

# HEART

HEALTH & EDUCATION ADVICE & RESOURCE TEAM

## Helpdesk Report: Evidence for the greater cost-effectiveness of long acting methods in family planning

Date: 20<sup>th</sup> June 2016

**Query:** What is the evidence for the greater cost-effectiveness of long acting methods in family planning?

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### 1. Overview

Modern contraceptives can be categorised into those which are short acting and those which are long acting / permanent. Methods of long acting reversible contraception (LARC) include the hormonal contraceptive implant, the intrauterine device (IUD) and the intrauterine system (IUS). The implant is a small plastic rod which is surgically inserted until the skin of the woman's upper arm. It releases a progestin hormone and can last for up to five years. The IUD is a small device made from plastic and copper which is placed into the uterus. It can last five to ten years depending on the type. The IUS is a small plastic device which releases a progestin hormone and is placed into the uterus. It can last three to five years depending on the type. Permanent, or non-reversible, methods of contraception include male and female sterilisation. Short acting contraceptives include the contraceptive pill, contraceptive injection, male condoms, female condoms, contraceptive sponges, cervical caps, diaphragms, hormonal patches, the contraceptive ring, and spermicides<sup>1,2</sup>. Some reports refer to the contraceptive injection as a long acting contraceptive, but with each injection providing approximately three months of contraceptive protection, it is more appropriately categorised as a short term measure. For the purposes of this report, permanent methods are included within the category of long acting contraceptives.

This report explores the evidence for the greater cost-effectiveness of long acting contraceptives, as compared with short acting contraceptives. Although there is strong

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1 National Institute of Child Health and Human Development (2012) *What are the different types of contraception?* Accessed 20/06/16 from: <https://www.nichd.nih.gov/health/topics/contraception/conditioninfo/Pages/types.aspx>

2 The Family Planning Association (2014) *Long-acting reversible contraception (LARC)*. Accessed 20/06/16 from: <http://www.fpa.org.uk/contraception-help/long-acting-reversible-contraception-larc>

evidence on this topic from developing countries, it was found that many of the most robust studies were on developed countries. Evidence from both has therefore been included. It was also found that there was relevant evidence available on the effectiveness of long acting contraceptives, which has also been included to support and expand upon the cost-effectiveness evidence. Overall, the evidence is overwhelmingly in favour of long acting contraceptives as more cost-effective than short acting contraceptives, as despite their higher initial costs, they are both cheaper in the long run and prevent more unintended pregnancies, largely due to the drastically reduced risk of user error. Sterilisation is identified in several studies as one of the most cost-effective options, but its use is more limited as it is generally irreversible. The evidence suggests that the IUD is the most cost-effective method of reversible contraception.

### **Cost-effectiveness – Evidence from developing countries**

The key message from the evidence included in this section and the following section on evidence from developed countries is that although long acting and permanent methods of contraception incur higher initial costs than short acting methods, the long term protection that they provide and substantially greater effectiveness at preventing unintended pregnancies means that their overall cost-effectiveness is higher. Singh et al. (2014) describe this key message, including providing data identifying IUDs and sterilisation as having the lowest annual direct costs. The report by USAID (2006) also identifies the IUD as being the most cost-effective method of contraception available. Singh & Darroch (2012) present similar information, adding that the average direct costs are highest for implants, injectables and pills. They provide detailed data on the direct annual costs of a range of contraceptive methods, with a breakdown by region (Africa, Asia and Latin America & the Caribbean) and type of cost. The information provided in these reports is further supported by the related report by Darroch et al. (2016). Family Health International (2007) agrees that long acting and permanent methods of contraception are usually less expensive than short acting methods over time. However, it offers a slightly different analysis in terms of the most cost-effective of the methods, suggesting that if used for at least three years, the IUD, vasectomy and implant are the three most cost-effective methods of contraception when all direct medical costs including unintended pregnancies are taken into account. The report states that during one year of typical use, long acting and permanent methods of contraception are between three and 60 times more effective than short acting methods, and that continuation rates for these methods are much higher. Blumenthal et al. (2011) identify the IUD, injections and implants as more cost-effective than condoms and the pill.

### **Cost-effectiveness – Evidence from developed countries**

This section explores the evidence from developed countries on the greater cost-effectiveness of long acting contraceptives as compared to short acting contraceptives. It provides further support to the evidence from developing countries that, despite the higher upfront costs, long acting contraceptives provide greater cost-effectiveness due to the duration of contraceptive protection and greater effectiveness of the methods. Cleland et al. (2011) state that long acting contraception is firmly more cost-effective as it is both more effective and less expensive, with IUDs and the implant costing under half the cost of oral contraceptives if used for five years. Trussell et al (2009) found that the IUD, vasectomy and IUS were the most cost-effective contraceptive methods available, as determined by method costs, the cost of an unintended pregnancy and their duration. Mavranouzouli et al. (2008) found that long acting reversible contraceptives, including the implant, IUD and IUS were both more effective and less costly than the oral contraceptive pill. Female sterilisation was found to be more cost effective than LARC methods after five years. The report from NICE (2005) found that the average annual cost to the NHS was lower for the IUD and IUS than the oral contraceptive pill. Lipetz (2009) found that the implant was more cost-effective than oral contraception at all points in time, being both much more effective and less expensive. Trussell et al. (2014) found that the IUS resulted in both fewer unplanned pregnancies and lower costs than short acting contraceptives. A study by Hassan et al. in 2014 found that the IUS both resulted in fewer unplanned pregnancies than oral contraceptives and was

substantially less expensive. Han et al., 2014, found that immediate postpartum implants were much more cost-effective than standard contraceptive initiation from 12 months onwards. Mavranezouli et al (2006) demonstrated that LARC are both more effective, and, overall, less costly than the contraceptive pill and the male condom even over short time periods; the implant and IUS were found to be less expensive starting from Year 2, but were considered to be cost-effective from Year 1 due to the increased number of unintended pregnancies averted. Male and female sterilisation were ultimately more cost-effective though they have the notable disadvantage of being largely irreversible. Trussell et al. (2015) found that even if LARC methods are not used for their full duration of efficacy, they become cost-saving relative to short acting contraceptive methods within three years of use, with the IUD and IUS being the least expensive methods.

### **Effectiveness – Evidence from developing countries**

The key message from this and the following section on evidence from developed countries is that although both short and long acting contraceptives are extremely effective with perfect use, the far greater potential for user error when using short term contraceptives results in a drastically increased failure rate for these methods; long acting contraceptives are therefore much more effective at preventing unintended pregnancies in practice. Unfortunately, limited robust evidence from developing countries on this topic was identified; however, there is ample evidence to this effect from developed countries in the following section. Darroch et al. (2011) note that women using a long acting or permanent method of contraception were far less likely to become pregnant than those using a short acting method. This is attributed to the difficulty of using short term methods consistently and correctly; by contrast, long acting and permanent methods are described as much less susceptible to user error.

### **Effectiveness – Evidence from developed countries**

This section explores the evidence from developed countries on the effectiveness of long acting contraceptives as compared to short acting contraceptives. All of the studies and reports identified found long acting contraceptives to be more effective in preventing unintended pregnancies than short acting contraceptives. Winner et al. (2012) found that the contraceptive failure rate among participants using contraceptive pills, patch or ring was 4.55 per 100 participant years, as compared with 0.27 among participants using LARC. The failure rate was almost double for participants under the age of 21 using short acting methods compared with those over 21, whereas the failure rate among LARC participants did not substantially vary dependent on age. Boonstra (2013) suggests that, although short acting contraceptives have very low failure rates with perfect use, in the real world, many couples do not use these methods consistently or correctly, with adolescents twice as likely to experience a contraceptive failure. LARC virtually removes the risk of user error. Boonstra identifies LARC as the most effective contraceptive approach, resulting in less than one pregnancy per 100 women per year. Stoddard et al. (2011) concur that in practice LARC is drastically more effective than short acting methods, with the key benefit of LARC methods being that they bring typical use failure rates more in line with perfect use failure rates as they are not so dependent on user compliance. The data from Hatcher et al. (2011) also supports this assessment, providing evidence that while the LARC failure rate with typical use is almost identical to perfect use, the failure rate of short acting methods with typical use is drastically higher than it would be with perfect use. Peipert et al. (2012) found a statistically significant reduction in the number of repeat abortions following their study where they promoted the use of LARC methods. Shoupe (2016) describes how current LARC methods are easy to use, safe, long lasting, quickly reversible and 20 times more effective than oral contraceptive pills.

### **Other useful resources**

This section includes additional relevant studies, which do not directly fit into the cost-effectiveness or effectiveness section. Morse et al. (2013) note that there is very low provision of long acting contraceptives in South Africa and Zimbabwe, with many clinicians desiring additional training. This is described as being of particular concern in light of the high

rates of unintended pregnancy among HIV-positive and at-risk women. Ngo et al. (2013) describe Marie Stopes International's successful programme to promote access to long acting reversible contraception and permanent contraception in 11 sub-Saharan African countries. Staveteig et al. (2015) describe how LARC has the lowest discontinuation rates of modern methods, perhaps due to the need for health provider removal.

