

Cost-effectiveness of long-acting reversible contraceptive methods: a review

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ABSTRACT

Long-acting reversible contraception (LARC) methods are proven to be effective in preventing unintended pregnancies. Evidence on cost-effectiveness of these methods will enable policy makers to introduce them in national policies and programs to improve contraceptive access. The aim was to review the studies based on economic evaluations of LARC methods and provide evidence to policy makers to renew their commitment to family planning access. A review of studies on economic evaluations of LARC methods was done. This article uses data from three electronic databases: PubMed, Cochrane and Web of Science to examine whether LARC is cost-effective for clinical trials. The results are presented as a narrative review and summary tables. The literature search yielded 87 studies and 12 studies (five economic evaluations studies from USA) and (five studies from Europe while two studies were from low and middle-income countries) were included. Out of 12 papers, nine had multiple comparators; seven included female sterilization as a comparator, while two studies compared one individual LARC contraceptive method with an individual SARC method. All studies consistently showed that LARCs dominated all SARC (short acting reversible contraceptives) methods. Within LARC, copper IUD, LNG-IUS and implant were more cost-effective than DMPA. After a period of five years, female sterilization turned out to be more cost-effective than LARC methods. LARC methods are cost-effective as compared to SARC methods, especially after 1 year of use. Vasectomy is more cost-effective than LARC methods. Policy makers can consider the findings of this review to aid decision making in contraceptive method introduction or scale-up access.

Keywords: Long-acting reversible contraceptive, Cost-effectiveness, Short acting reversible contraceptive, Narrative review, Economic evaluation

INTRODUCTION

There were 1.9 billion women in the reproductive age of 15-49 years in the world in 2019. Of them, 1.1 billion required family planning (FP), 842 million of whom used contraceptive methods and 270 million had unmet need of contraception.^{1,2} Female sterilization and male condoms are preferred the most in the world. 42% women did not need contraception and 10% had an unmet need. 27% used LARC methods which included intra-uterine device

(IUD), copper or levonorgestrel, either combined or progestin-only implants and injectable contraceptive.³

Differences in contraceptive prevalence across countries may be attributed to biomedical, socio-cultural and policy aspects. In developed (high-income) countries, women relied mostly on oral contraceptives (OC pills) and condoms. In low and middle-income countries, only 6.5 percent of women used IUD and 1.8 percent used injectable.⁴ In this paper we explored the cost-

effectiveness of LARC methods to aid governments in making decisions on introducing or scaling up LARC methods.

LARC as contraceptive methods requiring administration less than once per cycle or month.^{5,6} LARC methods like IUDs and subdermal implants and injectables provided a safe and clinically-effective option that could help women space or limit births.^{7,8} Evidence suggested that increased use of LARC methods reduced unintended pregnancy and abortion rates.⁹ While their use in some developed nations was gradually increasing, they remained uncommon in most low- and middle income countries (LMICs).^{7,10-12} Reducing barriers to access of LARC methods may continue to help lower unintended rates of pregnancy.¹³

Lower-middle and low-income countries account for 1% to 4% use of implants and IUDs compared to 16% IUD users in upper middle and 6.5% in high-income countries. Asia accounts for very low implant users ranging from 0% in Iran and India to 0.3% in Pakistan. Most African countries have low prevalence of LARC methods.¹⁴

Our review on cost-effectiveness studies of LARC was aimed at providing evidence to policy makers of these countries to renew their commitment to FP access. The availability of one contraceptive method to a population enables a four to eight percentage points improvement in contraceptive prevalence.¹⁵ Cost-effectiveness analysis (CEA) took into account all costs and health effects and helped policy makers to prioritize available alternatives within the limited healthcare resources.

