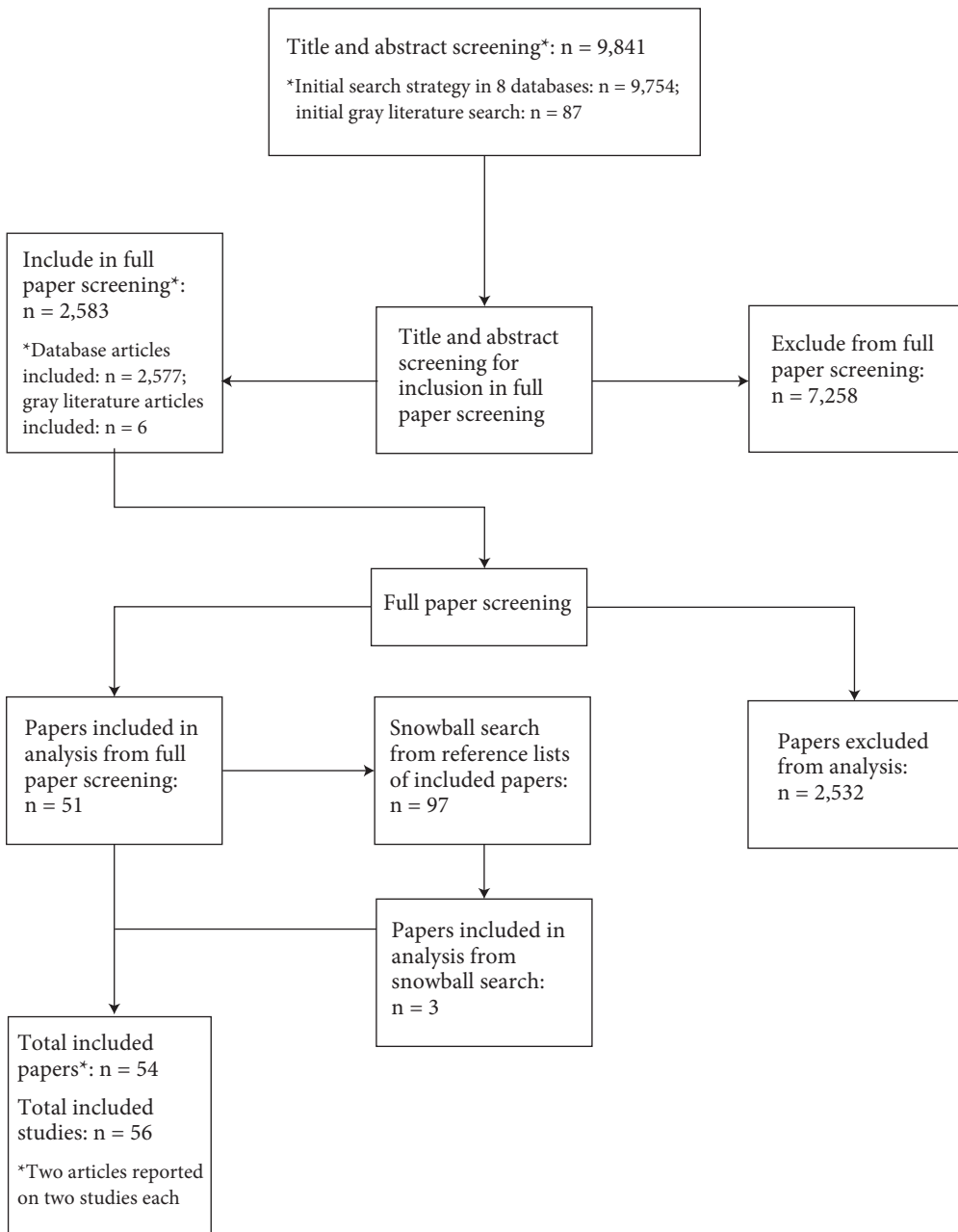
This systematic review was conducted according to PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) methodology (Moher et al. 2009). Two independent reviewers conducted title and abstract screening, full paper screening, data abstraction, and methodological quality rating. Disagreements were resolved by consensus between the two reviewers or, if consensus could not be reached, by a third independent reviewer. The initial search yielded 9,841 references. Title and abstract screening was conducted on these references according to the following inclusion criteria: (1) written in English, (2) located in a low- or middle-income country as defined by the World Bank, (3) related to family planning or reproductive health, (4) included CHWs. Of these references, 2,583 were selected for inclusion in full paper screening according to more rigorous inclusion criteria on study design and outcome measures (Figure 1).

Randomized cluster trials, longitudinal designs with a comparison group, and pre-test/post-test studies with or without a comparison group were included in the review. All included studies reported on at least one of the following client outcome measures: use of contraceptives, knowledge or attitudes regarding family planning, intentions to use family planning, or referrals for family planning services. Data were abstracted only when reported in accordance with an included study design. For instance, if a pre-test/post-test study only presented its post-test data for a certain relevant indicator, those data were not included. Given the diversity of indicators presented across studies, a broad range of outcome indicators were included. For instance, "use of contraceptives" may reflect various indicators, including "current use of modern contraceptives," "ever use of contraceptives," and/or "unmet need for modern contraceptives." Program output indicators, such as "number of family planning clients served," were not included, with the exception of the "referrals for family planning services" indicator. Additionally, all studies were required to present sufficient detail to allow for classification of the study design and reporting of sample size. School-based sexual health education programs were excluded as being beyond the scope of this review, along with programs primarily focused on HIV prevention. Finally, articles reporting the same study results as other more comprehensive included articles were excluded to prevent duplicative results.