## 2. Cost-effectiveness – Evidence from developing countries

### **Adding it up: The Costs and Benefits of Investing in Sexual and Reproductive Health 2014**

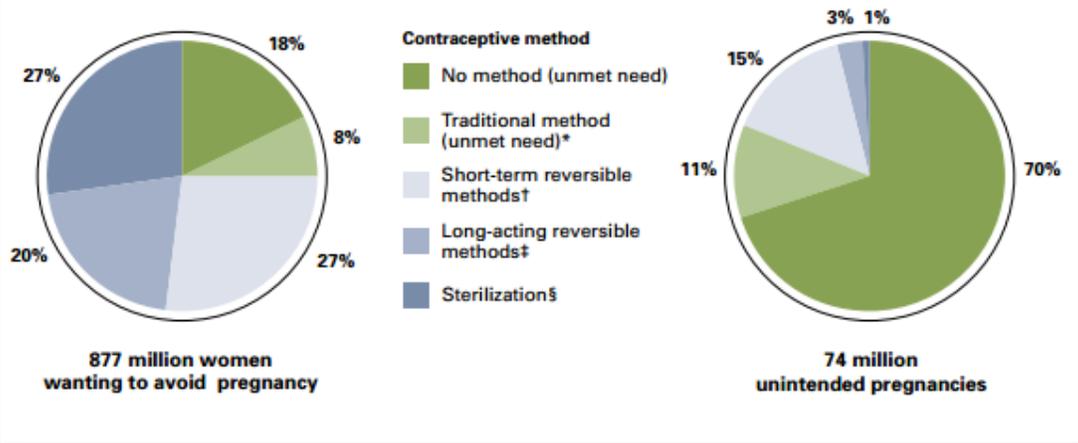
Singh, S., Darroch, J., Ashford, L. (2014) Guttmacher Institute and UNFPA  
[https://www.guttmacher.org/sites/default/files/report\\_pdf/addingitup2014.pdf](https://www.guttmacher.org/sites/default/files/report_pdf/addingitup2014.pdf)

This is a report on the costs and benefits of investing in sexual and reproductive health, which includes detailed information on the comparative costs of different contraceptive methods. It describes how the current cost of modern contraceptive services for 652 million users in the developing world in 2014 is an estimated \$4.1 billion. This estimate includes the costs of contraceptives and related supplies (\$1.3 billion), health worker salaries (\$0.7 billion) and programme and systems costs (also called indirect costs, \$2.1 billion). The indirect costs include many types of programme support, such as staff supervision and training, information and education on family planning, construction and maintenance of facilities, development and maintenance of commodity supply systems, and other management functions.

The cost of contraceptives and related supplies varies by method: Long-acting and permanent methods such as the IUD and sterilisation incur higher costs up front than short-acting methods, but they offer protection from pregnancy for many years. Thus, for each user, average annual direct costs are lowest for IUDs (\$0.58), male sterilisation (\$0.88) and female sterilisation (\$1.84). Annual costs per user are substantially higher for condoms (\$4.07) and are highest for hormonal methods (\$7.51–7.90). The average annual cost per current user in the developing world in 2014 is \$3.18 in direct costs and a total of \$6.35 when indirect costs are factored in. These costs vary widely by region: the average total cost per user is lowest in Asia (\$4.76), where more than half of users are located; it is \$10.65 in Africa and \$13.44 in Latin America and the Caribbean. These differences were found to be due to variations in method costs, the mix of methods used and indirect costs. Costs are lowest in Asia, primarily because of the high prevalence of female sterilisation and IUD use, especially in India and China. The costs of commodities and personnel are generally higher in Latin America and the Caribbean than in other regions, but costs are also high in Sub-Saharan Africa, where a higher proportion of women use hormonal methods, compared with other regions.

FIGURE

**2.4 Women with unmet need for modern contraception make up 26% of those who want to avoid a pregnancy, but account for 81% of unintended pregnancies.**



**Adding It Up: Costs and Benefits of Contraceptive Services Estimates for 2012**

Singh, S. and J.E. Darroch (2012) Guttmacher Institute and UNFPA

[https://www.guttmacher.org/sites/default/files/report\\_pdf/aiu-2012-estimates\\_0.pdf](https://www.guttmacher.org/sites/default/files/report_pdf/aiu-2012-estimates_0.pdf)

This report presents the 2012 estimates of the numbers and proportions of women in the developing world using modern methods and in need of modern contraception, as well as the cost and impact of meeting this need. It describes how modern contraceptive methods vary in terms of their service delivery requirements. Some methods require contraceptive commodities (IUDs, implants, injectables, pills and condoms); some require other supplies for insertion and removal (IUDs and implants), for provision (injectables) and for surgical procedures (sterilisation). Personnel are needed for counselling, clinical care, method provision and follow-up. Average direct costs to provide one year of method use are highest for hormonal methods—implants (\$7.75), injectables (\$8.61) and pills (\$7.26)—with the commodities themselves accounting for most of the cost. Permanent male and female sterilisation and the IUD have the lowest annual costs when total method costs are divided by the average number of years users are covered by these methods. Annual average direct costs for male condoms fall between these method groups, at \$4.17 per year.

Regional differences in commodity costs primarily reflect variation in the specific methods offered; for example, levonorgestrel-releasing IUDs, which are currently much more expensive than copper-bearing IUDs, make up greater proportions of IUDs provided by international donors for Latin America and the Caribbean than for Africa and Asia, so IUD costs overall are higher in Latin America and the Caribbean. Labour costs also vary by country, even though the analysis assumed no differences in the amount of time needed to provide each method. Supply costs are similar from region to region because available unit cost data covered all developing countries, without variation by country or region; however, costs are not identical because supply needs differ within some method categories (such as one-month vs. three-month injectables), because the average length of method use varies (for IUDs, implants and sterilisation) and because the proportion of women using specific types of a particular method varies from country to country.

It includes two particularly useful tables: the first on the number and proportion of women with an unmet need for modern contraceptives by region and subregion of the developing world; and the second on the direct annual costs of modern contraceptives, by region.

**TABLE 2. Number of women with unmet need for modern methods and proportion with unmet need for modern methods among all women in need of modern contraception, by region and subregion of the developing world and for the 69 lowest-income countries, 2008 and 2012.**

Region and subregion	Women 15–49 with unmet need for modern methods (millions)			% of women 15–49 in need of contraception who have unmet need for modern methods		
	2008*	2012	Annual % change	2008*	2012	Annual % change
<b>Developing world</b>	226	222	–0.5	27	26	–1.5
<b>Africa</b>	55	58	1.6	54	53	–0.5
Sub-Saharan Africa†	50	53	1.6	62	60	–0.9
Eastern Africa	19	20	0.4	63	54	–3.5
Middle Africa	10	10	1.3	82	81	–0.1
Southern Africa	2	2	–6.2	25	17	–8.1
Western Africa	18	19	2.6	74	74	0.0
Northern Africa	6	8	5.8	25	32	7.8
<b>Asia</b>	147	140	–1.1	23	21	–1.9
Eastern Asia	24	16	–7.8	8	6	–7.7
Central Asia	3	2	–3.1	30	28	–1.4
South Asia	79	83	1.1	34	34	–0.4
Southeast Asia	25	25	–0.6	33	28	–4.2
Western Asia	15	14	–2.8	54	50	–1.8
Oceania	<1	1	2.1	39	49	6.8
<b>Latin America &amp; the Caribbean</b>	24	23	–1.4	25	22	–2.8
Caribbean	2	2	–2.4	31	30	–0.8
Central America	5	5	1.3	23	23	0.0
South America	17	16	–2.0	25	21	–3.8
<b>69 poorest countries‡</b>	153	162	1.5	40	39	–0.6

**TABLE 3. Average annual direct costs (in 2012 U.S. dollars) of modern contraceptive services,\* by region and type of cost, according to method, 2012**