Methods

A narrative literature review was carried out to find cost-effectiveness studies on LARC methods. The review summarized descriptive data specific to 4 LARC devices (etonorgestrel subdermal implant, copper-IUD and levonorgestrel intra-uterine system (LNG-IUS)). The search was conducted using 3 electronic databases: Medline via PubMed, Cochrane and Web of Science for published evidence from January 2000 to August 2020. The list of search terms used is provided in Appendix 1. Only English-language studies were included. PICOT criteria were developed for selection of the studies to be included in the current study. Population of interest was women using LARC method. Comparison of the LARC interventions, to other LARC methods, no method, sterilization, SARC methods or a combination of different methods were included for this review. Only economic evaluation type of studies were included either model based or alongside an RCT or an observational study. Studies that compared individual contraceptive methods or compared different hypothetical scenarios in a model were included. Studies that evaluated the cost-effectiveness of the different timing of insertion of LARC were excluded. Costing studies that did not compare cost-effectiveness of different contraceptives or were not economic evaluation studies were excluded. Reviews on cost-effectiveness of

LARC were excluded for our review; but are referred to in the discussion section of this paper.

Data from included studies were extracted to obtain information on author, year of publication, study settings including country context where economic evaluation was conducted, type of LARC, whether the economic evaluation was done alongside an RCT or COHORT study or whether it was model based and if model based, type and structure of model, model characteristics, measured outcomes and study population characteristics. All studies that were included were evaluated critically using the CHEERS checklist. The checklist had 24 items to assess quality.

Results

The literature search in the 3 electronic databases yielded 87 studies. After title and abstract screening, 12 papers were selected for the review. A brief summary of the included studies is presented in Table 1.

Study designs of included studies

Eleven (91.6%) of the 12 economic evaluations were model based, with seven of the eleven model type being Markov models. Four of the studies did not specifically mention the type of model used. These studies described the model conceptually, but did not explicitly mention the model type. One of the studies was not model based and the economic evaluation was conducted based on a COHORT study of implanon users.¹⁶ Six studies considered the societal perspective, four were from health system or provider perspective and two were from third-party payer perspective.

Country of origin of authors

Five (41.6%) of the economic evaluations were done by authors based in the USA and five (41.6%) of the studies had authors from Europe. Only two (16.6%) of the studies were by authors from low and middle-income countries, 1 from Iran and another from India.

Comparators

Nine of the 12 papers had multiple comparators. Five of the economic evaluations compared more than five individual contraceptive methods. Seven of the studies included sterilization as a comparator. Two studies compared 1 individual LARC contraceptive method with an individual SARC method: Implanon as compared to OC pill and LNG-IUS 13.5 mg as compared to OC pill.^{16,17} Only one study compared two scenarios, one with standard of care and the other with etonorgestrel contraceptive implant added to the standard of care.

Outcomes

Reported as cost savings

Five of the 12 studies had defined outcomes as cost savings. The costs of different contraceptive methods were compared and cost savings over the different time horizons were reported.

Chiou et al in 2003 in USA showed that LNG-IUS, copper-IUD and 3-monthly injectables were the least expensive with cost-savings of 1646 USD, 1678 USD and 2195 USD per woman per year.¹⁸

Sonnenbrerg et al showed in 2004 in the USA compared various contraceptive methods to non-use of contraception.¹⁹ Their results showed that there were cost savings in the range of USD 5907 per woman for tubal sterilization to USD 9936 for vasectomy with a time period of 2 years. All LARC methods had higher cost savings as compared to SARC methods. Copper IUD and LNG-IUS had cost savings of USD 9765 and USD 9763 respectively while oral contraceptive pills had cost saving of USD 8829; measured over a 2 year period.

Lipetz et al showed in 2009 in United Kingdom that providing Implanon® was more cost-effective than providing oral contraceptive pills.¹⁶ Implanon® was half as expensive as oral contraception after using for 1 year.

Foster et al showed in 2013 in USA, that among 11 methods of contraception, intrauterine contraception (both copper and hormonal) and etonorgestrel implants showed the most cost savings.²⁰ For every USD spent on users these LARC were able to save 5 USD. For all the 11 methods, the cost of an unintended pregnancy on failure of the method was much higher than the cost of providing the contraception.

Henry et al showed in 2015 in Sweden that use of LNG-IUS 13.5 mg resulted in costs savings of 311000 Euros among 1000 women of aged 15-44 years. Also, the study showed that among women using the LNG-IUS, 55 unintended pregnancies were reported as compared to 294 among the women who used oral contraceptive pills.