Fifty-four articles published from 1974 to 2013 were included in the review. Two articles presented two separate studies together in a publication; each of these studies was considered separately (Han et al. 1978; Columbia University Center for Population and Family Health 1988). Thus, a total of 56 studies are presented in this review (Table 1). Although all included studies meet the basic study design criteria, the strength of study designs varies greatly. Each of the studies was ranked as high, medium, or low quality, using a slightly modified version of a previously published rating scale for family planning intervention studies based on the strength of study design and control of confounders and selection bias (Mwaikambo et al. 2011).

CHWs' effectiveness in expanding access to FP was determined with consideration of whether a comparison group was included in the study. Among those studies having facility-

FIGURE 1 Article inclusion flow chart



based comparison groups, we assessed whether there was an improvement in the FP outcome indicator from baseline to follow-up in the CHW intervention area that was at least equal to the improvement of the same indicator in the facility-based area. In those studies that did not have a comparison group (all low-quality), any increase in the outcome indicator from base-

TABLE 1 Strength of design of 56 community health worker family planning studies, 1974–2013

High	Medium	Low
Arends-Kuenning 2001	Bertrand et al. 1986	Amendola, Planells, and Lundgren 1993
Debpuur et al. 2002	Daniel, Masilamani, and Rahman 2008	Azim 1994
Lutalo et al. 2010 ^a	Desai and Tarozzi 2011	Babalola et al. 2001
Phillips et al. 1993	Gomez 1985	Bertrand et al. 1993
Phillips, Hossain, and Arends-Kuenning 1996	Hossain 2005	Bhatia et al. 1980
	Howlader 1990	Columbia University Center for Population and Health 1988 (2 studies) ^a
	Huber and Khan 1979	De Chavez et al. 1992
	Jahanfar et al. 2005 ^a	Doucoure et al. 1998
	Kalanda 2010	Gadalla, Nosseir, and Gillespie 1980
	Katz et al. 1998	Gural et al. 2007
	Leenen et al. 2008	Han et al. 1978 (2 studies)
	Malwenna, Jayawardana, and Balasuriya 2012 ^a	Huber, Saeedi, and Samadi 2010
	Olawo et al. 2013	Jacobson et al. 1989
	Prata et al. 2011	Johnson 2002
	Sebastian et al. 2012	Kak, Quain, and Richiedei 1991
	Stanback, Mbonye, and Bekiita 2007	Koenig et al. 1992
		Kraut et al. 2004
		Lechtig et al. 1982
		Luck et al. 2000
		Lush et al. 2006
		Mirza et al. 1994
		Mullany et al. 2010
		National Health Administration of Taiwan and JHSPH 1993
		Palmore et al. 1987
		Park, Cho, and Palmore 1977
		Paxman et al. 2005
		Population Council and Ministry of Public Health Cameroon 1993
		Prasad et al. 1995
		Rosenfield 1974
		Sirikulchayanonta 1989
		Suyadi, Sadjiman, and Rohde 1977
		Ward, Neumann, and Pappoe 2005 ^a
		Wawer, Lassner, and Hanff 1986 ^a

^aStudy CHWs included nurses, midwives, and/or traditional birth attendants.

line to follow-up measurement in the CHW intervention area or any increase that was statistically associated with CHW exposure was considered to demonstrate CHW effectiveness. Programs were considered to demonstrate “mixed effectiveness” when improvements were seen in some, but not all, FP indicators or geographic study areas. Studies varied widely in their presentation of statistical significance. If a study presented measures of statistical significance, this was taken into account in determining effectiveness; if no statistical results were reported, crude changes were evaluated.

A subset analysis was also performed to calculate weighted averages of the “current use of modern contraception” indicator for both CHW and comparison groups at baseline and endline measurements. Weighted averages were calculated by first summing the product of the modern contraceptive prevalence rate and the sample size for each of four groups: CHW and comparison groups at both baseline and endline. These summed products were

then divided by the sum of sample sizes of each group to obtain a weighted modern contraceptive prevalence rate for each group. The baseline values for each group were then subtracted from the endline to show the average weighted difference from baseline to endline measurements.

RESULTS

The majority of studies were conducted in South or East Asia ($n = 27$), followed by sub-Saharan Africa ($n = 19$), and Latin America and the Caribbean ($n = 7$). Only two studies were done in the Middle East and North Africa, and a single study was located in Europe/Central Asia. Methodological quality varied among studies, with the majority categorized as low quality ($n = 35$), 16 as medium quality, and 5 as high quality. Most CHW FP interventions were carried out in exclusively rural settings ($n = 39$), while 12 took place in both a rural and urban area, and 5 took place in an exclusively urban area.