Region and type of cost	Female sterilization	Male sterilization	IUD	Implant	Injectable	Pill	Condom
<b>Total direct costs</b>							
All developing countries	\$1.78	\$0.78	\$0.77	\$7.75	\$8.61	\$7.26	\$4.17
Africa	\$2.79	\$1.59	\$1.01	\$7.74	\$9.14	\$8.72	\$4.15
Asia	\$1.58	\$0.70	\$0.63	\$7.86	\$6.64	\$5.74	\$3.98
Latin America & the Caribbean	\$3.02	\$1.34	\$3.80	\$7.35	\$14.58	\$10.16	\$4.94
<b>Commodities†</b>							
All developing countries	na	na	\$0.17	\$6.73	\$5.02	\$4.93	\$2.72
Africa	na	na	\$0.12	\$6.82	\$4.90	\$5.95	\$2.43
Asia	na	na	\$0.07	\$6.91	\$4.20	\$4.07	\$2.84
Latin America & the Caribbean	na	na	\$2.28	\$5.86	\$8.25	\$6.41	\$2.35
<b>Supplies‡</b>							
All developing countries	\$1.01	\$0.31	\$0.14	\$0.16	\$0.63	na	na
Africa	\$1.13	\$0.32	\$0.14	\$0.16	\$0.59	na	na
Asia	\$1.00	\$0.31	\$0.14	\$0.17	\$0.58	na	na
Latin America & the Caribbean	\$1.13	\$0.32	\$0.15	\$0.13	\$0.90	na	na
<b>Labor§</b>							
All developing countries	\$0.76	\$0.46	\$0.46	\$0.86	\$2.96	\$2.33	\$1.45
Africa	\$1.66	\$1.27	\$0.74	\$0.76	\$3.65	\$2.77	\$1.72
Asia	\$0.59	\$0.39	\$0.41	\$0.78	\$1.86	\$1.67	\$1.14
Latin America & the Caribbean	\$1.89	\$1.02	\$1.37	\$1.36	\$5.44	\$3.75	\$2.59

\*Costs are weighted by the country-specific numbers of current users of each method in 2012, distributed across specific types within each method category based on the distribution of contraceptives reported in the Reproductive Health Interchange for the country in 2009–2011. Method costs for permanent and long-acting methods are converted to annual costs by dividing total costs by the expected average number of years of use, based on USAID conversion factors: Copper IUD, 4.6 years of use; levonorgestrel IUD, 3.3 years; Implanon implant, 2.5 years; Sino-Implant, 3.2 years; Jadelle implant, 3.8 years; and sterilization, 13 years in Bangladesh, India and Pakistan and 10 years in other developing countries (source: USAID, Couple Years of Protection (CYP), no date, <[http://www.usaid.gov/our\\_work/global\\_health/pop/techareas/cyp.html](http://www.usaid.gov/our_work/global_health/pop/techareas/cyp.html)>, accessed May 6, 2012). †We assumed users need an annual average of four three-month injections, 13 one-month injections, 14 pill cycles or 77 condoms. ‡Supplies include gloves, antiseptic, local anaesthesia, syringes, sutures and dressings. §Labor (community health worker, nurse/midwife, general physician, obstetrician) costs include counseling on family planning, STI/HIV prevention and gender-based violence; physical exams; contraceptive procedures; and follow-up and resupply visits.

### Adding it Up: Costs and Benefits of Meeting the Contraceptive Needs of Adolescents

Darroch, J., Woog, V., Bankole, A., Ashford, L. (2016) Guttmacher Institute

[https://www.guttmacher.org/sites/default/files/report\\_pdf/adding-it-up-adolescents-report.pdf](https://www.guttmacher.org/sites/default/files/report_pdf/adding-it-up-adolescents-report.pdf)

This report analyses the costs and benefits of meeting the contraceptive needs of adolescents in the developing world. It describes how the yearly cost of contraceptives and related supplies varies by method: Annual direct costs for IUDs are lowest, at \$2.45 per user. Condoms and implants fall in the middle, at \$4.69 and \$4.81 per user, respectively. Pills and injectables are most expensive, at \$11.05 and \$9.31 per user, respectively. The average annual cost per current adolescent user of modern contraception in the developing world is \$7 in direct costs and \$15 when indirect costs are factored in. Total costs vary widely by region due to variations in method costs, the mix of methods used and indirect costs. Direct costs are generally higher in Latin America and the Caribbean than in other regions because the costs of commodities and personnel are higher. In this analysis, service costs for each method are assumed to be the same for adolescents as for older women in the same country. But the contraceptive method mix, and therefore the average cost per user, differs. This is because adolescents rely to a greater extent on short-term methods, such as condoms and pills, which are more expensive for health systems to provide on an annual basis than the IUD and sterilisation, which older women are more likely to use. Direct costs include contraceptives, related supplies and health worker salaries, while indirect costs—also called programme and systems costs—make up the rest. Indirect costs include many types of programme support, such as staff supervision and training, information and education

activities, monitoring and evaluation, advocacy and public education, construction and maintenance of facilities, development and maintenance of commodity supply systems, and other management functions.

### **Addressing Unmet Need for Family Planning in Africa**

Family Health International (2007) Family Health International

[https://www.k4health.org/sites/default/files/LAPM\\_addressing%20unmet%20need%20in%20africa.pdf](https://www.k4health.org/sites/default/files/LAPM_addressing%20unmet%20need%20in%20africa.pdf)

This report describes how long-acting and permanent methods (LAPMs) are more convenient for users and more effectively prevent pregnancy than short-acting methods. It describes how they are also more cost-effective over time, can result in substantial cost savings for governments, and contribute directly to reaching national and international health goals. However, in many countries in sub-Saharan Africa, fewer than 5% of women who are using contraception are using an LAPM, suggesting a substantial unmet need. Women who do not want any more children (more than 20% in 9 of the 11 countries surveyed) could benefit in particular. Oral contraceptives and injectables may at first appear to be lower-cost options, but their cumulative costs due to return visits and resupply can be surprisingly high. On the other hand, LAPMs may have a higher one-time start-up cost, depending on the type of facility providing them, but are usually less expensive over time. When compared with the use of other methods, use of LAPMs results in fewer unintended pregnancies and fewer clinic visits. This eases the burden on already overextended health systems and providers. If used for at least three years, the IUD, vasectomy, and implants are considered the three most cost-effective methods when all direct medical costs associated with the methods, side effects, and unintended pregnancies are taken into account.

LAPMs are the most effective methods for preventing pregnancies. Most modern methods of family planning are highly effective when used correctly and consistently during every act of sexual intercourse, but with typical use, when people occasionally forget to use a method or use it incorrectly, many contraceptive methods are not as effective. During one year of typical use, LAPMs are between three and 60 times more effective than most short-acting methods. LAPMs are convenient for users. Women who use oral contraceptives must remember to take their pills each day. Likewise, injectable users must have reinjections every one to three months, depending on the type of injectable they are using. Resupply often requires travel to a clinic, and the timing of clinic visits is critical for preventing pregnancies. LAPMs require almost no attention on the part of the user after they are initiated, and their effectiveness is not dependent on daily or monthly action.

In developing countries, 20-30% of women who use oral contraceptives or injectables stop within two years of starting, while continuation rates appear to be substantially higher among women who use reversible LAPMs. LAPMs also offer non-contraceptive health benefits. Implants and female sterilisation protect against ovarian cancer, and use of an IUD or implant may lower a woman's risk of endometrial cancer. Use of an implant also decreases a woman's risk of anaemia and reduces the amount of bleeding, pain, and cramps typically associated with menstruation. As LAPMs are more effective for preventing unintended pregnancies, they have potential to prevent many thousands of cases of maternal mortality, which can be as high as one in seven in certain countries in sub-Saharan Africa. They are therefore also more effective at preventing mother to child transmission of HIV among HIV-infected women who do not want to become pregnant.

## **Long-Acting and Permanent Methods of Contraception: Meeting Clients' Needs**

USAID (2006) USAID

[http://pdf.usaid.gov/pdf\\_docs/Pnadi070.pdf](http://pdf.usaid.gov/pdf_docs/Pnadi070.pdf)

This is a USAID Issue Brief on long acting and permanent contraception (LA/P). It describes how ensuring LA/P methods are available is important to meeting people's needs. Experience in countries where LA/P methods are available shows that they are highly popular. They state that female sterilisation is the most widely used method of contraception worldwide, accounting for approximately 20 percent of all contraception. The second most popular method is the IUD, used by 150 million women, oral contraceptives are third, and vasectomy is the fourth most popular method, which is simpler and safer than female sterilisation. One reason these methods are so popular is that they are highly effective; another is that they do not require daily use or repeated visits to obtain resupply.

Although they have a higher initial cost, LA/P methods are actually the most cost-effective of all contraceptive methods, a feature valued by individuals who choose them, as well as by Ministries of Health trying to serve as many of their citizens as they can. The IUD is the most cost-effective method of contraception available. Significant attributes of LA/Ps are by far the most effective (99 percent or greater) methods of contraception available and are very safe and convenient. They are all clinical methods and thus must be provided by trained doctors, nurses, and/or midwives in health facilities. Just one action by client and provider results in years of protection against unintended pregnancy. The desirability of these methods is due to their long life span, which requires fewer visits to health providers, thus saving clients time, effort, and money while at the same time easing the patient load at health facilities. In addition, these methods do not require daily motivation on the part of users, unlike pills and condoms, and thus have higher continuation and effectiveness rates.