Reported as cost per couple-years of protection

Two of the studies reported cost per couple-years of protection (CYP) between comparators.

Philips et al showed in his study, done in Wales in 2000 that the cost per CYP for Implanon® was GBP 95 and the cost per CYP was GBP 168 for LNG-IUS. The injectable contraceptive DMPA showed a cost per CYP of 131; hence, the implant was more cost-effective than the DMPA.

Nakhaee et al study in Iran in 2002.²¹ This study used real world data and one couple year of protection meant that a

couple who used the contraceptive method did not conceive for a period of one year. The cost per adjusted couple years of protection was lowest for vasectomy at 10.4 USD and copper IUD at 13.4 USD. It was highest for implants at 82.8 USD.

Reported as incremental cost-effectiveness ratios (ICER)

Four of the studies had ICER as outcome. One of the studies had incremental cost-utility ratio (ICUR) as outcome.

Varney et al reported from the UK NHS perspective in 2004.²² The study showed that using LNG-IUS or etonorgestrel implant was more cost-effective as compared to using DMPA. Also, using the implant instead of LNG-IUS was the least cost-effective method. Hence LNG-IUS dominated among the three options.

Mavranouzouli et al study in 2008 in UK showed that the ICER of implant versus IUD was GBP 13206 per unintended (UIP) averted over one year of use.²³ The ICER decreased progressively until at 15 years, the implant became more cost-effective than IUD. The LARC methods were more cost-effective than oral contraception. Female sterilization overtook the LARC methods after five years of use. Among the LARC methods, DMPA and LNG-IUS were not as cost-effective as copper IUD and implants.

Trussel et al study in the USA in 2009 showed that keeping copper-IUD as reference, ICER values of vasectomy, LNG-IUS and implants were 164, 1415, 3828 USD per unintended pregnancy averted.²⁴ The rest of the methods including sterilization and SARC were more expensive and less effective than copper-IUD; hence not cost-effective.

Trussel et al in 2014 showed that in the USA, LNG-IUS 13.5 mg was more cost-effective as compared to SARC methods comprising of OC pill, ring, patch and contraceptive injections.¹⁷ Compared to women using SARC methods, who reported higher UIP of 276; women using LNG-IUS 13.5 mg reported 64 UIP. Women using LNG-IUS had lower total costs of 1,283,479 USD as compared to 1,862,633 USD among SARC users resulting in a saving of 31% during the time horizon of three years. This study reports costs and outcomes separately and does not report ICER. We have calculated the ICER from the given information and reported in Table 1.

Joshi et al in 2020 from India used a different approach.²⁵ Instead of cost-effectiveness of individual contraceptive methods, cost-effectiveness of adding a new contraceptive method (etonorgestrel implant) to the existing scenario in India was assessed. This study showed that the ICUR of standard of care scenario as compared to addition of Implanon® scenario was 232 USD implying that adding the implant to the public health system of India would be cost-effective.

Table 1: Included studies in the cost-effectiveness review.

Author, year of publication	Country, time horizon	Comparisons	Model type	Target population (age)	Discount rate; currency/price date	Perspective used	Outcome	Interpretation for policymakers (> stands for better than)
Philips 2000	UK, Europe	Implanon versus Norplant versus Mirena versus DMPA	Decision tree	Not specified	Discounted UIP but not costs	Healthcare service	Cost per CYP: £95 for Implanon; £146 for Norplant; £168 for Mirena and £131 for DMPA	ImplanonLNG-IUS and ImplanonDMPA
Chiou et al 2003	USA	Nine contraceptive methods (including 3-month injectable, oral contraceptives, IUD, intrauterine system (IUS), barrier methods and surgical methods)	Markov model	Women who do not intend to have children for the next five years	3% for costs	Third-party payer	Cost saving per person for 5-year: \$1646 for LNG-20 IUS, \$1678 for Copper-T 380A and \$2195 for 3-month injectable	Copper-T 380A>LNG-IUS and DMPA>Copper-T in terms of cost savings
Nakhaee et al 2002	Iran; NR	Seven Individual methods compared: IUD, injectable, OC, condom, implants, tubal ligation, vasectomy	Not mentioned	Couples of reproductive age (not specified).	Not applied; US\$2000	Provider perspective (institutional)	Cost per CYP: vasectomy cheapest \$10.4, IUD \$13.4, OCP \$21.1, condoms \$24.1, tubal ligation \$27.8, injectables \$46.8, implants \$82.8	Vasectomy > Copper-IUD and Implanon has least cost saving
Sonnenberg et al 2004	USA; two years	13 methods compared to non-use: COC, transdermal contraceptive patch, vaginal ring, male condom, diaphragm, copper IUD, LNG-IUS, DMPA, oestrogen-progestin monthly	Markov model	15-50	3%; 2002 USD	Societal perspective	Cost savings for 2 years versus no method: 9765 USD for copper IUD; 9763 USD for LNG-IUS; 9815 USD for DMPA	Similar cost savings for copper-IUD and LNG-IUS