Use of Contraceptives

Fifty-four studies in this review reported on contraceptive use. Approximately 93 percent ($n = 50$) of those studies having data on use of contraceptives demonstrated that CHWs effectively increased contraceptive use. Among 26 studies comparing CHWs to facility-based services, 77 percent ($n = 20$) showed that CHWs had a greater impact on contraceptive use than facility-based services alone (Table 2).

All five of the high-quality studies reporting on contraceptive use found that CHWs were effective in increasing contraceptive use. These studies demonstrated improvements in contraceptive prevalence among clients exposed to CHWs across a variety of settings, including Bangladesh, Ghana, Pakistan, and Uganda, compared with standard government facility-based care or no contact with a family planning worker. Debuur and colleagues' (2002) seminal article examined the impact of the Navrongo experiment in a rural, traditional area in northern Ghana comparing four cells: (1) government nurse outreach services alone, (2) *zurugelu* (volunteer outreach) alone, (3) combined nurse outreach and *zurugelu*, and (4) comparison area with standard government facility-based services. While no increases were seen in either the nurse outreach or *zurugelu* approach alone, the combined nurse outreach and *zurugelu* approach was effective in increasing contraceptive use. Interestingly, two of the high-quality studies based in Matlab, Bangladesh suggest that CHW gender can have a significant impact on program results (Phillips et al. 1993; Phillips, Hosain, and Arends-Kuenning 1996). In these studies, only female CHWs produced statistically significant improvements in contraceptive use. Among 15 medium-quality studies and 34 low-quality studies, the vast majority ($n = 13$ and $n = 32$, respectively) found that CHWs effectively increased contraceptive use. Three of these studies showed "mixed" effectiveness that varied by rural versus urban areas (Howlader 1990; Amendola, Planells, and Lundgren 1993; Babalola et al. 2001). For example, Babalola and colleagues (2001) found that CHWs were effective in increasing contraceptive use in the rural area of Mbouda (Cameroon), but not in the city of Djoungolo. Variation in program exposure likely explains the geographic

TABLE 2 Effectiveness of community health workers versus comparison group in increasing contraceptive use

Quality/Study	Indicator(s)	More effective than comparison group in increasing contraceptive use	Description of comparison/control group
High			
Arends-Kuenning 2001	Contraceptive adoption rate/contraceptive discontinuation rate	Yes ($p \leq 0.01$)/Yes ($p \leq 0.01$)	No contact with an FP worker this round
Debpuur et al. 2002	Contraceptive prevalence (odds ratio)	Yes (for combined nurse and <i>zurugelu</i> approach only, for 3 of 4 program years)	Standard of care (MOH clinic-based)
Lutalo et al. 2010	Current use of modern contraception	Yes	Standard of care (FP services from government, private, and NGO sources; all clients who requested HIV test results and received post-test counseling received FP counseling by community-based HIV counselors employed by the Rakai program)
Phillips et al. 1993	Current use of contraception	Yes (only in female, not male, CHWs)	No 90-day contact with an FP worker
Phillips, Hossain, and Arends-Kuenning 1996	Use of contraception	Yes (only in female, not male, CHWs)	No contact with an FP worker; worker-initiated discussion with a clinic paramedic rather than a family welfare assistant
Medium			
Bertrand et al. 1986	Current use of modern contraception/ever use of modern contraception	Mixed—no in rural areas, yes in urban areas/Yes in both rural and urban areas	Improved clinic-based FP (dispensaries stocked with contraceptives)
Daniel, Masilamani, and Rahman 2008	Current use of contraception	Yes	Standard of care
Desai and Tarozzi 2011	Current use of contraception	No	Standard of care
Gomez 1985	Current use of modern contraception	Yes ^a	Standard of care (MOH clinic-based) + CHWs not providing FP
Hossain 2005	Cumulative probability of switching to nonuse and at risk within 12 months	Yes	No contact with an FP worker
Howlader 1990	Current use of modern contraception/ever use of contraception	Mixed—no in Dhaka, yes in Chittagong/ Mixed—no in Dhaka, yes in Chittagong	Standard of care
Huber and Khan 1979	Current use of modern contraception	Yes	Clinic-based + government FP program (FP not emphasized)
Jahanfar et al. 2005	Current use of modern contraception	Yes	Standard of care (clinic-based FP)
Kalanda 2010	Current use of modern contraception/women's condom use at last sex	Yes ($p = 0.0003$)/ Yes ($p < 0.0001$)	Standard of care
Katz et al. 1998	Current use of modern contraception/men's ever use of condoms	Mixed—yes for CHWs providing both supplies and education, and no for CHWs with only education/ Yes for both CHW groups	Standard of care
Malwenna, Jayawardana, and Balasuriya 2012	Current use of modern contraception	Yes	Standard of care (clinic-based FP)
Olawo et al. 2013	Current use of modern contraception	Yes	Standard of care (clinic-based FP)

(Continued on next page)

TABLE 2 (continued)