### **Strategies to prevent unintended pregnancy: increasing use of long-acting reversible contraception**

Blumenthal, P.D., Voedisch, A., Gemzell-Danielsson, K. (2011) Hum Reprod Update; 17(1):121-37

<http://www.ncbi.nlm.nih.gov/pubmed/20634208>

Despite increasing contraceptive availability, unintended pregnancy remains a global problem, representing as many as 30% of all known pregnancies. Various strategies have been proposed to reverse this disturbing trend, especially increased use of long-acting reversible contraceptive (LARC) methods. In this review, the authors aim to discuss the role of LARC methods and importance of contraceptive counselling in reducing unintended pregnancy rates.

References/resources cited were identified based on searches of medical literature (MEDLINE, 1990-2009), bibliographies of relevant publications and the Internet.

LARC methods-copper intrauterine devices (IUDs), progestogen-releasing intrauterine system and injectable and implantable contraceptives- were found to be safe and effective contraceptive options (unintended pregnancy rates with typical versus perfect use: 0.05-3.0 versus 0.05-0.6%) that are appropriate for a wide range of women seeking to limit or space childbearing. Despite their safety and efficacy records, these methods remain underutilised; injectable and implantable methods are used by an estimated 3.4% and intrauterine methods by 15.5% of women worldwide. LARC methods require no daily or coital adherence and avoid the adverse events and health risks of oestrogen-containing contraceptives. The copper IUD and progestin-only injections and implants have been shown to be more cost-effective than more commonly used methods, such as condoms and the pill (5-year savings: \$13,373-\$14,122, LARC; \$12,239, condoms; \$12,879, pill). Women who are considering use of LARC methods should receive comprehensive contraceptive counselling, as women who receive

counselling before use demonstrate higher rates of after-use method satisfaction, continuation and acceptance than those who do not.

### 3. Cost-effectiveness – Evidence from developed countries

#### **Family Planning as a Cost-Saving Preventive Health Service**

Cleland, K, Peipert, J., Westhoff, C., Spear, S., Trussell, J. (2011) *The New England Journal of Medicine*; 364:e37

<http://www.nejm.org/doi/full/10.1056/NEJMp1104373#t=article>

This study explores the cost-effectiveness of family planning, including long acting contraceptives, in the US. The selection of contraceptives available in the United States includes some highly effective and cost-effective methods. Long-acting reversible contraceptives, such as hormonal implants and levonorgestrel and copper intrauterine contraceptives (IUCs), require no adherence on the part of the user, leaving virtually no scope for user error. These methods are more than 99% effective; their inherent excellent efficacy, coupled with the fact that once they've been inserted, users need not take any action to continue using them, gives them considerable potential for reducing the number of unintended pregnancies that are due to user error or contraceptive failure. In addition to being highly effective, these methods are exceptionally cost-effective. If used for 5 years, the copper IUC costs \$129 per year (including the cost of the device, pregnancies that occur despite the IUC's use, and side effects), the implant costs \$319 per year, and the levonorgestrel IUC costs \$404 per year — as compared with \$676 for oral contraceptives.

Contraception is a highly cost-effective public health measure, and the most effective methods are also the most cost-effective. Unfortunately, the cost to individuals can be a substantial barrier to the use of highly effective methods. In a nationally representative study conducted in 2004, women of reproductive age who reported that they would have switched contraception methods if it weren't for the cost were more likely to use condoms than more effective contraceptives. Thus, lack of access to the full range of contraceptive options leads to greater use of methods with higher failure rates. The study's authors concluded that "to ensure that all women are able to choose a method unhindered by cost, continued and increased funding for public sector family planning programmes is needed." Although IUCs are among the most cost-effective methods over the long term, they carry a high up-front cost that can present an insurmountable barrier to women who might otherwise want to use them. These methods are among the most underutilised among US women; in 2008, according to the National Center for Health Statistics, only 5.5% of women using contraception chose them. Two studies provide evidence that when the barrier of cost is removed, a shift toward the most effective contraceptive methods results.

#### **Cost effectiveness of contraceptives in the United States**

Trussell, J., Lalla, A.M., Doan, Q.V., Reyes, E., Pinto, L., Gricar, J. (2009) *Contraception*; 79(1):5-14

<http://www.ncbi.nlm.nih.gov/pubmed/19041435>

The study was conducted to estimate the relative cost effectiveness of contraceptives in the United States from a payer's perspective. A Markov model was constructed to simulate costs for 16 contraceptive methods and no method over a 5-year period. Failure rates, adverse event rates and resource utilisation were derived from the literature. Sensitivity analyses were performed on costs and failure rates.

The research found that any contraceptive method is superior to "no method". The three least expensive methods were the copper-T intrauterine device (IUD) (US\$647), vasectomy (US\$713) and levonorgestrel (LNG)-20 intrauterine system (IUS) (US\$930). Results were

sensitive to the cost of contraceptive methods, the cost of an unintended pregnancy and plan disenrollment rates.

In conclusion the copper-T IUD, vasectomy and the LNG-20 IUS are the most cost-effective contraceptive methods available in the US. Differences in method costs, the cost of an unintended pregnancy and time horizon are influential factors that determine the overall value of a contraceptive method.

Table 3  
Cost effectiveness (C/E) of contraceptive methods at 5 years

Method	Method-related costs (\$)	Failure cost (\$)	Cost of side effects (\$)	Total cost (C) (\$)	Marginal cost <sup>a</sup> (\$)	Effectiveness <sup>b</sup> (E)	Marginal effectiveness <sup>c</sup>	C/E (\$)	ICER (\$)
Copper-T IUD	605	42	0	647		99.6		6.50	
Vasectomy	710	3	0	713	66	100 <sup>c</sup>	0.4	7.13	164
LNG-20 IUS	823	58	49	930	283	99.8	0.2	9.32	1415
Male condom	358	1217	0	1575	928	86.6	-13	18.19	(Dominated) <sup>d</sup>
Implant	1537	5	55	1597	950	100 <sup>c</sup>	0.4	15.97	2375
FAB methods	0	1892	0	1892	1245	79.2	-20.4	23.89	(Dominated) <sup>d</sup>
Withdrawal	0	2017	0	2017	1370	77.8	-21.8	25.92	(Dominated) <sup>d</sup>
Diaphragm	764	1288	119	2171	1524	85.8	-13.8	25.31	(Dominated) <sup>d</sup>
Spermicides	431	2104	112	2647	2000	76.6	-23	34.55	(Dominated) <sup>d</sup>
Female condom	1043	1633	0	2676	2029	76.8	-22.8	34.85	(Dominated) <sup>d</sup>
Injectable contraceptive	2341	300	40	2681	2034	97	-2.6	27.64	(Dominated) <sup>d</sup>
Sponge	969	1829	0	2798	2151	79.8	-19.8	35.06	(Dominated) <sup>d</sup>
Tubal ligation	2866	59	53	2978	2330	99.8	0.2	29.84	(Dominated) <sup>d</sup>
Vaginal ring	2467	683	8	3158	2511	92.4	-7.2	34.18	(Dominated) <sup>d</sup>
Oral contraceptive	2630	682	69	3381	2734	92.4	-7.2	36.59	(Dominated) <sup>d</sup>
Transdermal patch	2774	683	1	3458	2811	92.4	-7.2	37.42	(Dominated) <sup>d</sup>
No method	0	4739	0	4739	4091	48	-51.6	98.72	(Dominated) <sup>d</sup>

IUD, intrauterine device; IUS, intrauterine system; ICER, incremental cost-effectiveness ratio. FAB, fertility-awareness-based.  
<sup>a</sup> Compared to the least costly method over 5 years (i.e., copper-T IUD).  
<sup>b</sup> Average annual rate of not becoming pregnant over 5 years.  
<sup>c</sup> Effectiveness of vasectomy and implant was 99.96%.  
<sup>d</sup> Dominated means this contraceptive option cost more and was less effective than the reference contraceptive, in this case, copper-T IUD.

The table above is a correction of that published in the original study by Trussell et al., 2009. Ref: Erratum to Cost effectiveness of contraceptives in the United States, Trussell, J., Lalla, A.M., Doan, Q.V., Reyes, E., Pinto, L., Gricar, J. (2009) *Contraception*; 80(1): 229-230. [http://www.contraceptionjournal.org/article/S0010-7824\(09\)00303-5/abstract](http://www.contraceptionjournal.org/article/S0010-7824(09)00303-5/abstract)

**Long-acting reversible contraceptives: not only effective, but also a cost-effective option for the National Health Service**

Mavranezouli, I. & Wilkinson, C. (2006) *J Fam Plann Reprod Health Care*; 32(1): 3–5 <http://jfprhc.bmj.com/content/32/1/3.full.pdf>

The National Institute of clinical excellence (NICE) clinical guideline on LARC incorporated an economic analysis aimed at determining the cost effectiveness of LARC in comparison to other contraceptive methods available in the UK National Health Service (NHS). A decision-analytic model was developed for this purpose, to assess both the costs and clinical outcomes associated with use of LARC, the combined oral contraceptive pill (COC), male condom, and female and male sterilisation. The LARC methods evaluated included the intrauterine device (IUD), the intrauterine system (IUS), progestogen-only injection and the subdermal implant.