Continued.

Author, year of publication	Country, time horizon	Comparisons	Model type	Target population (age)	Discount rate; currency/price date	Perspective used	Outcome	Interpretation for policymakers (> stands for better than)
		injectable, periodic abstinence, withdrawal, tubal sterilisation, vasectomy						
Varney et al 2004	UK; UK NHS; varied	Depo-Provera, Implanon, Mirena	Not mentioned	> 30	3.5%; 2002/2003 GBP	Societal perspective	ICER of £20 953 per additional pregnancy averted for Mirena versus Implanon (in favour of Mirena)	LNG-IUS > Implanon
Mavranzouli 2008	UK; 15 years	LARC versus COC versus female sterilization	Markov model	Reproductive age (not specified)	3.5%; 2005 GBP	Societal perspective (UK NHS)	ICER of implant versus IUD was £13 206 per pregnancy averted at one year of use; implant dominates IUD at 15 years. ICER of £38 197 per pregnancy averted for Oral contraceptive versus LARC (favouring LARC). After six years Female sterilization dominated all LARC	Implanon > IUD at 15 years and LARC > oral contraception and Female sterilization > LARC at 6 years of use
Lipetz et al 2009	Wales community; three years	Implanon versus OC pill	Alongside a cohort study; not model-based	Not specified	None; none (GBP)	Annual health costs (Wales NHS)	Cost per patient per cumulative years of use at completion of three years of use: £50 in Implanon versus £83 for Oral contraception	Implanon > oral contraception in terms of cost savings

Continued.

Author, year of publication	Country, time horizon	Comparisons	Model type	Target population (age)	Discount rate; currency/price date	Perspective used	Outcome	Interpretation for policymakers (> stands for better than)
Trussell et al 2009	USA; health care payer; five years	16 individual methods compared with non use: IUDs, sterilisation, condoms, implants, behavioural, other barrier, OC, transdermal patch, injectable, no contraception	Markov model	Not specified	3% to costs; 2007 USD	Societal perspective	All ICERs relative to copper IUD: vasectomy \$164 per one point reduction in the annual probability of pregnancy; LNG-IUS \$1415; implants \$3828; all other methods dominated by copper IUD	vasectomy> LNG-IUS and Implant with reference to copper IUD
Foster et al 2013	USA; two years	Individual methods compared: Interval tubal ligation, tubal occlusion, copper IUC, hormonal IUC, Implanon, injectable, ring, patch, OC, barriers, emergency contraceptives	Not mentioned	15-44	None; 2009 USD	Public health program (not clear)	Cost savings per dollar expenditure: Highest for Implant, Copper IUD and Hormonal IUD at 5, 5 and 4.89 USD respectively	Implant=Copper-IUD> Hormonal IUD in terms of cost savings
Trussell et al 2014	USA; institutional; three years	LNG-IUS 13.5mg vs SARCs	Markov model	22-29	3% to costs; 2012 USD	Third-party payer	ICER of 2731 USD per Unintended pregnancy averted in favour of LNG-13.5mg-IUS as compared to SARC	LNG-13.5mg IUS> SARC
Henry et al 2015	Sweden; three years	Novel LNG-IUS (13.5 mg) versus oral contraceptive	Markov model	15-44	3%; converted to Euros 27/1/15	Societal perspective including direct and indirect costs	ICER of €1302.7 per Unintended pregnancy averted and € 230629 per QALY gained; both in favour of LNG-IUS as compared	LNG-13.5mg> oral contraception

Continued.