Quality/Study	Indicator(s)	More effective than comparison group in increasing contraceptive use	Description of comparison/control group
Prata et al. 2011	Contraceptive continuation rate (received third injection of DMPA)	Yes ($p < 0.01$)	Standard of care (HEWs in health posts)
Sebastian et al. 2012	Current use of modern contraception	Yes ($p \leq 0.01$)	Standard of care (government clinic-based FP)
Low			
Bertrand et al. 1993	Current use of modern contraception/ever use of modern contraception	No	Comparison: Improved clinic-based FP; Control: Standard of care
Jacobson et al. 1989	Current use of contraception/ever use of contraception	Yes ^b /Yes ^b	Standard of care
Lechtig et al. 1982	Current use of modern contraception	Yes	Standard of care (MOH clinic-based FP)
National Health Administration of Taiwan and JHSPH 1993	Contraceptive prevalence rate	No	Standard of care
Palmore et al. 1987	Current use of contraception	Yes	Standard of care
Rosenfield 1974	Continuation rate for oral contraceptives	Yes	Standard of care (one health center per province with a physician; auxiliary nurse-midwives who attended a 1-week FP course but are not allowed to prescribe OCs)
Sirikulchayanonta 1989	Use of contraception	Yes	Standard of care

^aYes for both CHWs providing antihelminthics and family planning and CHWs providing family planning only.

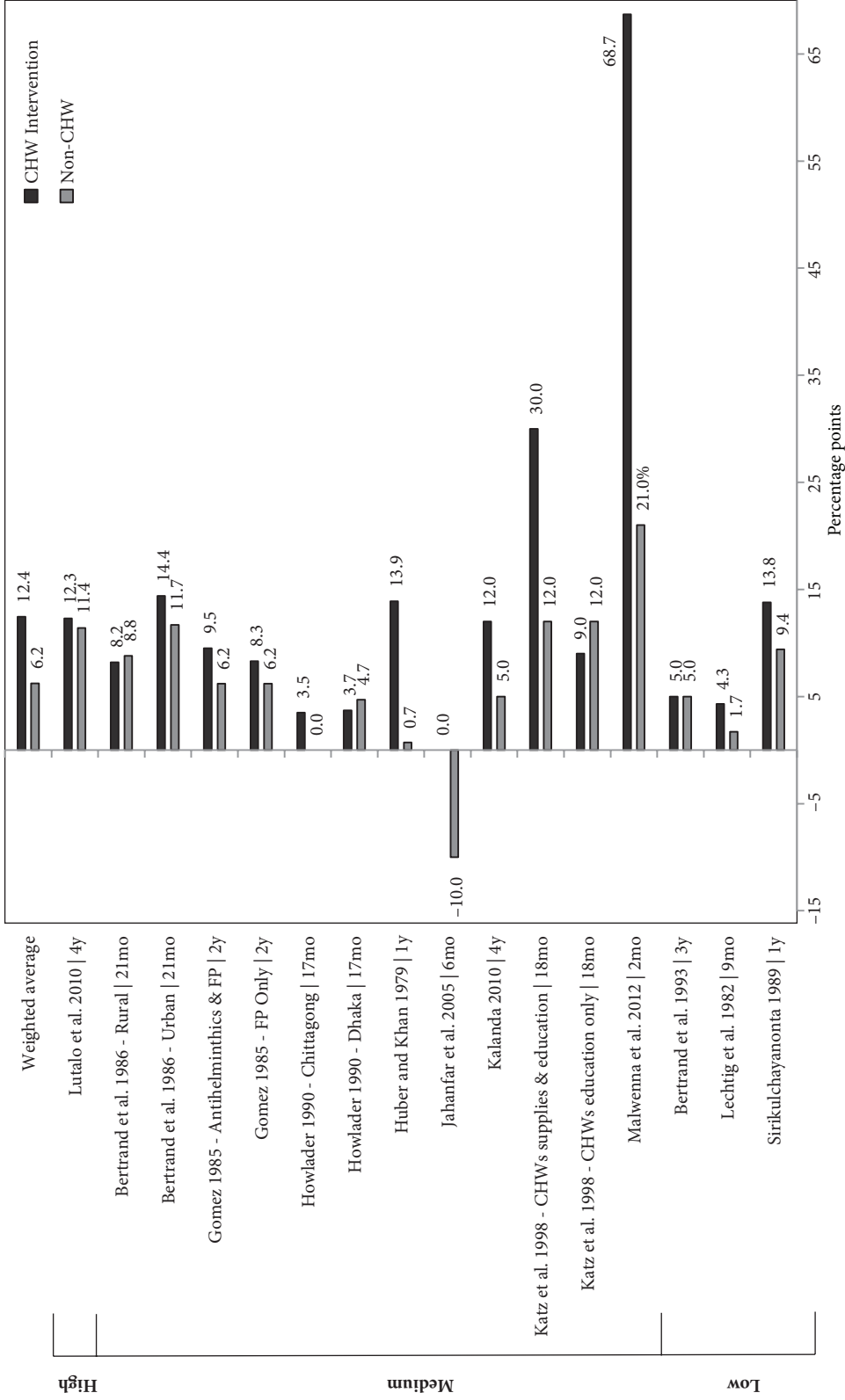
^bArticle stated results were significant; no p values provided.

