

Systematic Review

Effectiveness of demand generation interventions on use of modern contraceptives in low- and middle-income countries**L. Belaid¹, A. Dumont², N. Chaillet³, A. Zertal⁴, V. De Brouwere⁵, S. Hounton⁶ and V. Ridde⁷**¹ School of Public Health (ESPUM), University of Montreal, Montréal, QC, Canada² UMR 216 IRD - Université Paris Descartes, Paris, France³ Centre de recherche du CHU Québec, Centre hospitalier de l'Université Laval, Ville de Québec, QC, Canada⁴ CHU Sainte Justine, Montréal, QC, Canada⁵ Department of Public Health, Institute of Tropical Medicine, Antwerp, Belgium⁶ Technical Division, United Nations Population Fund, New York, USA⁷ School of Public Health (ESPUM, IRSPUM), University of Montreal, Montréal, QC, Canada**Abstract**

OBJECTIVES To synthesise evidence on the implementation, costs and cost-effectiveness of demand generation interventions and their effectiveness in improving uptake of modern contraception methods.

METHODS A Cochrane systematic review was conducted. Searches were performed in electronic databases (MEDLINE, EMBASE) and the grey literature. Randomised controlled trials, cluster randomised trials and quasi-experimental studies, including controlled before–after studies (CBAs) and cost and cost-effectiveness studies that aimed to assess demand interventions (including community- and facility-based interventions, financial mechanisms and mass media campaigns) in low- and middle-income countries were considered. Meta-analyses and narrative synthesis were conducted.

RESULTS In total, 20 papers meeting the inclusion criteria were included in this review. Of those, 13 were used for meta-analysis. Few data were available on implementation and on the influence of context on demand interventions. Involving family members during counselling, providing education activities and increasing exposure to those activities could enhance the success of demand interventions. Demand generation interventions were positively associated with increases in current use (pooled OR 1.57; 95% CI: 1.46–1.69, $P < 0.01$). Financial mechanism interventions (vouchers) appeared effective to increase use of modern contraceptive methods (pooled OR 2.16; 95% CI: 1.91–2.45, $P < 0.01$; $I^2 = 0\%$). Demand interventions improved knowledge (pooled OR 1.02; 95% CI 0.63–1.64, $P = 0.93$) and attitudes towards family planning and improved discussion with partners/husbands around modern contraceptive methods. However, given the limited number of studies included in each category of demand generation interventions, the dates of publication of the studies and their low quality, caution is advised in considering the results. Very limited evidence was available on costs; studies including data on costs were old and inconsistent.

CONCLUSION Demand generation interventions contribute to increases in modern contraceptive methods use. However, more studies with robust designs are needed to identify the most effective demand generation intervention to increase uptake of modern contraceptive methods. More evidence is also needed about implementation, costs and cost-effectiveness to inform decisions on sustainability and scaling-up.

keywords Systematic review, low- and middle-income countries, family planning, demand intervention, effectiveness, costs, and contraception

Introduction

Increasing access to and use of modern contraceptive methods is one of the target objectives of the Post-2015

Sustainable Development Goals (SDG). In fact, in low- and middle-income countries (LMICs), around 225 million women of reproductive age who do not wish to become pregnant are not using modern contraceptive

methods and an estimated 30 million unplanned births and 40 million abortions (legal and illegal) occur annually [1]. To help LMICs achieve universal coverage of family planning, the United Nations Population Fund (UNFPA), as part of its family planning strategy, commissioned a systematic review on the implementation, effectiveness and cost-effectiveness of family planning demand generation interventions in LMICs. The results of that systematic review will contribute to strengthening the evidence base for planning, implementing and evaluating demand generation interventions in family planning.

Over the years, several strategies have been implemented to increase the demand for modern contraceptive methods: community- and facility-based interventions (social and community mobilisation, counselling with community health workers or health providers, male motivator and home visits), financial mechanisms (voucher scheme, loan fund and cash incentives) and mass media campaigns (radio, television, soap opera and drama) [2].

To date, evidence has shown some effectiveness of these strategies in improving family planning, as well as sexual, reproductive and adolescent health outcomes [2–6]. For example, a systematic review on the impact of school-based sex education in LMICs reported that the intervention contributed to increasing knowledge on HIV (Hedges $g = 0.63$; 95% confidence interval (CI): 0.49–0.78, $P < 0.001$) and condom use (OR = 1.34; 95% CI: 1.18–1.52, $P < 0.001$) [5]. The interventions included in this systematic review were heterogeneous. They included media (video, audio tapes), drama (plays, skits), community involvement and counselling [7].

Another systematic review assessing the impact of voucher programs on maternal and reproductive health services, such as antenatal and facility-based deliveries, reported a positive effect on knowledge, service utilisation, quality and health impacts such as live births and prevalence of sexually transmitted diseases [6]. However, the heterogeneity in the designs of studies assessing demand-side interventions and the lack of standardisation of indicators used to measure the outcomes of such interventions make it difficult to draw overall conclusions about the interventions' effectiveness [2].

Moreover, to our knowledge, no systematic reviews have reported evidence on implementation costs and cost-effectiveness related to demand generation interventions and their influence on family planning outcomes [8]. A systematic review was undertaken to fill these gaps by synthesising the knowledge on: (i) the implementation process for demand generation interventions and (ii) the evidence on their effectiveness and cost-effectiveness in improving uptake of modern contraception methods.

Methods

The Cochrane Collaboration's guidelines for systematic review were followed [7]. The protocol for this review was published [9] and registered in the PROSPERO database (CRD 42015017549).

Inclusion criteria

In accordance with PICOS (population, intervention, comparator, outcome and study design), both women and men of reproductive age, irrespective of marital status, who were sexually active at the time of the studies were considered. The intervention took place in LMICs, as defined in the World Bank's country classification [10].

This review focused only on demand generation interventions, as required by UNFPA. These included community- and facility-based interventions (social and community mobilisation, counselling with community health workers or health providers, male motivator and home visits), financial mechanisms (voucher scheme, grant and loan fund, and cash incentives) and mass media campaigns (radio, television, soap opera and drama) [11].