Author, year of publication	Country, time horizon	Comparisons	Model type	Target population (age)	Discount rate; currency/price date	Perspective used	Outcome	Interpretation for policymakers (> stands for better than)
Joshi et al 2020	India	Etonorgestrel implant scenario versus Standard of care scenario	Markov model	15-45 years	3%. INR and USD, 2018	Societal	to oral contraceptives ENG Implant scenario is cost-effective with ICER 232 USD cost per QALY gained	Addition of ENG implant > current scenario without implant

Table 2: Critical appraisal of included studies.

CHEERS checklist	Estimating resources and cost	Currency price date and conversion	Choice of model	Assumptions	Analytic methods	Study parameters	Incremental costs and outcomes	Characterising uncertainty	Characterising heterogeneity	Study findings, limitations, generalisability and source of funding	Conflicts of interest			
Philips 2000	Y	N	N	Y	Y	Y	N	SW	SW	Y	N	N	Poor	
Nakhaee et al 2002	Y	Y	Y	Y	Y	Y	N	SW	SW	SW	Y	N	Poor	
Sonnenberg et al 2004	N	Y	Y	Y	Y	Y	N	SW	SW	Y	Y	N	Poor	
Varney et al 2004	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	Fair	
Mavranezouli 2008	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Good	
Lipetz et al 2009	Y	N	N	Y	Y	Y	N	Y	Y	N	N	N	Poor	
Trussell et al 2009	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Good	
Foster et al 2013	Y	Y	N	Y	Y	Y	N	Y	Y	Y	N	N	Poor	
Trussell et al 2014	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Good	
Henry et al 2015	N	Y	Y	Y	Y	Y	N	Y	Y	N	Y	Y	Fair	
Joshi et al 2020	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Good	
Chiou et al 2003	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Fair	

Summarizing results on cost-effectiveness of LARC

The 6 studies that reported outcomes in terms of cost savings showed the following: LARC cost-savings were higher than SARC; however, cost saving in vasectomy was highest. Out of 11 contraceptive methods, most cost

savings occurred in copper-IUD and implants. LNG-IUS 13.5 mg was more cost-effective as compared to oral contraceptive pills, contraceptive ring, patch and injectable contraception. There were more cost-savings in the use of LNG-IUS as compared to oral contraceptives. The two studies that reported results as cost per couple years of

protection showed that implants were more cost-effective than LNG-IUS and DMPA. Cost per CYP was lowest for vasectomy and copper-IUD and highest for implant. The studies that reported ICERs showed the following: LNG-IUS or implant was more cost-effective than DMPA. LNG-IUS was more cost-effective than implant. LARC was more cost-effective than SARC; but female sterilization turned out to be more cost-effective than LARC after five years of use. Among LARC, copper-IUD and implant were more cost-effective than LNG-IUS.

Hence from all the above it was consistently observed that LARC was more cost-effective than SARC. Sterilization became more cost-effective than LARC after five years of use. But there was some inconsistency as to which LARC method was most cost-effective. Copper-IUD emerged as cost-effective, however between LNG-IUS and implants studies reported differently as to which was more cost-effective. Of the 12 studies, 8 studies considered the etonorgestrel contraceptive implant (Implanon®); three studies did not mention the type of implant and one considers Norplant (levonorgestrel implant).

Critical appraisal of included studies

All included studies were evaluated critically and the appraisal was presented in Table 2. Studies have been marked as good, fair and poor quality based on their scores. Out of 24, a score of less than 18 was considered poor; 19-22 was fair and 23-24 as good. Five (41.7%) of the included studies were of poor quality, four (33.3%) were of good quality and three (25%) were of fair quality.