FP = Family planning, MOH = Ministry of Health, CHW = Community Health Worker, DMPA = Depot-medroxyprogesterone acetate, HEW = Health extension worker, OC = Oral contraceptive.

differences in the impact of CHWs, with only 10 percent of respondents in Djoungolo exposed to activities conducted by the community mobilization agent, compared with almost one-third of respondents in Mbouda (Babalola et al. 2001). The odds of using contraceptives among those exposed to CHWs were 2.01 and 1.26 in Djoungolo and Mbouda, respectively, compared with those not exposed. Thus, CHW exposure was effective but may have been too limited in Djoungolo to make an impact. One reason cited by Babalola and colleagues (2001) for the difference in program exposure was the absence of a qualified family planning provider at the referral clinic in Djoungolo, which affected the motivation of community mobilization agents.

Among the medium- and low-quality studies, only Desai and Tarozzi (2011) found that CHWs did not significantly increase contraceptive use in any way. They posit that the lack of effectiveness of this program in Ethiopia was the result of the mismatch between the methods offered by community-based reproductive health agents (contraceptive pills and condoms) and women's strong preference for injectable contraceptives. By the time of the study, nearly 80 percent and 62 percent of women using contraceptives in Amhara and Oromia, respectively, were using injectables. Not surprisingly, Desai and Tarozzi suggest that an important modification to the CHW FP program would be to train community-based reproductive health agents to provide injectable contraceptives.

FIGURE 2 Percentage point difference in current use of modern contraception between baseline and follow-up in studies comparing CHW and non-CHW delivery of family planning



NOTE: Results from studies having more than one group of CHWs or intervention areas are displayed separately here; duration of follow-up is presented by each study.

In a subset analysis of only those studies that have comparison group data on the specific indicator “current use of modern contraception,” we calculated an average of the percentage point difference in the proportion of current users from baseline to follow-up, weighted by sample size, for both the CHW intervention groups and the non-CHW comparison groups (Figure 2). CHWs improved contraceptive use in their intervention area by a weighted average of 12.4 percentage points, whereas non-CHW comparison groups demonstrated a weighted average increase of 6.2 percentage points. Thus, CHWs in these studies achieved a two-fold higher weighted average increase in contraceptive use from baseline to follow-up than non-CHW comparison groups.

Knowledge of and Attitudes Toward Family Planning

Fewer studies reported on CHW effectiveness in improving knowledge of or attitudes toward FP. Of the 23 studies that included these data, approximately 83 percent ($n = 19$) found that CHWs effectively improved FP knowledge or attitudes. Of the 13 studies comparing CHWs to facility-based services, 69 percent ($n = 9$) found that CHWs were more effective in increasing knowledge of and improving attitudes toward FP than fixed facilities alone (Table 3).

Debuur and colleagues’ study (2002), the only high-quality study measuring contraceptive knowledge or attitudes, found that knowledge of a modern method of contraception significantly improved for all three CHW groups (nurse outreach only, zurugelu only, and zurugelu plus nurse outreach) after the first year of program exposure. By the third year of the program, only the zurugelu plus nurse outreach approach improved knowledge. Although no significant impact on contraceptive knowledge was demonstrated in the fourth year of the program, this study is considered to demonstrate effectiveness given the significant increases in knowledge attained in the first three years. Debuur and colleagues (2002) suggest that the absence of impact in the final year of the study reflects the diminishing returns of the project as contraceptive knowledge became widespread within the population over time and note that CHWs did accelerate the early pace of knowledge attainment.

Nine of the ten medium-quality studies reporting on FP knowledge or attitudes found that CHWs were effective. The exception was a study in eight sites (four CHW areas and four control areas in both Dhaka and Chittagong in Bangladesh) that found that while knowledge of most contraceptive methods was slightly higher in the CHW areas, there was some variation depending on the method and the study site (Howlader 1990). Finally, 8 of the 11 low-quality studies found that CHWs effectively increased knowledge of and/or attitudes toward FP, and 3 found mixed results, with CHWs working effectively in some, but not all, areas or improving knowledge of only certain methods (Bertrand et al. 1993; Luck et al. 2000; Babalola et al. 2001). As with contraceptive use, Babalola and colleagues (2001) found that CHWs did not improve contraceptive knowledge in the city of Djoungolo, where program exposure was low, but CHWs were effective in rural Mbouda. Luck and colleagues’ (2000) study of health volunteers in rural Gambia demonstrated knowledge improvements for some, but not all, contraceptive methods. Knowledge of injectables and oral contraceptives increased, whereas knowledge of condoms and spermicides did not; this likely reflects the desire of CHWs to promote more effective contraceptive methods.