All randomised controlled trials (RCTs), cluster randomised trials (cRTs) and quasi-experimental studies, including controlled before–after studies (CBAs) and interrupted time series (ITS) comparing a demand generation intervention to routine care (family planning services delivery), no intervention or other interventions (group counselling, advocacy with leaflet page and counselling session with wives only), were considered for inclusion.

Literature search

With the support of a medical librarian, two investigators (LB, AZ) conducted multiple searches in EMBASE (CINAHL, Ovid Medline), MEDLINE, the Cochrane Database of Systematic Reviews and the grey literature (Google Scholar, Social Care Online) and screening references from 1970 to 2015 (April, 2015) using Mesh terms (see Appendix S1). Searches began with the 1970s because that was when most national voluntary family planning programs were implemented to reduce population growth in developing countries; 1970–1990 is considered the 'reproductive revolution' era in LMICs, with the exception of sub-Saharan Africa [12]. Demographers consider the 'reproductive revolution' to be the period when average fertility decreased significantly in LMICs while the prevalence of contraceptive use increased significantly [13].

Screening references from selected papers identified additional studies. Language was restricted to French and English. The two investigators (LB, AZ) independently assessed all potentially eligible studies for inclusion.

Data extraction and data synthesis

For each study selected, the two investigators (LB and AZ) extracted data using a standardised data extraction checklist on costs, cost-effectiveness and family planning outcomes. Another template based on Hoffman's checklist was used to report data on the content and implementation of each intervention [14].

Authors were contacted when data from the original report were unclear. Discordances between reviewers were resolved by consensus within the research team. Study quality was assessed using the risk of bias tool from Cochrane for randomised studies [7] and the Cochrane Effective Practice and Organization of Care (EPOC) checklist for non-randomised studies [15]. Baseline outcome measurement, socio-demographic characteristics of groups (control and intervention) and protection against contamination were added to assess the studies' quality according to EPOC guidelines [15]. Quality of both cost and cost-effectiveness studies was assessed using Drummond's checklist, as recommended by the Cochrane Collaboration [16].

Data were entered into the Cochrane Review Manager software (RevMan 5.1) [14]. A meta-analysis was conducted with dichotomous data using odds ratios (OR) with a 95% confidence interval (CI) as measures of effect size. Interstudy variation was incorporated with the assumption of a random effects model for the treatment effect using the DerSimonian and Laird procedure and inverse variance method when heterogeneity between trials was significant or superior to 50% [11, 13]. A fixed effect model was used in the absence of significant heterogeneity, using the Mantel-Haenszel method. Heterogeneity was assessed using the I^2 statistic and Q test. Sensitivity and subgroup analyses were conducted on study characteristics, quality of study, type of intervention and intensity of counselling and educational interventions. Intensity was characterised by number of sessions and duration (low = one session of <30 min; high = more than one session and more than 30 min).

Finally, narrative analysis was conducted when meta-analysis was not possible because of heterogeneity of outcomes or when no data were available. Narrative synthesis followed the guideline developed by Popay *et al.* [13].

Effectiveness in this review was mainly assessed based on significant changes in contraceptive prevalence rates or numbers of new users of contraception. Although some studies assessed perception, knowledge and attitude with regard to family planning, the evidence summary was based on effectiveness in improving contraceptive prevalence rates or number of new users of contraception.

Results

The flow diagram in Figure 1 describes the results of the review, which included 20 papers. Characteristics of the studies are detailed in Table 1. Studies were carried out in Africa ($n = 7$) [17–23], the Middle East ($n = 5$) [24–29], Central America ($n = 1$) [30], South Asia ($n = 5$) [28, 31–34] and multiple countries ($n = 2$) [35, 36]. Year of publication ranged from 1978 to 2015.

Strategies to increase demand for family planning included community- and facility-based interventions ($n = 13$) [17–19, 21–29, 32], financial mechanisms (voucher schemes, cash incentives and loan fund) ($n = 3$) [31, 33, 34], mass media campaigns (entertainment-education radio soap operas) [20], one mixed study combining mobilisation (male promotor) and a mass media activity (radio spots) ($n = 1$) [30] and two partial economic evaluations [35, 36].

Community- and facility-based interventions focused mainly on counselling, sensitisation and education activities performed either by community health workers (traditional birth attendants [TBA], female health assistants) or health providers (physicians and nurses). They also included interventions involving social mobilisation (opinion leaders and male motivators) and home visits with the presence of husbands and TBAs. Lastly, the two partial economic evaluations aimed to assess the effect of social marketing programs on couple-years of protection (CYP) in different countries.

Overall, the quality of studies was poor. Among the controlled before–after studies (CBAs) ($n = 7$), this was due to high potential risk of contamination between intervention and control groups. Differences between comparison groups were observed at baseline on outcome measurement in three CBA studies [17, 20, 34]. Two studies did not control for confounding variables among CBA studies [25, 34]. Six poor-quality trials were marked as 'unclear' or 'high risk' for 'sequence generation', 'concealment of allocation' and 'blinded outcome'.