DISCUSSION

This review aimed at summarizing cost-effectiveness information on LARC including copper-IUD, LNG-IUS, implants and DMPA. Literature search revealed that there were only a handful of studies on this subject. Most of the included studies have demonstrated cost savings by using contraception as compared to no-contraception and have further shown that LARC methods generate higher cost savings. Only two studies report cost per couple years of protection. One of these studies showed highest cost per CYP for implant. This was the only study that showed implant to be not cost-effective. This was probably because the study used real-world data from Iran in 2002 and the least number of users were for the implant (n=257) while other methods had much higher number of acceptors such as condoms (2077540) and OC pill (197487). Only four studies reported ICERs. One study reported costs and outcome differences separately but did not compute ICER. Only one study from India assessed cost-effectiveness of adding implant to existing scenario and found that addition of implant to the public health system of India was cost-effective. Of the 12 studies included in the review, majority (10 of 12 or 83.3%) were by authors from developed countries.

In 2018, Lynch et al reviewed the cost-effectiveness of LARC in the Australian context in a narrative review.²⁶ They chose studies that reported cost per pregnancy averted. They aimed to review literature to assess if it was generalizable to the Australian context. They also assessed the quality of the 20 included studies using the CHEERS checklist. Overall the review concluded that LARC methods were more cost-effective than oral contraception but highlighted that there were limitations in study quality. Nine studies were common between our review and the review done in 2018. The additional 11 studies included in their review were either older than the year 2000 or did not fit our PICOTs criteria. Of the 20 studies that Lynch et al reviewed; the average score on the CHEERS checklist was 62/100, showing that the overall quality of studies was low. The reasons for this include non-availability of data on aspects of contraception like failure and discontinuation rates. Nine of the 20 included studies in their review derived most of their data from two reference studies using data from the American national survey of family growth. These two studies reported data that was one to two decades old. The review concluded that although many of the included studies were not of the best methodological quality, it was likely that, LARCs were cost-effective from a policy perspective and that LARCs were more cost-effective as compared to oral contraceptives.

Despite consistency across studies that LARC were cost-effective; their acceptance rates were very variable. In countries like India LARC use accounted to <5% and female sterilization accounted to 75% of contraceptive method mix. A few Central Asian and African countries like Egypt report IUDs to comprise more than 50% of the method mix. Implants were yet to be used in the public health system of countries like India, while a few African countries like Burkina Faso, Benin, Senegal, Mali and Ghana had >25% of their contraceptive users using implants.²⁷ The contraceptive method mix in the USA showed that roughly 25% each were OCP users and sterilization. However there has been a steady increase in LARC users from 6% in 2008 to 14% in 2014.²⁸ Overall contraceptive use of the world showed that IUDs and implants account to less than 20%; DMPA accounted to 8%, pills to 16%. Female sterilization and male condoms were the commonest methods used in the world 24% and 21% respectively.²⁹

It was evident that the difference in availability and prevalence of contraceptive use depended on policies adopted and implemented by different countries. The health systems in different countries varied greatly as well; ranging from completely publicly-funded and regulated health systems to health systems that relied heavily on private and un-regulated markets. It was hence important from a policy perspective that the most cost-effective options among contraceptives like copper-IUD, LNG-IUS and implants be available to all women who needed it in all countries of the world. The contraceptive prevalence report by United Nations for 2019, showed that prevalence of IUD use (the report combines copper IUD and LNG-

IUS into one category) was less than 1% in 43 African countries and three Asian countries. Prevalence of implants (the report considers all types of contraceptive implants including combination and progestin-only implants) was less than 1% in 20 African countries and 36 Asian countries. This showed that there was a large scope for improving access and uptake of contraceptives.