**Table 1** Annual average outcomes (number of unintended pregnancies due to contraceptive failure) and costs per 1000 women using the combined oral contraceptive pill (COC) or long-acting reversible contraceptives (LARC) for an initially intended 5-year contraceptive use

Contraceptive method	Unintended pregnancies (n)	Total costs (£)
Intrauterine device	46	106 911
Intrauterine system	46	120 707
Implant	43	133 455
Injectable	60	152 120
LARC (average)	49	128 298
COC	96	179 939
Difference: LARC vs COC	-47	-51 641

The analysis demonstrated that LARC are more effective and, overall, less costly than COC and the male condom, even for short time frames. Injectables and IUDs were less costly than COC and male condom at all time frames examined (i.e. from 1 to 15 years of use). The implant and IUS incurred lower overall costs than COC and male condom starting at 2 years of use and above, but were deemed to be cost effective from Year 1, since the

additional benefit (number of unintended pregnancies averted) compared to COC and male condom was considered to be worth the additional cost (approximately £350–£500 per additional unintended pregnancy averted). These findings result from the substantially higher effectiveness of LARC, which leads to much greater cost savings from unintended pregnancies averted relative to COC and the male condom, offsetting the high start-up costs entailed by LARC use. The higher cost-effectiveness of LARC versus the male condom remains even when LARC are used in combination with the male condom. Consequently, for populations at high risk for sexually transmitted infections (STIs) who need, besides contraceptive protection, security against STIs, the combined use of LARC with the male condom is more cost-effective than using the male condom alone. Based on the results of the economic analysis, it can be shown that in a population of 1000 women, initiation of LARC for an intended period of 5 years of contraceptive use prevents, on average, an additional 47 unintended pregnancies yearly, and provides annual net cost savings (including provision costs) of £511,641, in comparison to COC use. Benefits in terms of number of unintended pregnancies averted and net cost savings would be far more substantial if women using a contraceptive method less effective than COC (or no method) switched to LARC use.

Female and male sterilisation are more cost-effective than LARC at 15 years of contraceptive protection as they prevent more unintended pregnancies and carry lower total costs. This is explained by the high discontinuation rates characterising LARC, resulting in the use of less effective contraceptive methods. However, female sterilisation is not an option for women wishing to retain their fertility. Furthermore, 3–10% of women who have undergone sterilisation regret this decision at a later date, and a proportion request a reversal procedure. Use of an effective, reversible method such as LARC might be more appropriate than permanent sterilisation. Among LARC, the injectable is the least cost effective for time frames longer than 1 year, as it prevents a lower number of unintended pregnancies and incurs higher costs compared to the rest of LARC (however, for 1 year of use the injectable is the least costly among LARC). The implant is the most effective but, at the same time, the most costly of the remaining LARC. Nonetheless, the additional costs associated with the implant relative to IUD/IUS are greatly reduced as duration of contraceptive use increases. The IUD is the least costly but also the least effective option for most time frames examined. The IUS is ranked between the IUD and the implant regarding associated costs and outcomes.

A limitation of the economic model was that it did not consider side effects associated with LARC use. Besides causing distress to the user, some side effects may require additional health care resources for their management, and this factor was not taken into consideration in estimating the total costs incurred by LARC use. Conversely, noncontraceptive benefits of LARC and subsequent cost savings (e.g. the management of menstrual disorders achieved with IUS use) were also not considered. The quality of life arising from contraceptive use and the distress caused by contraceptive failure were additional factors not accounted for in the economic analysis.

**The cost-effectiveness of long-acting reversible contraceptive methods in the UK: analysis based on a decision-analytic model developed for a National Institute for Health and Clinical Excellence (NICE) clinical practice guideline**

Mavranezouli, I & LARC Guideline Development Group (2008) Hum Reprod.; 23(6):1338-45  
<http://www.ncbi.nlm.nih.gov/pubmed/18372257>

Long-acting reversible contraceptive (LARC) methods are highly effective in preventing unintended pregnancies. However, their uptake is low in much of the developed world. This study aimed at assessing the cost-effectiveness of LARC methods from the British National Health Service (NHS) perspective.

A decision-analytic model was constructed to estimate the relative cost-effectiveness of the copper intrauterine device (IUD), the levonorgestrel intrauterine system (LNG-IUS), the etonogestrel subdermal implant and the depot medroxyprogesterone acetate injection (DMPA). Comparisons with the combined oral contraceptive pill (COC) and female sterilisation were also performed. Effectiveness data were derived from a systematic literature review. Costs were based on UK national sources and expert opinion.

LARC methods were found to dominate COC (i.e. they were more effective and less costly). Female sterilisation dominated LARC methods beyond 5 years of contraceptive protection. DMPA and LNG-IUS were the least cost-effective LARC methods. The incremental cost-effectiveness ratio of implant (most effective LARC method) versus IUD (cheapest LARC method) was £13,206 per unintended pregnancy averted for 1 year of use and decreased until implant dominated IUD in 15 years. Discontinuation was a key determinant of the cost-effectiveness of LARC methods.

In conclusion, LARC methods are cost-effective from the British NHS perspective. Practices improving user satisfaction and continuation of LARC method use should be identified and promoted.

**National cost-impact report: Implementing the NICE clinical guideline on long-acting reversible contraception**

National Institute for Health and Clinical Excellence (NICE) (2005) NICE  
<https://www.nice.org.uk/guidance/cg30/resources/cost-impact-report-194835421>

This report looks at the cost impact of implementing the NICE guideline 'Long acting reversible contraception' (LARC) in England. The guideline development group found that among the four LARC methods, the injectable is less cost effective than the IUD, IUS and implant, with the latter (IUD, IUS and implant) becoming more cost effective with longer duration of use. This means that the relatively high initiation costs should not be a barrier to their use, as LARC result in greatest cost-savings compared to other reversible methods. This is borne out by the cost impact model that has been developed, which estimates that the annual revenue changes in costs arising from fully implementing the guideline are: additional cost of switching from oral contraception to LARC £12.7M; saving from unplanned pregnancies avoided -£115.0M; and net saving from increased use of LARC -£102.3M.

In addition to the estimated annual revenue cost there will be an initial nonrecurrent cost to provide sufficient suitably trained staff to fit LARC methods. This is estimated to be £0.9 million. There will be ongoing costs for staff to maintain skills in these areas, but compared with other recommendations this was not considered to be significant. The net saving assumes that unplanned pregnancies avoided as a result of more effective LARC represent a realisable saving. In practice some women use LARC to delay pregnancy and this is therefore only delaying expenditure on obstetric services. Timing of family planning is reflected in the model, which looks at contraceptive use by age and shows declining use as

women get older. A further assumption is that the total number using LARC methods or the contraceptive pill will remain static at 34% of 15–49 year olds, with a swing from oral contraception to LARC of 8%. An economic model developed in the US showed an even greater cost saving when women using other less reliable methods, or no methods at all, also chose LARC. If improvements in service access enabled unmet demand to be addressed and further increased the numbers choosing LARC, then savings could be even greater than those estimated in this report.

**Table 6 Average annual cost and duration for each method**

	First year unit cost to NHS £	Subsequent year cost £	Removal cost £	Full cost £	Average duration (years)	Average annual unit cost to NHS £
Oral contraceptive pill	106	61	0	202	2.57	79
<i>Long-acting methods:</i>						
Intrauterine device	133	0	28	161	3.36	48
Intrauterine system	207	0	26	233	3.32	70
Implant	175	0	55	230	2.24	103
Injectable	144	99	0	298	2.56	117

**The cost-effectiveness of a long-acting reversible contraceptive (Implanon) relative to oral contraception in a community setting**

Lipetz, C., Phillips, C.J., Fleming, C.F. (2009) *Contraception*; 79(4):304-9

<http://www.crd.york.ac.uk/CRDWeb/ShowRecord.asp?AccessionNumber=22009101084>

The purpose of this study was to compare the cost-effectiveness of Implanon (implant) and oral contraception provision over a 36-month period within the setting of a UK community sexual health service.

A case-controlled retrospective cost-effectiveness study was done on a cohort of 493 Implanon users and 493 oral contraceptive users. The actual cost of provision of both methods was calculated. Cost-effectiveness was calculated based on provision of method and pregnancy costs of each cohort.

Implanon provision was found to be more cost-effective than oral contraception at all time points. There were no pregnancies attributable to the failure of Implanon, and 43 in the group taking oral contraception. Implanon was therefore simultaneously more effective and less expensive.

In conclusion, long-acting reversible contraception is perceived to be expensive. It is reassuring to contraception providers that Implanon is, in fact, highly cost-effective when compared to oral contraception with typical use.