TABLE 3 Effectiveness of community health workers versus comparison group in improving knowledge of and attitudes toward family planning

Quality/Study	Indicator(s)	More effective than comparison group in increasing knowledge and promoting attitudes	Description of comparison/control group
High			
Debpuur et al. 2002	Knowledge of at least 1 modern method	Yes (for combined nurse/zurugelu approach only, for 3 of 4 program years)	Standard of care (MOH clinic-based FP)
Medium			
Bertrand et al. 1986	Knowledge of at least 1 modern method	Mixed—yes ^a in rural area; no in urban area	Improved clinic-based FP (dispensaries stocked with contraceptives)
Daniel, Masilamani, and Rahman 2008	Attitude toward family planning (agree that contraceptives are safe and necessary for delay of first birth)	Yes (p < 0.001)	Standard of care
Howlader 1990	Knowledge of contraception by method	Mixed—by contraceptive method and study area	Standard of care
Jahanfar et al. 2005	Knowledge of family planning on a test	Yes	Standard of care (clinic-based FP)
Kalanda 2010	Knowledge of at least 1 modern method; approval of family planning	Yes; yes (p = 0.001)	Standard of care
Katz et al. 1998	Knowledge of at least 1 modern method	Yes	Standard of care
Leenen et al. 2008	Score on knowledge of contraception scale	Yes	Standard of care
Malwenna, Jayawardana, and Balasuriya 2012	Mean knowledge score; overall attitude toward FP scores	Yes	Standard of care (clinic-based FP)
Prata et al. 2011	Can name side effects requiring visit to health center; can name side effects from DMPA	Mixed—by side effect for DMPA and no improvement for health center	Standard of care (HEWs in health posts)
Sebastian et al. 2012	Knowledge of healthy birth-spacing messages; knowledge of at least 2 birth-spacing methods	Yes (p ≤ 0.01); yes (p ≤ 0.01)	Standard of care (government clinic-based FP)
Low			
Bertrand et al. 1993	Knowledge of at least 1 modern method	No	Comparison: Improved clinic-based FP; Control: Standard of care
Jacobson et al. 1989	Knowledge of family planning	Yes ^a	Standard of care

^aArticle stated results were significant; no p values provided.

MOH = Ministry of Health. FP = Family planning. DMPA = Depot-medroxyprogesterone acetate. HEW = Health extension worker.

Intentions to Use Family Planning and Referrals for FP Services

Intention to use family planning was an additional outcome measure included in this review. Only two studies provided data for this measure, thus making it impossible to draw any conclusions about CHW effectiveness in changing women's intention to use FP in the future. Katz and colleagues (1998) found that CHWs were more effective than the standard of care in increasing intentions to use FP in the future, while Desai and Tarozzi (2011) showed no improvement among CHWs compared with the standard of care. As described above, the lack of impact reported in Desai and Tarozzi (2011) on intentions to use FP may also be related to the lack of provision of injectables, the most widely preferred method among the study population.

Although a few studies reported on the number of referrals that CHWs made for FP services, none of the studies presented referral data according to the study design inclusion criteria.

Assessment of CHW Program Characteristics

Key program characteristics are presented for all included studies (Table S2). There was a significant lack of reported data on various program characteristics, making it difficult to ascertain whether certain program components were missing or simply not reported. CHWs were typically recruited within the communities in which they live ($n = 35$). Only one study reported recruiting CHWs from outside the community; the remaining 20 studies did not report on location of CHW recruitment. The CHWs evaluated in this review were predominantly female, with 23 of the 37 studies that reported CHW gender exclusively using female CHWs. Only 23 studies reported on who was responsible for the recruitment and selection of CHWs, with many using multiple representatives. Of these 23 studies, 10 reported CHW selection by community leaders, followed by 9 studies reporting selection by health officials, 7 by study researchers, 6 by community members, and 4 by community-based organizations.

Eligibility criteria for CHWs were not reported for more than half of all studies in the review, but the most common requirement noted was educational attainment, followed by respect in the community, literacy, and personal experience using contraceptives. Although the details of CHW training—for example, curricula, educational approach, and provision of refresher training—were usually omitted, information on the length of training was reported by 30 studies. The average length of training for CHWs was approximately 53 days; however, this average is heavily skewed by a few outliers. If we remove the two studies reporting more than 200 training days (Rosenfield 1974; Mullany et al. 2010), the average length of CHW training was approximately 28 days. CHW training was longest for studies based in South or East Asia, where training averaged 78 days, followed by Latin America and the Caribbean (35 days), sub-Saharan Africa (34 days), and the Middle East and North Africa (11 days).

The most common training topics covered in the CHW curricula were contraceptive counseling ($n = 22$), provision of contraceptives ($n = 19$), and contraceptive technology ($n = 15$). Other topics included maternal health care ($n = 12$), data collection and recordkeeping ($n = 9$), immunizations ($n = 7$), and hygiene ($n = 6$). Educational training methods varied and overlapped across the slightly more than half of studies ($n = 30$) reporting this information, with many programs using multiple approaches. On-the-job training was the method most commonly reported ($n = 12$), followed by hands-on classroom learning ($n = 11$) and classroom lectures ($n = 8$). Only 10 studies reported that CHWs received refresher training, while one stated that they did not and the remainder did not report on this program characteristic.