This review can be used as an evidence compilation of cost-effectiveness of LARC methods where the IUD, IUS and the implant consistently turn out cost-effective. This could be used to influence policy in several countries. However, the outcomes reported in these included studies were different (cost-savings, cost per CYP and ICER) and hence statistically combining these outputs was not feasible. Also, most studies were from high-income countries, with only 2 studies from low and middle income countries. The included studies reported their findings in different currencies (pounds, US dollar). We have not converted or inflated these values to current year. The two reasons for this were: the studies were very heterogeneous to statistically combine the findings; intra-study comparison of LARC was meeting the objective of our review not necessitating inter-study comparison. Perspectives used in the models and the type of health systems in the context of the studies were heterogenous as well. Hence countries could either conduct their own economic evaluation of LARC or use this review's findings to bring about positive changes in their contraceptive policy. 41.7% of included studies were of poor quality as per the CHEERS checklist. This needed to be considered while decision-making.

In countries where all the cost-effective LARC were available but there was low acceptance of LARC; reasons needed to be explored. The reasons may vary from lack of access, to lack of information or choice of women to avoid side-effects of hormonal methods. It was hence important to understand the needs and preferences of women locally and ensure that the unmet need of contraceptives was brought down to zero.

A few current international programs that supported commitments to focus and address the unmet need for contraception were the sustainable development goals (SDG), every woman every child (EWEC) and family planning 2020 (FP2020) agenda 2030. The progress that had been achieved in increasing access to family planning needed to be monitored to identify gaps in health systems, funding and research. Of the 17 SDGs and various targets, 1 of them was the target 3.7 that stated ensure universal access to sexual and reproductive health (SRH) services, including FP, by 2030. EWEC aimed at ending preventable deaths of women, children and adolescents and ensuring their safety and well-being; this required universal access to SRH services and rights by the year 2030. FP2020 seeks to extend access of FP to at least 120 million women and girls in some of the world's poorest countries by the year 2020, aiming for a significant increase from the baseline year of 2012.³⁰⁻³² In 2019, 49

percent of women in the reproductive age range (15-49 years) (a total of 22 million women) used some form of contraception worldwide, an increase from 42 percent in 1990 (a total of 554 million women). In 2019, contraceptive use among reproductive-age women was over 55 percent in 37 countries and in 23 countries it was below 20 percent.³³ These commitments have enabled an increase in contraceptive prevalence over the past few decades and yet there was a huge unmet need for contraception, especially spacing methods.³⁴ These continued efforts with back up of evidence on cost-effectiveness will help expanding the basket of contraceptive choices and achieve SDGs translating to better quality of lives for women and their families.

CONCLUSION

All studies consistently showed that LARCs dominated all SARC methods. Within LARC, copper IUD, LNG-IUS and implant were more cost-effective as compared to DMPA. Vasectomy was found to be more cost-effective as compared to LARC and female sterilization was more cost-effective than LARC after five years' time duration.

Recommendations

The recommendations were to utilize evidence to include the three cost-effective LARC methods: copper-IUD, LNG-IUS and implants in the health system. Acceptability and feasibility studies were prerequisites to program introduction strategies that could help achieve improved uptake of LARC methods.

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APPENDIX 1: CHEERS checklist evaluation of quality of included studies.

CHEERS checklist	Title-1	Abstract-2	Background and objectives	Target population and sub-groups	Setting and location	Study perspective	Comparators	Time horizon	Discount rate	Choice of outcomes	Measurement of effectiveness	Measurement and valuation of preference-based outcomes
Philips 2000	Y	N	Y	N	Y	N	Y	SW	N	Y	N	Y
Nakhaee et al 2002	Y	Y	Y	N	Y	Y	Y	N	N	Y	N	Y
Sonnenberg et al 2004	N	N	N	Y	Y	N	Y	Y	Y	Y	N	Y
Varney et al 2004	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	SW	Y
Mavranouzouli 2008	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y
Lipetz et al 2009	Y	Y	Y	N	Y	Y	Y	Y	N	SW	N	Y
Trussell et al 2009	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y
Foster et al 2013	N	N	N	Y	N	N	Y	Y	N	Y	N	Y
Trussell et al 2014	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Henry et al 2015	Y	Y	Y	Y	Y	Y	SW	Y	Y	Y	N	Y
Joshi et al 2020	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Chiou et al 2003	SW	Y	Y	N	N	Y	N	Y	Y	Y	SW	Y

Note: Y=yes; N=no; SW=some what.