**Cost-effectiveness analysis of levonorgestrel-releasing intrauterine system (LNG-IUS) 13.5mg in contraception**

Trussell, J., Hassan, F., Henry, N., Pacoski, J., Law, A., Filonenko, A. (2014) *Contraception*; 89(5): 451–459

<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4019682/>

This analysis evaluated the cost-effectiveness of LNG-IUS 13.5mg in comparison with short-acting reversible contraceptive (SARC) methods in a cohort of young women in the US from a third-party payer's perspective. LNG-IUS 13.5mg (total content) is a low-dose levonorgestrel intrauterine system for up to three years of use.

A state-transition model consisting of three mutually exclusive health states – initial method, unintended pregnancy (UP) and subsequent method – was developed. Cost-effectiveness of LNG-IUS 13.5mg was assessed versus SARC methods in a cohort of 1,000 women aged 20–29 years. SARC methods comprise oral contraceptives (OC), ring, patch and injections which are the methods commonly used by this cohort. Failure and discontinuation probabilities were based on published literature, contraceptive uptake was determined by the most recent data from the National Survey of Family Growth and costs were taken from standard US databases. One-way sensitivity analysis was conducted around key inputs while scenario analysis assessed a comparison between LNG-IUS 13.5mg and the existing IUS, LNG-IUS 20mcg/24 hours. The key model output was cost per UP avoided.

Compared to SARC methods, initiating contraception with LNG-IUS 13.5mg resulted in fewer UP (64 UP vs. 276 UP) and lower total costs (\$1,283,479 USD vs. \$1,862,633 USD, a 31% saving) over the three-year time horizon. Results were most sensitive to the probability of failure on OC, the probability of LNG-IUS 13.5mg discontinuation and the cost of live births. Scenario analysis suggests that further cost savings may be generated with the initiation of LNG-IUS 20mcg/24 hours in place of SARC methods.

From a third-party payer perspective, LNG-IUS 13.5mg is a more cost-effective contraceptive option than SARC. Therefore, women switching from current SARC use to LNG-IUS 13.5mg are likely to generate cost savings to third-party healthcare payers, driven principally by decreased UP-related expenditures and long-term savings in contraceptive costs.

**Cost-Effectiveness of Long-Acting Reversible Contraception: LNG-IUS 13.5mg, a low-dose contraceptive Levonorgestrel Intrauterine system versus oral contraceptives**

Hassan, F., Dhanjal, J., Lowin, J., Jeddi, M., Filonenko, A. (2014) Value in Health 17; A1-A295

[https://www.researchgate.net/publication/275150624\\_PIH33\\_Cost-Effectiveness\\_Of\\_Long-Acting\\_Reversible\\_Contraception\\_Lng-Ius\\_135mg\\_A\\_Low-Dose\\_Contraceptive\\_Levonorgestrel\\_Intrauterine\\_System\\_Versus\\_Oral\\_Contraceptives](https://www.researchgate.net/publication/275150624_PIH33_Cost-Effectiveness_Of_Long-Acting_Reversible_Contraception_Lng-Ius_135mg_A_Low-Dose_Contraceptive_Levonorgestrel_Intrauterine_System_Versus_Oral_Contraceptives)

This study aimed to evaluate the cost-effectiveness of LNG-IUS 13.5mg, a low-dose hormonal intrauterine contraceptive system for use up to 3 years, relative to the most commonly used oral contraceptive (OC) in Canada from a societal perspective.

A state-transition model was developed to assess the cost-effectiveness of LNG-IUS 13.5mg over 3 years in a cohort of 1,000 women of reproductive age (15-44 years). The comparator was a generic version of the 100 mcg levonorgestrel and 20 mcg ethinyl estradiol OC. The model consisted of three mutually exclusive health states: initial contraceptive method, unplanned pregnancy (UP) due to contraceptive failure and subsequent contraceptive method, taken up following UP or due to discontinuation of the initial method. The subsequent contraceptive method was represented by a basket of market-weighted contraceptives. Contraceptive failure and discontinuation rates were taken from published literature, resource use was estimated from product monographs and unit costs were taken from standard Ontario and Quebec cost databases. Analysis from the societal perspective allowed the model to incorporate economic costs associated with missed work. The key model output was cost per UP avoided. Probabilistic sensitivity analyses (PSA) were performed.

LNG-IUS 13.5mg dominated the OC method, resulting in fewer UP (8 vs. 180) and lower total costs (\$665,224 vs. \$1,102,456), representing a savings of \$437,232 over 3 years. Overall savings resulted from fewer UP and avoided costs associated with the uptake of the subsequent contraceptive method. PSA results indicated a high probability of dominance as all iterations showed LNG-IUS 13.5mg to be more effective and less costly.

In conclusion, LNG-IUS 13.5mg is an effective contraceptive option that generates savings compared to a generic OC.

### **Preventing repeat pregnancy in adolescents: is immediate postpartum insertion of the contraceptive implant cost effective?**

Han, L., Teal, S.B., Sheeder, J., Tocce, K. (2014) *Am J Obstet Gynecol.*; 211(1):24.e1-7  
<http://www.ncbi.nlm.nih.gov/pubmed/24631431>

The objective of the study was to determine the cost-effectiveness of a hypothetical state-funded program offering immediate postpartum implant (IPI) insertion for adolescent mothers in the US.

Participants in an adolescent prenatal-postnatal program were enrolled in a prospective observational study of IPI insertion (IPI group, n = 171) vs standard contraceptive initiation (comparison group, n = 225). Implant discontinuation, repeat pregnancies and pregnancy outcomes were determined. The authors compared the anticipated public expenditures for IPI recipients and comparisons at 6, 12, 24, and 36 months postpartum using the actual outcomes of this cohort and Colorado Medicaid reimbursement estimates. Costs were normalized to 1000 adolescents in each arm and included 1 year of well-baby care for delivered pregnancies.

At 6 months, the expenditures of the IPI group exceed the comparison group by \$73,000. However, at 12, 24, and 36 months, publicly funded IPIs would result in a savings of more than \$550,000, \$2.5 million, and \$4.5 million, respectively. For every dollar spent on the IPI program, \$0.79, \$3.54, and \$6.50 would be saved at 12, 24, and 36 months. Expenditures between the IPI and comparison groups would be equal if the comparison group pregnancy rate was 13.8%, 18.6%, and 30.5% at 12, 24, and 36 months. Actual rates were 20.1%, 46.5%, and 83.7%.

In conclusion, offering IPIs to adolescent mothers is cost-effective. Payers that do not currently cover IPI should integrate these data into policy considerations.

### **Achieving cost-neutrality with long-acting reversible contraceptive methods**

Trussell, J., Hassan, F., Lowin, J., Law, A., Filonenko, A. (2015) *Contraception*; 91(1):49-56  
[http://www.contraceptionjournal.org/article/S0010-7824\(14\)00646-5/abstract](http://www.contraceptionjournal.org/article/S0010-7824(14)00646-5/abstract)

This analysis aimed to estimate the average annual cost of available reversible contraceptive methods in the United States. In line with literature suggesting long-acting reversible contraceptive (LARC) methods become increasingly cost-saving with extended duration of use, it aimed to also quantify minimum duration of use required for LARC methods to achieve cost-neutrality relative to other reversible contraceptive methods while taking into consideration discontinuation.

A three-state economic model was developed to estimate relative costs of no method (chance), four short-acting reversible (SARC) methods (oral contraceptive, ring, patch and injection) and three LARC methods [implant, copper intrauterine device (IUD) and levonorgestrel intrauterine system (LNG-IUS) 20 mcg/24 h (total content 52 mg)]. The analysis was conducted over a 5-year time horizon in 1000 women aged 20–29 years.

Method-specific failure and discontinuation rates were based on published literature. Costs associated with drug acquisition, administration and failure (defined as an unintended pregnancy) were considered. Key model outputs were annual average cost per method and minimum duration of LARC method usage to achieve cost-savings compared to SARC methods.

The two least expensive methods were copper IUD (\$304 per women, per year) and LNG-IUS 20 mcg/24 h (\$308). Cost of SARC methods ranged between \$432 (injection) and \$730 (patch), per women, per year. A minimum of 2.1 years of LARC usage would result in cost-savings compared to SARC usage.

This analysis finds that even if LARC methods are not used for their full durations of efficacy, they become cost-saving relative to SARC methods within 3 years of use.

Previous economic arguments in support of using LARC methods have been criticized for not considering that LARC methods are not always used for their full duration of efficacy. This study calculated that cost-savings from LARC methods relative to SARC methods, with discontinuation rates considered, can be realised within 3 years.