Content and implementation of demand generation interventions

Intervention rationale

In the interventions assessed by the selected studies, the rationale was focused mainly on reproductive health needs, as shown by data from demographic health surveys (Appendix S2). Eight studies justified the intervention based on high rates of fertility, unwanted pregnancies, abortion, maternal mortality and unmet need for contraception, or on low prevalence of modern

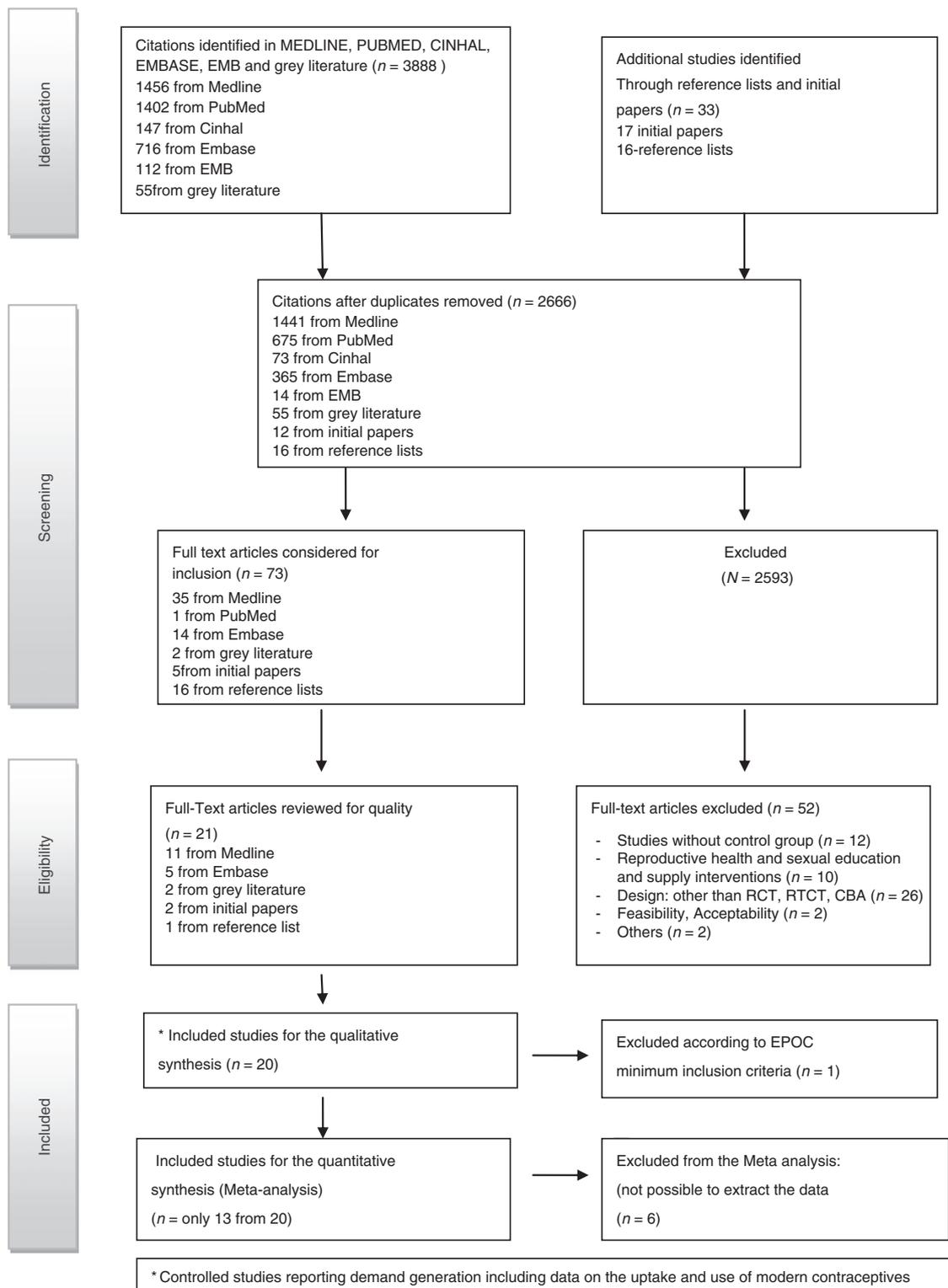


Figure 1 Study eligibility flow chart.

Table 1 Characteristics of the included studies

Studies	Country	Design	N	Type of demand intervention	Intervention	Quality*
Azmat <i>et al.</i> (2013)	Pakistan	CBA	4992	Financial mechanism	Voucher scheme. Vouchers were distributed by community field workers. Vouchers concerned only the IUCD method and social franchising. Supply activities: training of field workers	Low
Akman <i>et al.</i> (2010)	Turkey	RCT	180	Community facility-based intervention	Community-based intervention (individual counselling)	Low
Barberi and al. (1997)	Multi country	Economic evaluation	NA	Economic evaluation	Assess cost-effectiveness of various modes of family planning services (social marketing)	High
Bertrand <i>et al.</i> (1982)	Guatemala	CBA	1600	Mix: Community facility-based intervention and mass media	Radio spots and male promotor: a male from the community promote vasectomy	Low
Dureab (2015)	Yemen	CBA	94	Community facility-based intervention	'community-based reproductive health promotion' (CBRHP): community-based promotion, peer education and the generation dialogue methodology	Low
Fisek and Sımbüloğlu (1978)	Turkey	CBA	1480	Community facility-based intervention	Community-based intervention (counselling with physician and public health nurses with the presence of husbands)	High
Huber and Harvey (1989)	Multi country	Economic evaluation	NA	Economic evaluation	Assess cost-effectiveness of various modes of family planning services (social marketing)	High
Luck <i>et al.</i> (2000)	Gambia	CBA	1128	Community facility-based intervention	Demand mobilisation (kinship network (Kabilo), imam meetings) Supply	Low
Katz <i>et al.</i> (1998)	Mali	CBA	2551	Community facility-based intervention	Education by community health workers (home visits and group talks) Supply	Low
Lutalo <i>et al.</i> 2011	Uganda	cRCT	5944	Community facility-based intervention	Counselling by community health workers, group of theatre and dance	Low
Mahamed <i>et al.</i> (2012)	Iran	RCT	200	Community facility-based intervention	Educational intervention by health trainer (pre-marital sex education)	Low
Rogers <i>et al.</i> (1999)	Tanzania	CBA	2750	Mass media	Mass Media (entertainment-education radio soap opera). Broadcasting Twende na Wakati in Tanzania ('let's be modern' (and, implicitly, 'let's control our lives')	Low
Saeed <i>et al.</i> (2008)	Pakistan	RCT	648	Community facility-based intervention	Informal Counselling in the presence of husband (preferably) or some close relative (mother/mother-in-law, female relatives)	High
Sebastian <i>et al.</i> (2012)	India	RCT	959	Community facility-based intervention	Education provided by community health workers at homes and using materials (Booklet, poster, wall painting)	Low