The vast majority ($n = 47$, 84 percent) of CHW interventions provided door-to-door services within their community. Other methods of FP outreach, which often overlapped with the provision of door-to-door services, included group meetings ($n = 16$, 29 percent), visits within the CHW's home ($n = 8$, 14 percent), and community depot supply areas ($n = 7$, 13 percent). Most CHWs carried out interventions that were considered to be both supply- and demand-oriented ($n = 39$, 70 percent), while the remaining 25 percent ($n = 14$) and 5 percent ($n = 3$) of studies assessed supply-side-only and demand-side-only interventions, respectively. A total of 23 studies reported that CHWs provided comprehensive services in addition to FP,

including maternal and primary health care services such as antenatal care and immunizations. Most studies did not report payment and incentives offered to CHWs, but 22 reported that CHWs were offered incentives for their services. Performance-based financial compensation (such as fees for contraceptives sold) was provided to CHWs in 11 studies, while 9 reported that CHWs were offered regular salaries or stipends. One study reported offering both regular salaries and performance-based financial incentives to CHWs, and one provided CHWs with periodic gifts such as raincoats or backpacks to assist with their work.

Only 20 percent of studies ($n = 11$) provided any information on the availability of contraceptives. Of these, only 3 reported that contraceptives were always or almost always available. Nearly half of all studies ($n = 27$) reported that CHWs had an established referral system for facility-based FP services, while 18 studies (32 percent) reported that there was a defined linkage between CHWs and a specific facility. Given the scarcity of information on program elements in these publications and the diversity of study designs, we were unable to determine whether any correlation exists between certain program characteristics and CHW effectiveness.

DISCUSSION

This systematic review identified a substantial body of rigorous evidence indicating that CHW-based family planning programs have increased the practice of modern contraception in a variety of low-resource settings. Not only do CHWs effectively meet the need for direct provision of modern contraceptives in areas where health facility coverage is low, they also often support the formal health system by acting as outreach agents who provide health education and encourage clients needing more complex services to seek care at facilities. In turn, CHW programs work best when they are supported by and integrated into a formal health system.

In a subset analysis of studies comparing CHW versus clinic-based care outcomes on the “current use of modern contraceptives” indicator, CHWs demonstrated a weighted average increase in contraceptive use over time that was approximately twice that of clinic-based services. These results are not necessarily generalizable because they are based on a small number of studies and are highly dependent on program design and context, which is often not well described. However, the results are indicative of strongly positive effects on contraceptive use among the CHW FP programs included in this review.

Less evidence was available on the effectiveness of CHWs in improving knowledge of or attitudes toward contraceptives, although the majority of studies reporting on these outcomes found that CHWs were effective. Knowledge and/or attitude indicators used by the studies were less rigorous than the contraceptive use indicators, with a lower threshold for showing effectiveness, which may have limited the scope for improvement between the intervention and comparison areas. For instance, 13 of the 23 studies presenting data on knowledge used either “knowledge of at least one method of (modern) contraception” or generic “knowledge” or “awareness” of FP as the indicator. Only two studies measured intentions to use FP, and none provided information on FP referrals that met inclusion criteria; thus, this review cannot draw conclusions regarding CHW impact on these outcome indicators.

While there is compelling evidence demonstrating the positive impact of CHWs on contraceptive use and knowledge, debates over CHW provision of FP services have often hinged

on concerns about safety and quality of care. Safety concerns have been especially pertinent in the evaluation of CHW programs providing injectable contraceptives. Despite the more advanced skills required to administer injectables, several studies indicate that CHWs are able to do so as safely as higher-level providers (Stanback, Mbonye, and Bekiita 2007; Malarcher et al. 2011; Prata et al. 2011). One area for improvement identified by several studies concerned gaps in CHWs' knowledge of contraceptive side effects. Lack of knowledge of side effects was also found to be a problem among facility-based providers and may contribute to contraceptive discontinuation (Stanback, Mbonye, and Bekiita 2007). CHWs should be well trained in the knowledge and management of potential contraceptive side effects, and if a woman is dissatisfied with one method, the CHW should be able to facilitate a change in method (Gadalla, Nosseir, and Gillespie 1980). Scheduling regular client visits and active follow-up can ensure that women have the opportunity to discuss any problems or questions related to their contraceptive choice (Bhatia et al. 1980; Johnson 2002).

The sustainability of CHW FP programs, in terms of both duration of impact and cost, has also been raised as an important consideration as many countries seek to strengthen their formal health systems. Few studies have explored either the impact of CHW FP programs over long periods of time or their cost-effectiveness. The relatively low cost of CHWs' services has made them an attractive workforce, but the long-term cost-effectiveness of these programs remains unclear. Lack of or low payment provided to CHWs likely affects retention rates and thus recruitment and training costs, raising questions about long-term sustainability. However, in regions where access to facilities requires substantial client travel time, CHWs increase access to information and methods while reducing users' out-of-pocket expenses, which should be factored into cost-effectiveness calculations. Given that FP program resources are limited and must be optimized for impact, additional rigorous research is needed to better understand the cost-effectiveness of CHW FP programs and their impact over time. It is also important to consider the unique advantages of CHW programs, including greater privacy for clients and the opportunity to reach populations that have limited mobility, particularly women who live in socially conservative societies (Gomez 1985; Amendola, Planells, and Lundgren 1993).