#### 4. Effectiveness – Evidence from developing countries

##### **Contraceptive Technologies: Responding to Women's Needs**

Darroch, J.E., Sedgh, G. and Ball, H. (2011) Guttmacher Institute

[https://www.guttmacher.org/sites/default/files/report\\_pdf/contraceptive-technologies.pdf](https://www.guttmacher.org/sites/default/files/report_pdf/contraceptive-technologies.pdf)

This report describes how around two thirds (67-69%) of women who wish to avoid unplanned pregnancy in South Central and Southeast Asia use a modern contraceptive method, while in Sub-Saharan Africa, only 39% of women who want to avoid pregnancy use a modern method. Women who use any contraceptive method have far lower risk of unintended pregnancies than do sexually active women who use no method. However, although the decision to use a method is crucial to success in avoiding pregnancy, having a choice of methods is also important, since the risk of contraceptive failure varies widely across methods. Women using a permanent or long-acting method are much less likely to become pregnant than those who use short-acting modern contraceptives, such as the birth control pill. Both groups, though, experience lower rates of unintended pregnancy than do women who use traditional methods or no method. For example, 29% of women in the three regions who want to avoid a pregnancy rely on sterilisation. Their risk of unintended pregnancy is so low that they have only 1% of all unintended pregnancies that occur in the three regions. In contrast, because of the risk of pregnancy is so high among women who do not use a method, these women have 70% of unintended pregnancies, even though they account for only 25% of all women who want to avoid a pregnancy.

Failure rates of nonpermanent modern contraceptive methods primarily reflect the difficulty of using them consistently and correctly. For example, a survey from the US found that 30% of pill users had missed two or more active pills in the prior three months, and 21% of those relying on condoms had used the method fewer than half of the times they had had sex in the prior three months. Methods that require less ongoing action by users and that do not interrupt intercourse tend to be less susceptible to user failure. Typical pregnancy rates are lowest among women using IUDs and implants, higher among those using injectables, higher still among oral contraceptive users and highest among those relying on condoms and other coitus-related methods. Still, all of these methods are more effective than traditional methods.

## 5. Effectiveness – Evidence from developed countries

### **Effectiveness of Long-Acting Reversible Contraception**

Winner, B., Peipert, J., Zhao, Q., Buckel, C., Madden, T., Allsworth, J., Secura, G. (2012) *N Engl J Med*; 366:1998-2007

<http://www.nejm.org/doi/full/10.1056/NEJMoa1110855#t=abstract>

This is a study on the use of long-acting reversible contraceptive methods as a means of reducing unintended pregnancies in the US. It describes how the rate of unintended pregnancy in the United States is much higher than in other developed nations. Approximately half of unintended pregnancies are due to contraceptive failure, largely owing to inconsistent or incorrect use. This was a large prospective cohort study where participants were provided with reversible contraception of their choice at no cost. They compared the rate of failure of long-acting reversible contraception (intrauterine devices [IUDs] and implants) with other commonly prescribed contraceptive methods (oral contraceptive pills, transdermal patch, contraceptive vaginal ring, and depot medroxyprogesterone acetate [DMPA] injection) in the overall cohort and in groups stratified according to age (less than 21 years of age vs. 21 years or older).

Among the 7486 participants included in this analysis, there were 334 unintended pregnancies. The contraceptive failure rate among participants using pills, patch, or ring was 4.55 per 100 participant-years, as compared with 0.27 among participants using long-acting reversible contraception (hazard ratio after adjustment for age, educational level, and history with respect to unintended pregnancy, 21.8; 95% confidence interval, 13.7 to 34.9). Among participants who used pills, patch, or ring, those who were less than 21 years of age had a risk of unintended pregnancy that was almost twice as high as the risk among older participants. Rates of unintended pregnancy were similarly low among participants using DMPA injection and those using an IUD or implant, regardless of age. The effectiveness of long-acting reversible contraception was found to be superior to that of contraceptive pills, patch, or ring.

### **Leveling the Playing Field: The Promise of Long-Acting Reversible Contraceptives for Adolescents**

Boonstra, H. (2013) Guttmacher Institute

<https://www.guttmacher.org/about/gpr/2013/12/leveling-playing-field-promise-long-acting-reversible-contraceptives-adolescents>

This report discusses the benefits of long-acting reversible contraceptives for US adolescents, but is also relevant to other groups including in developing countries. Although when used perfectly, condoms and the pill have extremely low failure rates, in the real world, many couples have difficulty using these methods consistently and correctly—every day for the pill or at every act of intercourse for the condom—and, therefore, experience a higher risk of failure. Teens are especially likely to experience a contraceptive failure: Adolescent women are more than twice as likely as women aged 30 or older to experience a pill failure, for example. For adolescents, LARCs offer several advantages over other contraceptive methods. Because there is virtually no possibility of user error, IUDs and implants rank in the top tier of contraceptive methods in terms of effectiveness (see chart below). The “set and forget” nature of LARCs may be appealing to teens who do not want to worry about remembering to use a contraceptive. Plus, once the IUD or implant is in place, it prevents pregnancy for years. The report includes a helpful table summarising the effectiveness of different methods of modern contraception:

**Long-acting reversible methods are among the most effective in terms of typical use.**

<p><b>Most effective</b> Less than one pregnancy per 100 women in one year</p>	<ul style="list-style-type: none"> <li>• Implant</li> <li>• Male sterilization</li> <li>• Female sterilization</li> <li>• Intrauterine device (IUD)</li> </ul>
<p><b>Highly effective</b> 6–12 pregnancies per 100 women in one year</p>	<ul style="list-style-type: none"> <li>• Injectable</li> <li>• Pill</li> <li>• Patch</li> <li>• Ring</li> <li>• Diaphragm</li> </ul>
<p><b>Less effective</b> 18–28 pregnancies per 100 women in one year</p>	<ul style="list-style-type: none"> <li>• Male condom</li> <li>• Female condom</li> <li>• Sponge</li> <li>• Withdrawal</li> <li>• Fertility awareness</li> <li>• Spermicide</li> </ul>

### **Efficacy and Safety of Long-Acting Reversible Contraception**

Stoddard, A., McNicholas, C., Peipert, J. (2011) *Drugs*; 71 (8): 969-980  
<http://www.ncbi.nlm.nih.gov/pubmed/21668037>

This article describes how long-acting reversible contraception (LARC), including intrauterine devices (IUDs) and the subdermal implant, are the most effective reversible methods of contraception, and have the additional advantages of being long-lasting, convenient, well-liked by users and cost effective. Compared with other user-dependent methods that increase the risk of noncompliance-related method failure, LARC methods can bring 'typical use' failure rates more in line with 'perfect use' failure rates. LARC methods are 'forgettable'; they are not dependent on compliance with a pill-taking regimen, remembering to change a patch or ring, or coming back to the clinician for an injection. Oral contraceptive pills and male condoms are the most commonly used reversible methods of contraception in the US. However, typical male condom failure rate is approximately 15-18% and oral contraceptive failure rate is 8-9%. LARC method failure rates rival that of tubal sterilisation at <1% for IUDs and the subdermal implant. For these reasons, they believe that IUDs and implants should be offered as first-line contraception for most women. This article provides a review of the LARC methods that are currently available in the US, including their effectiveness, advantages, disadvantages and contraindications.

### **Preventing Unintended Pregnancies by Providing No-Cost Contraception**

Peipert, J., Madden, T., Allsworth, J., Secura, G. (2012) *Obstet Gynecol*; 120:1291–97  
<http://www.ncbi.nlm.nih.gov/pubmed/23168752>

This study aimed to promote the use of long-acting reversible contraceptive (LARC) methods (intrauterine devices [IUDs] and implants) and provide contraception at no cost to a large cohort of participants in the US in an effort to reduce unintended pregnancies in the St. Louis region.

9,256 adolescents and women at risk for unintended pregnancy were enrolled into the Contraceptive CHOICE Project, a prospective cohort study of adolescents and women desiring reversible contraceptive methods. Participants were recruited from the two abortion facilities in the St. Louis region and through provider referral, advertisements, and word of mouth. Contraceptive counselling included all reversible methods but emphasised the superior effectiveness of LARC methods (IUDs and implants). All participants received the reversible contraceptive method of their choice at no cost. The authors analysed abortion rates, the percentage of abortions that were repeat abortions, and teenage births.

The authors observed a significant reduction in the percentage of abortions that were repeat abortions in the St. Louis region compared with Kansas City and nonmetropolitan Missouri (P: 0.001). Abortion rates in the CHOICE cohort were less than half the regional and national rates (P: 0.001). The rate of teenage birth within the CHOICE cohort was 6.3 per 1,000, compared with the U.S. rate of 34.3 per 1,000.

The authors noted a clinically and statistically significant reduction in abortion rates, repeat abortions, and teenage birth rates. Unintended pregnancies may be reduced by providing no-cost contraception and promoting the most effective contraceptive methods. They further noted that unintended pregnancy remains a stubborn problem in the United States, with higher proportions among adolescents and young women, racial and ethnic minorities, and women with less education and lower socioeconomic status. Approximately half of unintended pregnancies are the result of contraceptive failure, with the majority of women using reversible contraception using OCPs or condoms. The American College of Obstetricians and Gynecologists and many family planning experts believe that LARC methods should be first-line contraceptive options and that increased uptake of LARC methods is essential to decreasing the rate of unintended pregnancy. In addition, because LARC methods have been shown to have higher continuation rates than other reversible methods, the number of adolescents and women using no contraception would decline, further decreasing the unintended pregnancy rate. Increased access to contraception, particularly highly effective LARC methods, and providing contraception at no cost may result in a significant decrease in the rate of unintended pregnancy in the United States.