Table 1 (Continued)

Studies	Country	Design	N	Type of demand intervention	Intervention	Quality*
Soliman (1999)	Egypt	RCT	200	Community facility-based intervention	Counselling Antenatal counselling: using Gather technique (greetings clients) with the presence of husbands	Low
Shattuck <i>et al.</i> (2011)	Malawi	RCT	400	Community facility-based intervention	Male motivator: male outreach worker target husband. Intervention based on information–motivation–behavioral skills	High
Shwandt and <i>et al.</i> (2011)	Ghana	RCT	648	Community facility-based intervention	Counselling: group family counselling by health personal (nurse)	Low
Stevens & Stevens (1992)	India	CBA	1000	Financial mechanism	Financial mechanism (small cash incentives). The programme offered 30 rupees per month for 6, 8, 12 or 18 months to programme participants who remained no pregnant	Low
Terefe & Larson (1993)	Ethiopia	RCT	476	Community facility-based intervention	Counselling performed by female health assistants at home visits with the involvement of TBA and the presence of the husbands	High
Weeden <i>et al.</i> (1986)	Thailand	CBA	ND	Financial mechanism	Incentives in the form of loans intended to promote small-scale income generating activities and linked to a community's contraceptive prevalence rate	High

*Risk of Bias and Quality assessment

contraceptive methods [17–19, 23–25, 30, 34]. Others cited the need for knowledge ($n = 6$) [22, 26–29, 32] or to test a new approach [31, 33]. However, overall, the interventions' rationales were poorly justified. Only two studies used conceptual theories to justify the content of their interventions [20, 21].

Intervention materials

Most ($n = 13$) of the interventions used and provided materials (money, contraceptive methods, visual aids, posters, wall painting, logo, booklets, leaflets, pamphlets and radio) [17–20, 22, 23, 26–30, 32, 34]. Booklets and leaflets were the main materials used for community- and facility-based interventions focusing on counselling ($n = 4$) [19, 26, 28, 32].

Procedures

Overall, the different components of the interventions were well described, especially the processes, such as how community health workers were selected (criteria) and trained (duration, content). For financial mechanisms, the vouchers and loans systems were also well described.

However, for counselling, education and sensitisation interventions, the precise content of messages to participants (only a list of themes was provided) and how they were done (approach used) were poorly described [17–19, 23, 27, 28, 32].

The actors who implemented the interventions were identified. Community health workers most commonly ($n = 8$) delivered the interventions [17–19, 23, 25, 29, 32, 34]. Facility-based interventions relied mainly on physicians and nurses ($n = 3$) [22, 26, 28]. In three studies, the research investigators had conducted the interventions themselves [24, 27, 31], while two others were carried out by peers (males) independent of the research team [21, 30]. All of these actors were trained; however, their socio-demographic profiles were poorly described.

Scope of intervention

Intervention areas were variable: region, province, district, subdistrict, villages, hospitals and health facilities. Seven studies had implemented their interventions in an entire health district [19, 21, 23, 26, 31–33], eight were hospital-based interventions [22, 24, 26–29, 31, 34] and

10 were implemented in communities (home visits, villages) [18–21, 23, 25, 30, 32, 33].

Duration and intensity of intervention

The duration of the interventions ranged from 6 months to 2 years. Studies assessing counselling and mass media interventions provided information on the duration of the activities, while other studies did not provide sufficient information. Among the counselling interventions ($n = 8$), six were considered high intensity [21, 23, 24, 26, 29, 32] and two low intensity [27, 28].

Modification, tailoring and fidelity

Two studies reported modifications to the interventions [18, 33]. Three studies provided information on how well the intervention was planned [20, 23, 33], and six provided information on how well the intervention was actually implemented [18, 19, 23, 30, 31, 33].

Intervention modification concerned one study that assessed a community-based intervention and another that evaluated a financial mechanism [18, 33]. With regard to the community-based intervention, the authors noted that the educational message provided to husbands and wives during home visits was tailored to the couple's knowledge and attitudes. However, they did not explicitly mention what had been changed or whether the changes occurred before or during the intervention [23].

The other study that reported a change to the intervention concerned a loan fund grant [33]. First, the ceiling was set at 200 USD to avoid monopolisation of the loan by a few individuals. Second, in most villages, demand exceeded supply. Thus, to secure a financial start of the loan fund, greater emphasis was placed on project appropriateness, personal character of the applicant and applicant creditworthiness. Family planning criteria also became more important in the loan review procedures. 'For the first two rounds, if the loan request of creditworthy applicants exceeded the supply of money than available in the fund, then non-practising applicants received less or none of the loan amount which they had requested' [33]. The authors did not indicate whether the modification occurred before or during the intervention.

Two studies reported data on how interventions were successfully implemented [23, 33]. In one study in Ethiopia, which assessed a community-based intervention, husband participation was high because the health providers conducting the home visits were known by the community and shared the cultural and social background with husbands [27]. They also knew 'how to approach husbands in an acceptable and appropriate manner' ([27]

p. 1570), although the authors did not indicate what this entailed. The authors explained that a contextual factor present at the time of the intervention in Ethiopia – government stability being threatened – meant that people tended to return home early after work, which facilitated scheduling of home visits [23].

All the studies reporting on implementation highlighted the influence of actors delivering the interventions and how they affected (positively or negatively) the interventions [19, 23, 30, 31]. Two studies noted high turnover of community health workers and how it negatively affected the interventions and increased training and supervision workloads [19, 30]. Three other studies showed how community health workers were able to increase the effectiveness of the interventions [23, 30, 31]. For instance, in the cash incentive intervention implemented in India, community health workers were able to report the perceptions of new acceptors in the field and better inform the implementers so they could adjust the intervention. However, the authors did not describe what had been changed [31].