Improvements in sustainability can be achieved by closely linking CHW FP programs to the formal health system. Debpuur and colleagues (2002) demonstrated that dual-cadre approaches, such as using trained nurses alongside volunteer health workers who can increase community-level demand for family planning, may be more effective than using either trained clinicians or volunteer health workers alone. Neither of these cadres in isolation was able to achieve the lasting impact on contraceptive use seen in the dual-cadre approach. In turn, facilities can be an integral source of support to CHWs, particularly when they provide regular supervision. The importance of strengthening the formal health system is highlighted by Babalola and colleagues' (2001) finding of a lack of impact in the Djoungolo arm of the study, where the referral clinic had no trained FP providers and was unable to support the work and motivation of the CHWs.

In addition to the 56 CHW FP studies selected for inclusion in this study, our review identified hundreds of CHW program reports and studies conducted over decades and in dozens of countries. Many CHW FP programs are designed not with the intention of providing rigorous research evidence but rather of delivering services to women who lack access to FP. These

programs often focus on documenting CHW FP program outputs and following clients to ensure safety and quality. While many of these studies did not meet our strict inclusion criteria, it is important not to dismiss the large volume of reports indicating that CHWs can deliver safe and high-quality FP services. More rigorously conducted quasi-experimental studies on CHW FP programs are needed to identify the elements that make CHW FP programs effective. Although conducting rigorous evaluation studies may be difficult for resource-limited programs, such studies would further define the characteristics of successful CHW programs, thus improving CHW efficiency and saving resources in the long term.

The absence of detailed reporting on CHW program components, such as CHW eligibility, training, and incentives, in many of the included studies limits our ability to draw conclusions about various approaches for the design of effective CHW programs. This absence in itself demonstrates that there is a gap in the research on program characteristics relevant to effectiveness and a need for more comprehensive and detailed reporting of CHW FP interventions. Researchers and program managers should establish uniform indicators for reporting program characteristics and FP knowledge, attitudes, and behaviors to facilitate the translation of research to practice across a wide variety of programs and study settings. Following our extensive review of the CHW FP literature, we have developed a set of best-practice guidelines on program reporting (Table 4). Ideally, future research on CHW FP programs, including unpublished reports, should include or refer to descriptions of these basic program elements, including CHW recruitment and eligibility, training, links to the health system, supervision, payment and incentives, and program sustainability.

TABLE 4 Recommended best-practice guidelines in reporting on CHW FP program elements

Recruitment and eligibility

- Individuals/organizations responsible for CHW selection
- Required criteria for CHW selection

Training

- Duration
- Curriculum content
- Teaching methodology (i.e., fieldwork, lectures, role-playing)
- Use and frequency of refresher training

Links to the health system

- Whether the CHW program is an extended outreach from a facility or a stand-alone program
- Referral systems in place—unidirectional versus bidirectional

Supervision

- Eligibility—criteria required of the supervisor
- Frequency
- Roles of the supervisor (i.e., oversight, record-checking, on-the-job training)

Payment and incentives

- Any remuneration of CHWs
- Type of remuneration (regular salary versus performance-based)
- Opportunities for career advancement

Program sustainability

- Overall costs
 - Potential for scale-up
-

This study has several limitations that merit consideration. As with any systematic review, our findings are only as strong as the included studies and will not overcome study-level weaknesses in design or data collection. There is an inherent difficulty in synthesizing the findings of high-quality and low-quality studies having diverse study designs, which may lead to inaccuracies in estimations of true effect. To address these issues, this review only included studies with a certain level of rigor; for instance, all post-test-only designs were excluded. We have also attempted to make clear the strength of the study design of each of these studies. In addition, publication bias may have limited the availability of peer-reviewed studies containing negative findings. To address this, our review included a rigorous search for unpublished gray literature. Finally, only English-language publications were included, narrowing the scope of the review.

CHW FP program success in developing countries around the world and over the decades demonstrates the acceptability and effectiveness of CHWs for provision of FP services in diverse contexts. However, there are limitations on the generalizability of these findings, and it is not clear whether the results of these studies will be transferable to other settings where little research has been conducted. Historically, CHWs' services have been used in FP programs to better serve hard-to-reach rural populations. The majority of studies in this review represent rural programs and strongly indicate that CHWs are effective in increasing contraceptive use in rural areas. Less is known about the effectiveness of CHWs for FP provision in urban areas. With rapid urbanization occurring in many of the world's poorest countries, FP programs will increasingly need to focus on reaching the urban poor. Although the urban studies included in this review suggest that CHWs are effective in promoting FP beyond rural areas, the evidence base is slim. It remains to be seen what new challenges will emerge as urban populations grow and what strategies successful CHW programs will need to employ to reach these populations with high-quality FP services.

CONCLUSION

Although a systematic evaluation of the evidence for CHW FP effectiveness was complicated by the wide range of programs and contexts, as well as the paucity of rigorously evaluated programs, the studies presented in this review provide substantial evidence that CHW FP programs increase contraceptive use in low- and middle-income countries. There is also evidence, though it is more limited, that CHWs are effective in increasing knowledge of and improving attitudes toward FP. To further build the evidence base, it is essential that program managers and researchers work together to elucidate specific factors that make CHW FP programs successful. In the meantime, the existing evidence on CHW effectiveness indicates that in low- and middle-income countries, particularly those facing shortages of human resources for provision of health care, CHW programs should be strongly championed to further expand access to FP services.

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