### **LARC methods: entering a new age of contraception and reproductive health**

Shoupe, D. (2016) Contraception and Reproductive Medicine; 1:4

<http://contraceptionmedicine.biomedcentral.com/articles/10.1186/s40834-016-0011-8>

This is a report on LARC use in the US. Shoupe states that although IUDs and implants have been around for a long time, their use has been severely hampered and almost extinguished for periods of time due to early design flaws, difficult insertion and removal demands, or by the unacceptable side effect profiles. It is all very different now. The currently available LARC methods are easy to use, safe, long lasting, quickly reversible and 20 times more effective than oral contraceptive pills. The LARC methods have high patient acceptability, have limited contraindications for use, and are often recommended, in some cases, due to their dramatically improved bleeding control. All of the LARC methods can be inserted right after delivery or abortion and following removal, fertility is rapidly restored. Although the LARC methods have a high up-front cost, most or all of these costs are often covered by a 3rd party. In any case, compared to other options, they are highly cost-effective in the long-term. Use of the LARC methods in the U.S. has traditionally trailed dramatically behind Europe, Asia and developing countries. Worldwide, the IUD is the currently the most popular means of reversible birth control in the world with 160 million users (2/3 of the users are in China).

**Contraceptive Technology: Twentieth Revised Edition**

Hatcher, R.A., Trussell, J., Nelson, A.L., Cates, W., Kowal, D., Policar, M. (2011) Ardent Media Inc.

<http://www.contraceptivetechnology.com/CTFailureTable.pdf>

This is a comparative table comparing the percentage of women experiencing an unintended pregnancy during the first year of typical use and the first year of perfect use of contraception, and the percentage continuing use at the end of the first year. The data is from the US.

**Table 3–2 Percentage of women experiencing an unintended pregnancy during the first year of typical use and the first year of perfect use of contraception, and the percentage continuing use at the end of the first year. United States.**

Method (1)	% of Women Experiencing an Unintended Pregnancy within the First Year of Use		% of Women Continuing Use at One Year <sup>3</sup>
	Typical Use <sup>1</sup> (2)	Perfect Use <sup>2</sup> (3)	(4)
No method <sup>4</sup>	85	85	
Spermicides <sup>5</sup>	28	18	42
Fertility awareness-based methods	24		47
Standard Days method <sup>6</sup>		5	
TwoDay method <sup>6</sup>		4	
Ovulation method <sup>6</sup>		3	
Symptothermal method <sup>6</sup>		0.4	
Withdrawal	22	4	46
Sponge			36
Parous women	24	20	
Nulliparous women	12	9	
Condom <sup>7</sup>			
Female (fc)	21	5	41
Male	18	2	43
Diaphragm <sup>8</sup>	12	6	57
Combined pill and progestin-only pill	9	0.3	67
Evra patch	9	0.3	67
NuvaRing	9	0.3	67
Depo-Provera	6	0.2	56
Intrauterine contraceptives			
ParaGard (copper T)	0.8	0.6	78
Mirena (LNg)	0.2	0.2	80
Implanon	0.05	0.05	84
Female sterilization	0.5	0.5	100
Male sterilization	0.15	0.10	100

## 6. Other useful resources

### **Provision of long-acting reversible contraception in HIV-prevalent countries: results from nationally representative surveys in southern Africa**

Morse, J., Chipato, T., Blanchard, K., Nhemachena, T., Ramjee, G., McCulloch, C., Blum, M., Saleeby, E., Harper, CC. (2013); BJOG 120(11): 1386–1394.

<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3775997/>

This is a study to analyse the current provision of long-acting reversible contraception (LARC) and clinician training needs in HIV-prevalent settings in South Africa and Zimbabwe.

Nationally representative surveys of clinicians were conducted in South Africa and Zimbabwe ( $n = 1444$ ) to assess current clinical practice in the provision of LARC in HIV-prevalent settings. Multivariable logistic regression was used to analyse contraceptive provision and clinician training needs.

Provision of the most effective reversible contraceptives was found to be limited: only 14% of clinicians provide copper intrauterine devices (IUDs), 4% levonorgestrel-releasing IUDs and 16% contraceptive implants. Clinicians' perceptions of patient eligibility for IUD use were overly restrictive, especially related to HIV risks. Less than 5% reported that IUDs were appropriate for women at high risk of HIV or for HIV-positive women, contrary to evidence-based guidelines. Only 15% viewed implants as appropriate for women at risk of HIV. Most clinicians (82%), however, felt that IUDs were underused by patients, and over half desired additional training on LARC methods. Logistic regression analysis showed that LARC provision was largely restricted to physicians, hospital settings and urban areas. Results also showed that clinicians in rural areas and clinics, including nurses, were especially interested in training.

In conclusion, clinician competency in LARC provision is important in southern Africa, given the low use of methods and high rates of unintended pregnancy among HIV-positive and at-risk women. Despite low provision, clinician interest is high, suggesting the need for increased evidence-based training in LARC to reduce unintended pregnancy and associated morbidities.

### **Expanding long-acting and permanent contraceptive use in sub-Saharan Africa to meet FP2020 goals**

Ngo, T., Nuccio, O., Reiss, K., Pereira, S. (2013) Marie Stopes International

[https://mariestopes.org/sites/default/files/MSI\\_Research%20Brief%20Series%206pp%20LARC%20effectiveness.pdf](https://mariestopes.org/sites/default/files/MSI_Research%20Brief%20Series%206pp%20LARC%20effectiveness.pdf)

This study evaluated the effectiveness of the Marie Stopes International's programme in expanding access to a range of LARC/PM and addressing the unmet need in 11 sub-Saharan African countries between 2008 and 2012. It describes how there is a vast unmet contraceptive need in sub-Saharan Africa, a region that has a high fertility rate coupled with a desire among women to space and limit their number of births. Short-term family planning methods have traditionally been used here, and long-acting reversible contraceptives and permanent contraceptive methods (LARC/PM) have been underutilised despite their effectiveness and low cost. To increase women's contraceptive choice and address the unmet need in sub-Saharan Africa, Marie Stopes International (MSI) implemented a cross-country LARC/PM expansion programme. Findings showed a substantial overall increase in LARC uptake over the time period studied (from 140,408 services in 2008 to 895,041 services in 2012). The results also indicated that the programme had been successful in reaching under-served women in the region (women who had not used a modern contraceptive method in the past three months and women who switched from a short-term

contraceptive method to a LARC/PM), and clients situated not only in urban and peri-urban locations, but also rural areas.

Between 2008 and 2012, there was a 250% increase in the use of MSI's LARC/PM services across 11 countries in sub-Saharan Africa; from just under 300,000 services in 2008 to just over 1 million services in 2012. The MSI expansion programme was able to address the region's unmet contraceptive need. Overall, 42% of LARC users and 46% of PM users were adopters (women who had not used a modern family planning method in the last three months), and 51% of LARC users and 47% of PM users had switched from a short-term family planning method. There were high levels of client satisfaction among LARC/PM clients in the 11 countries. The effectiveness of the MSI LARC/PM expansion programme in these 11 sub-Saharan African countries demonstrates a vast untapped potential for wider LARC/PM use in the region.

### **Uptake and Discontinuation of Long Acting Reversible Contraceptives (LARCs) in Low-Income Countries**

Staveteig, S., Mallick, L. and Winter, R. (2015) DHS Analytical Studies No. 54; ICF International.

<https://dhsprogram.com/pubs/pdf/AS54/AS54.pdf>

This report describes how long-acting reversible contraceptive (LARC) methods—intrauterine devices (IUDs), implants, and injectables—together comprise a growing share of contraceptive use in low-income countries. Using DHS contraceptive calendar data this paper examines married women's adoption and discontinuation of LARCs, other modern methods, and traditional/folkloric methods in 21 low-income countries. The two methods that require provider removal, IUDs and implants, have the lowest discontinuation rates. The discontinuation rate of injectables is on par with that of traditional methods and is lower than that of other non-LARC modern methods combined. Cost or access is infrequently cited as an issue in discontinuation of any method. Failure rates of LARC methods are low, but four in ten episodes of LARC discontinuation are attributed to side effects or health concerns, more than double that of other modern methods. Three months after discontinuing while still in need (DWSIN), 15 to 20 percent of LARC users are at risk of an unwanted pregnancy. The authors modelled the hazard of DWSIN based on individual and country-level characteristics. Adjusted hazard models find that starting an IUD or injectable after birth, postpartum abstinence, or LAM significantly reduces the hazard of DWSIN. Additionally, living in a country with greater access to the method being used and higher-quality family planning programs reduces the hazard of DWSIN. These findings point to the benefits that postpartum family planning efforts and a supportive programmatic environment confer on sustained LARC use.

## **7. Additional information**

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