Effectiveness of demand intervention on modern contraceptive uptake

Contraceptive prevalence rate (CPR)

Contraceptive prevalence rate was reported only in one study [33], which assessed a loan fund grant in Thailand. At baseline, the intervention group CPR was estimated at 46.4% and the control group CPR at 51.2%. After the intervention, the intervention group and control group CPRs reached 74.4% and 56.8%, respectively [33]. The quality of the study was considered high.

Current use of modern contraceptive methods

The current use of modern contraceptive methods was reported by 10 studies [19–21, 23, 25, 26, 31–34]. It was defined as the uptake/use/practice of family planning using modern (hormonal and non-hormonal) methods during or following the study period. Except for one study by Katz *et al.* [22], all reported an increase in current use of modern contraception. The study indicating a contradictory effect was considered to be of low quality due to high risk of contamination between the intervention and the control groups (Table 2).

Nine studies, involving a total of 14 235 participants, were included in the meta-analysis [18–21, 23, 26, 31, 32, 34]. Demand generation interventions were associated with current use of modern contraceptive methods (pooled OR 1.57; 95% CI: 1.46–1.69, $P < 0.01$).

Table 2 Findings on the effectiveness of demand generation interventions on family planning outcomes*

Outcomes	Results	Number of studies included	Category of demand generation intervention
Contraceptive prevalence rate	Increase	1	Financial mechanism (loan grant fund)
Utilisation			
Current use of modern contraceptive method	Increase	10	Financial mechanism (loan grant fund, cash incentives, voucher) ($n = 3$), Mass Media (entertainment-education radio soap opera) ($n = 1$), Community based ($n = 6$)
Use of modern contraceptive methods in the post-partum	Increase	3	Community based ($n = 3$)
Ever use of contraceptive methods	Increase	3	Community based ($n = 2$), Financial mechanism ($n = 1$)
Unmet need for contraception	Decrease	1	Financial mechanism (voucher) ($n = 1$)
Knowledge, attitudes towards FP			
Knowledge on modern contraceptive methods	Increase	12	Financial mechanism (voucher, cash incentives) ($n = 2$), Mass media (entertainment-education radio soap opera) ($n = 1$), Mixed (mass media/community based) ($n = 1$) Community based ($n = 8$)
Attitudes towards FP	Increase	7	Mass Media (entertainment-education radio soap opera) ($n = 1$), Mixed ($n = 1$), Community based ($n = 5$)
Intention to use modern contraceptive methods	Increase	5	Community-based intervention ($n = 5$)
Triggering discussions on FP with partners	Increase	5	Community based ($n = 4$), Mass media (entertainment-education radio soap opera) ($n = 1$)
Decision-making on the use of modern contraceptive method	Increase	1	Community-based intervention ($n = 1$)
Currently pregnant	Decrease	4	Mass Media (entertainment-education radio soap opera) ($n = 1$), Financial Mechanism ($n = 1$) Community based (2)

*The table includes only the results from the narrative synthesis.

An important heterogeneity effect was detected ($I^2 = 95\%$). The type of intervention (mass media, financial mechanisms, and community- and facility-based interventions), its intensity and the quality of the studies explained the heterogeneity detected.

Financial mechanism interventions seemed to be effective in increasing current use of modern contraceptive methods (pooled OR 2.16; 95% CI: 1.91–2.45, $P < 0.01$; $I^2 = 0\%$).

Use of modern contraceptive methods in the post-partum period

Three studies reported this outcome [24, 27, 28], defined as the use of modern (hormonal and non-hormonal) contraceptive methods during the post-partum period, which ranged from 12 weeks to 6 months in the different studies. Demand generation interventions significantly increased the uptake of modern contraceptive methods in the post-partum period (pooled OR 7.37; 95% CI: 1.54–35.18, $P = 0.01$; $I^2 = 94\%$).

The two trials that reported significant increase in modern contraceptive methods at post-partum included the presence of a family member (husband, mother and mothers-in-law), in contrast to one trial that did not observe a change but targeted only the woman during the counselling session (one-to-one private counselling) [24, 27, 28]. The subgroup analysis based on the presence of husbands or other family members did not detect any heterogeneity effect between the two studies, and the pooled effect was high (pooled OR 17.46; 95% CI: 11.32–26.93, $P < 0.01$) (Table 3).

Utilization

Ever-use of contraceptive methods

This was reported in three studies that were considered low quality. Only one study defined the outcome as ‘a woman who has a history of using a contraceptive (p. 57) [25]’. All reported an increase in ever-use of

Table 3 Results of the meta-analyses on the impact of demand interventions on family planning outcomes

Outcomes – Subgroup	Studies	Participants	Statistical Method	Heterogeneity (I^2)	Overall effect
Use of modern contraceptive method at post-partum	3	947	Odds Ratio (M-H, Random, 95% CI)	96%	2.37 [0.44, 12.81]
Per year of publication					
1990–1999	1	200	Odds Ratio (M-H, Random, 95% CI)	NA	13.40 [6.08, 29.56]**
2000–2010	2	747	Odds Ratio (M-H, Random, 95% CI)	63%	0.95 [0.49, 1.83]
By intervention in the group control					
Intervention <i>vs.</i> other intervention (education leaflet)	1	147	Odds Ratio (M-H, Random, 95% CI)	NA	1.47 [0.69, 3.13]
Intervention <i>vs.</i> usual care	1	800	Odds Ratio (M-H, Random, 95% CI)	98%	3.07 [0.17, 54.25]
By timing of counselling					
Antenatal	2	347	Odds Ratio (M-H, Random, 95% CI)	94%	4.42 [0.50, 38.77]
Post-partum	1	600	Odds Ratio (M-H, Random, 95% CI)	NA	0.73 [0.53, 1.01]
Current use of modern contraceptive method		13 759	Odds Ratio (M-H, Random, 95% CI)	96%	1.56 [1.45, 1.68]**
By type of intervention					
Interpersonal communication	3	2113	Odds Ratio (M-H, Random, 95% CI)	0%	2.90 [2.40, 3.51]**
Mixt: Demand/Supply	2	4825	Odds Ratio (M-H, Random, 95% CI)	96%	1.94 [1.71, 2.20]**
Demand/Demand	1	4930	Odds Ratio (M-H, Random, 95% CI)	NA	1.15 [1.02, 1.30]
Mass Media	1	891	Odds Ratio (M-H, Random, 95% CI)	NA	0.55 [0.42, 0.73]
Financial Mechanism	1	1000	Odds Ratio (M-H, Random, 95% CI)	NA	2.18 [1.57, 3.04]**
By geographic area					
Asia (India, Pakistan)	3	5962	Odds Ratio (M-H, Random, 95% CI)	65%	2.30 [2.06, 2.58]**
Africa (Uganda, Mali, Tanzania, Malawi)	4	6932	Odds Ratio (M-H, Random, 95% CI)	92%	1.04 [0.94, 1.15]
Middle East (Turkey)	1	865	Odds Ratio (M-H, Random, 95% CI)	NA	2.84 [2.06, 3.90]**
By year of publication					
1970–1980	1	865	Odds Ratio (M-H, Random, 95% CI)	NA	2.84 [2.06, 3.90]**
1981–1999	3	2713	Odds Ratio (M-H, Random, 95% CI)	95%	0.93 [0.38, 2.28]
2000–2015	4	10 181	Odds Ratio (M-H, Random, 95% CI)	96%	1.66 [1.53, 1.81]**
By study design					
RCT	3	6178	Odds Ratio (M-H, Random, 95% CI)	96%	1.41 [1.26, 1.56]**
CBA	5	7581	Odds Ratio (M-H, Random, 95% CI)	96%	1.71 [1.54, 1.89]**
By income countries					
Middle	4	6827	Odds Ratio (M-H, Random, 95% CI)	58%	2.35 [2.12, 2.62]**
Low	4	6932	Odds Ratio (M-H, Random, 95% CI)	92%	1.04 [0.94, 1.15]
Knowledge about modern method of	5	8207	Odds Ratio (M-H, Random, 95% CI)	93%	1.02 [0.63, 1.64]
By type of intervention					
Interpersonal communication	1	289	Odds Ratio (M-H, Random, 95% CI)	NA	1.01 [0.63, 1.63]
Mixt: Demand/Supply	2	6027	Odds Ratio (M-H, Random, 95% CI)	49%	1.49 [1.17, 1.90]**
Mass Media	1	891	Odds Ratio (M-H, Random, 95% CI)	NA	0.35 [0.25, 0.50]
Financial Mechanism	1	1000	Odds Ratio (M-H, Random, 95% CI)	NA	1.25 [0.97, 1.61]
By year of publication					
1990–1999	2	1891	Odds Ratio (M-H, Random, 95% CI)	97%	0.67 [0.19, 2.31]
2000–2015	3	6316	Odds Ratio (M-H, Random, 95% CI)	49%	1.40 [1.10, 1.78]
By study design					
RCT	1	289	Odds Ratio (M-H, Random, 95% CI)	NA	1.01 [0.63, 1.63]
CBA	4	7918	Odds Ratio (M-H, Random, 95% CI)	95%	1.02 [0.58, 1.79]

Table 3 (Continued)

Outcomes – Subgroup	Studies	Participants	Statistical Method	Heterogeneity (I^2)	Overall effect
By geographic location					
Asia (Pakistan, India)	2	5003	Odds Ratio (M-H, Random, 95% CI)	64%	1.46 [1.05, 2.03]*
Africa (Gambia, Tanzania, Malawi)	3	3204	Odds Ratio (M-H, Random, 95% CI)	96%	0.79 [0.33, 1.90]

* $P < 0.05$; ** $P < 0.01$.

modern contraceptive methods [25, 27, 34]. It was not possible to conduct a meta-analysis for this outcome because the results were given only in proportions, and for one study, the data were missing (denominator for each group) [25].

Unmet need for contraception

Only one study, by Azmat *et al.* [34], reported change in unmet need for modern contraception as an outcome, although the authors did not define this variable. That study reported a significant reduction in unmet need for contraception. In the intervention group, the reduction was estimated at -12.8% in the intervention group, *versus* -5.2% in the control group (net effect: -7.6% , $P < 0.001$) [34]. However, this study was considered low quality because differences were observed between the intervention and control groups at baseline measurement.

Family planning knowledge, attitudes and practices

Knowledge about modern contraceptive methods

Except for two studies, all reported improvement in knowledge about modern contraceptive methods in the narrative synthesis ($n = 12$) [17, 18, 20–22, 24, 28–32, 34]. However, meta-analysis results showed that demand generation interventions had no significant effect on the proportion of women who had appropriate knowledge (pooled OR 1.02; 95% CI 0.63–1.64, $P = 0.93$). The meta-analysis included five studies [17, 20, 21, 31, 34].

Financial mechanisms and community- and facility-based interventions seemed to be effective in improving knowledge about modern contraceptive methods (pooled OR 1.46; 95% CI: 1.05–2.03; $P = 0.09$; OR 1.28; 95% CI: 1.01–1.61; $P = 0.04$, respectively). However, mass media interventions were under-represented (only one study) in the publications eligible for this review. Therefore, the effectiveness of the interventions should be assessed with caution. Heterogeneity was high ($I^2 = 93\%$,

$P = 0.93$). Subgroup analysis showed that intervention type could explain the heterogeneity detected.

Attitudes towards family planning

Attitudes towards family planning were reported by seven studies [20, 21, 23, 26, 28–30]. This variable was the most heterogeneous in terms of both definition and measurement and was poorly defined. Overall, the studies reported an improvement in attitudes towards family planning. Rogers *et al.*'s study [20] combined different items in this outcome, measuring each independently. For the item 'ideal age of marriage for women', the study reported an increase of 0.9 (SE 0.07) years in the intervention area compared to 0.1 year in the control area [20]. There was no reported SE for the control group.

Several studies ($n = 5$) assessed the 'ideal number of children', defined as the number of children appropriate for a married couple [18, 20, 23, 26, 33]. Results were mixed. While Rogers *et al.* [20], Weeden *et al.* [33] and Terefe and Larson [23] observed no effect of interventions (mass media, financial mechanism [loan fund] and home visit with TBA and husbands) on attitudes towards family planning, Fisek and Sümbüloğlu in Turkey [26] and Katz *et al.* in Mali [18] reported a slight positive change using counselling and educational interventions. In Mali, the mean number of children desired by women was seven on average before intervention and five after intervention [18].

A positive change was also observed for 'approval of family planning' in all studies. For example, Rogers *et al.*'s study in Tanzania with a sample size of 2,750 households reported a 3% increase in approval of family planning in the intervention area and a 6% decrease in the comparison area [20].

Finally, three studies defined attitudes regarding statements based on perceptions and beliefs surrounding family planning [28–30]. Some statements were myths and misconceptions [28–30]. The results were also mixed. Mahamed *et al.*'s study in Iran showed significant

improvement in attitude towards family planning [29]. The indicator included statements such as 'family planning is only for young people' and 'family planning improves maternal and child health'. However, this trial was categorised as low quality in this review [29].

Bertrand *et al.*'s study in Guatemala of an intervention to increase vasectomy prevalence reported a very slight change [30], with only 13.7% of respondents perceiving the effects of vasectomy to be 'poorer health' at baseline for the intervention group (radio spots and male promoter); at post-test, the proportion had decreased very slightly to 12.3% [30]. However, the quality of this study was considered low due to risk of contamination between intervention and control group.

Intention to use modern contraceptive methods

The intention to use modern contraceptive methods was reported by five studies [18, 22, 23, 27, 28]. Only one study defined it as: 'whether the participant intended to use contraception at any time and enquired about intention to use a method immediately after hospital visit' (p. 283) [22]. All reported an increase in intention to use modern contraceptive methods. Two studies assessed the effect on family planning outcomes of interventions in which counselling was provided by health providers; in two others, counselling was provided by community health workers. Terefe and Larson's study [23] in Ethiopia, with a sample size of 476 participants, that aimed to assess an intervention consisting of home visits with the presence of TBAs and husbands reported that 47% of the intervention group decided to start using modern contraceptives, versus 33% in the control group. In this study, the control group involved home visits for wives only [23].

Triggering discussions on family planning with partners

Five studies reported on triggering discussions on family planning with partners [18, 20, 21, 24, 32]. This outcome was assessed in terms of frequency of discussions with husbands on family planning. Overall, all reported an improvement [18, 20, 21, 24, 32]. Katz *et al.*'s article reported that the most significant change was in the community-based distribution group, compared to the education group [18]. In the community-based distribution group, participants were buying modern contraceptives and receiving counselling at home as well as attending group talks by community health workers, whereas in the education group, participants only received education on family planning. The outcome was stratified by gender. The results were highly significant ($P < 0.01$) for women and men in both groups. However, a significant increase

was also observed in the control group [18]. This study was considered of low quality.

Decision-making on the use of modern contraception

Only one study reported the decision-maker for family planning, categorised as: wife alone, husband alone, joint decision and other family members [24]. Soliman's study [24] in Egypt reported improvement in sharing the decision to use modern contraception. Before the intervention, only 15 women reported that the use of modern contraception resulted from a joint decision. After the intervention, the number of women had increased by 56. The study did not present the results as proportions of women exposed.

Currently pregnant

Four studies reported the proportion of women who became pregnant during the intervention [19, 20, 32, 33]. All studies reported a decrease in current pregnancies among women of reproductive age between intervention and control groups and between pre- and post-intervention periods. Weeden *et al.*'s study in Thailand assessing the effect of a loan grant fund reported that 11.2% of women were currently pregnant at baseline in the intervention group, and 7.4% in the control group; at post-test, the proportion of currently pregnant women was estimated at 5.2% in the intervention group and 8.2% in the control group [33].

Unexpected consequences

Only one study reported an unexpected consequence resulting from the intervention [33]. Weeden *et al.* showed that the intervention (loan fund) helped enhance women's status and had a positive economic impact. Women members of the loan fund committees had more perceived respect from men [33].

Costs and cost-effectiveness

None of the included studies assessed the cost-effectiveness of demand generation interventions. Some ($n = 7$) studies reported data on costs related to the interventions [18, 26, 30, 31, 33, 35, 36]. The data reported were poor, inconsistent and old, with publication ranging from 1978 to 1998.

Weeden *et al.*'s [33] study in Thailand examined a combined grant and loan system to enhance contraceptive prevalence in six villages. The total cost of the intervention for one village was 14,500 USD (1986) [33].

Fisek and Sümbüloğlu [30] reported that the educational activities did not engender added costs for health services because they were part of health professionals' usual tasks. Those authors estimated that if the intervention had been an added activity (not routinely performed by health staff at the district level), it would have cost 25.80 USD and 6.50 USD per year per married woman of reproductive age for the husband-and-wife education and wife-only education groups, respectively, at the time of the study (1978). The cost would have been higher for the husband-and-wife group because it included an extra activity (one-to-one education of husbands) compared to the wives-only group [26]. Another study in Guatemala assessed the costs of three communication strategies used for the intervention: combination of radio spots and male promoter, male promoter only and radio spots only [34]. In that study, the total project cost was estimated at 40,609 quetzals (5,325.07 USD, 2016). A total of 14,212 quetzals (1863.62 USD, 2016) were used for the research (technical assistance, design and analysis). The least expensive intervention was the promoter only (39 quetzals per additional operation) (5.00 USD, 2016) followed by the radio only (148 quetzal) (19.40 USD, 2016). The most expensive was the combined strategy (301 quetzals per operation) (39.40 USD, 2016) [30]. None of the studies reported evidence on intervention implementation costs and on direct and indirect costs to the population.

Finally, two partial economic evaluations assessed the effect of social marketing on couple-years of protection (CYP) [35, 36]. Both studies are considered high quality. They reported that social marketing was most effective, compared to different service delivery modes, such as clinics. According to Huber and Harvey [37], 78% of CYPs (2.00 USD on average) are provided by the two most cost-effective delivery modes, which are social marketing (58%) and clinics primarily offering sterilisation (20%). According to Barberis and Harvey [38], social marketing delivered almost 9 million CYPs and had the next-lowest cost per CYP on average (2.14 USD).

Limitations

The originality of this systematic review lies in the evidence collected on the implementation, effects and costs of demand generation interventions. However, this review presents some limitations. The change theories used by the studies were often missing or variable, and many studies were not able to demonstrate changes in contraceptive prevalence rates or in numbers of new users of contraception as a result of the interventions. The heterogeneity detected on the meta-analyses was sizeable.

Subgroup analysis helped explain part of this heterogeneity, but it remained significant. Very few studies were found that met the inclusion criteria for mass media interventions. This category of interventions is usually assessed using longitudinal designs or panel surveys because of the challenge of creating a control group. Therefore, data were lacking to identify the most effective demand generation interventions among community- and facility-based interventions, mass media campaigns and financial mechanisms.

Finally, the community- and facility-based intervention category encompassed diverse types of interventions. Due to the limited number of studies for each type of intervention, it was not possible to identify which was the most effective.

Discussion

The benefits of reporting on implementation

Reporting on implementation is essential to understand the impact of programmes [39]. Yet, the quantity and quality of information on the demand generation interventions assessed in the studies reviewed here were variable and not sufficiently documented. While those studies reported data on the duration, location and mode of delivery of interventions, they did not report sufficiently on the processes of modifying and adapting the interventions and ensuring implementation fidelity.

A striking finding was the lack of use of change theory in constructing the intervention content in the studies. Demand generation interventions in family planning need to be evidence-based to enhance intervention efficiency and avoid repeating weak or unsuccessful interventions.

This review reported on implementation processes using the TIDieR (Template for Intervention Description and Replication) checklist developed by Hoffman and colleagues [40]. This checklist was useful to document the rationale, materials, procedures (how, by whom, when and where intervention took place), modifications and fidelity of the interventions. Reporting on intervention intensity was of particular interest because this element helped us understand the meta-analysis results on the outcome of current use of modern contraceptive methods. Indeed, high intensity of community-based interventions was strongly associated with current use of modern contraceptive methods. However, this checklist is mostly focused on intervention content and fidelity and not on context. Yet, context is a key element in gaining a better understanding of intervention outcomes [37, 38]. Therefore, items related to acceptability, gender and social norms are needed to better assess the effect of

interventions and to guide the replication of successful interventions [41].

Effectiveness of demand generation interventions with regard to family planning outcomes

This review has shown that demand generation interventions have been associated with improvements in use and uptake of modern contraceptive methods. Financial mechanism interventions appear to be an effective approach to increase current use of modern contraceptive methods. However, these results should be considered with caution as only three studies were included in this category of demand generation interventions. Two are old studies (1986 and 1992), and significant heterogeneity of effect was detected in the meta-analysis. In the scientific literature, there is fairly widespread enthusiasm for financial mechanism interventions, specifically vouchers and performance-based financing programs, as a means of improving access to reproductive health services [42, 43]. With regard to voucher programs, the results generally showed a positive effect of these interventions in terms of use of maternal health services (health facility deliveries) [44, 45], whereas results for performance-based financing are mixed [46, 47].

Although there were few studies on the effectiveness of financial mechanisms that met the inclusion criteria, nevertheless the three studies included in this review supported the findings of other reviews on the positive impact of this type of intervention to increase access to and use of reproductive and maternal health services in general [48, 49]. However, more studies assessing the impacts of these interventions on family planning outcomes are needed. More robust study designs are also needed to better assess these interventions' efficacy, and data on implementation and sustainability are still lacking [6, 45, 49, 50].

Although the community- and facility-based intervention category is broad and encompasses diverse types of interventions, the results showed it is also an effective approach to improve uptake of modern contraception. Some key implementation ingredients, such as family member presence during counselling and education activities and high intensity in these activities, seemed to foster increased use of modern contraceptive methods. However, to assess the most effective approach, more detail is needed on how such education and counselling activities are conducted. This finding also supported the conclusions of other systematic reviews on the positive impact of this approach [51, 52].

Strategies to increase demand for family planning are complex. Most of the interventions assessed combined more

than one activity. All the studies reviewed assessed the overall effect of the interventions. However, we do not know to which activities the results are attributable. Thus, more complex study designs, combining mixed methods and taking into account context and actors, are needed to assess multicomponent programs and active ingredients [37].

Conclusion

Few studies have documented family planning demand generation interventions in terms of effectiveness, cost and sustainability. In fact, economic analysis is nearly absent in the literature. Among the interventions that have been shown to affect the uptake and use of modern contraception are financial mechanisms and community- and facility-based interventions. However, only three studies meeting our criteria were included in the financial mechanism interventions. Two are old and were assessed as being of low quality. The community- and facility-based interventions were diverse (e.g. counselling, male motivator, home visits), and high heterogeneity of effect was detected in the meta-analysis. Due to the limited numbers of each type of intervention in the three categories (financial mechanism, community- and facility-based, and mass media), it was not possible to assess which was the most effective approach to improve family planning outcomes.

Most of the studies were of poor quality. Insufficient data were available on implementation and context because few process evaluations were conducted. Very few of the studied interventions were theory-based, which is surprising in the era of evidence-based interventions.

Limited evidence was available on costs. The studies assessing costs were old and of poor quality. More research is needed to strengthen the findings of this review and to build evidence to support the sustainability and scaling-up of demand generation interventions, for instance, by measuring costs and cost-effectiveness.

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Supporting Information

Additional Supporting Information may be found in the online version of this article:

Appendix S1. Research strategy on effect of demand generation interventions on uptake and use of modern contraceptives in LMIC.

Appendix S2. Reporting data on implementation process of demand Interventions according to Hoffman's checklist.

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