Background: 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 we aim to discuss the role of LARC methods and importance of contraceptive counseling in reducing unintended pregnancy rates.

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

Results and Conclusions: LARC methods—copper intrauterine devices (IUDs), progestogen-releasing intrauterine system and injectable and implantable contraceptives—are 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 underutilized; 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 estrogen-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 counseling, as women who receive counseling before use demonstrate higher rates of after-use method satisfaction, continuation and acceptance than those who do not.

**Key words:** pregnancy / abortion / contraception / counseling / cost-effectiveness

### Introduction

Although the development of both contraceptive technology and family planning programs has revolutionized social and economic constructs, unintended pregnancies worldwide continue to occur at epidemic levels. According to estimates of the World Health Organization (WHO) (UNDP et al., 1995), of the ~182 million pregnancies estimated to occur annually in low-income countries, more than one-third are unintended (World Health Organization Guttmacher Institute, 2007). A higher rate is estimated in high-income countries, where more than 40% of the estimated 23 million pregnancies occurring each year are unintended (World Health Organization Guttmacher Institute, 2007). In the USA, estimates based on data from the 2002 National Survey of Family Growth (NSFG) and other federal, state and non-governmental sources indicate that nearly half (49%) of all pregnancies are unintentional (Finer and Henshaw, 2006). Such high rates of unintended pregnancy have a constraining effect, not only on the women and their families, but also on health systems, economies and the environment.

Despite annual increases in the prevalence of contraceptive use worldwide (The United Nations Department of Economic and Social Affairs, 2009), and advances in available contraceptive options, millions of women who do not want a child or want to delay childbearing are not using contraception (Ross and Winfrey, 2002; Skouby, 2004; Frost et al., 2007; World Health Organization Guttmacher Institute, 2007; The Alan Guttmacher Institute, 2009). In low-income countries, this unmet need is often the result of poor knowledge, inadequate logistics (e.g. supply chain issues), inability to service rural habitats and limits on the cadre of healthcare providers who can provide some contraceptive methods.

A substantial proportion of unplanned pregnancies also occur due to contraceptive method failure (Jones and Forrest, 1992; Henshaw, 1998; Fu et al., 1999). Most modern contraceptive methods are highly effective among couples who use them perfectly (both consistently and correctly), but may be less effective during actual or typical use (Trussell and Wynn, 2008). Methods that are heavily dependent on ‘user’ adherence to a specific routine (i.e. require daily or pre-coital administration), such as oral contraceptive pills and barrier methods, are associated with notably higher typical-use failure rates than perfect-use failure rates (Fig. 1; Trussell and Wynn, 2008). Methods not requiring daily or coital adherence, such as long-acting reversible intrauterine devices (IUDs), intrauterine systems (IUSs), injections and implants, are generally as effective with typical use as they are with perfect use. However, methods such as IUDs/IUSs or implants are ‘provider’ dependent, in that they require a trained healthcare professional both for treatment initiation and discontinuation (Trussell and Wynn, 2008).

Pregnancy prevention strategies include increasing the overall use of contraception (contraceptive prevalence) and use of specific contraceptive options. This approach may be achieved by liberalizing the cadre of clinicians who can provide long-term contraceptive methods and ‘demedicalizing’ (e.g. through community-based distribution) methods such as pills, injectables and implants so that they can be distributed to harder-to-reach women. In addition, contraceptive counseling, which significantly increases adherence and user satisfaction with various methods, is an underutilized pregnancy prevention strategy (Davie et al., 1996; Hubacher et al., 1999; Canto De Cetina et al., 2001; Backman et al., 2002; Asnake and Tilahun, 2010). The purpose of this article is to review the outcomes and contributing factors associated with unintended pregnancy; discuss the particular role of LARC methods in reducing unplanned pregnancy rates; and highlight counseling strategies to improve contraceptive use.

### Methods

To identify pertinent studies on unintended pregnancy and LARC methods, we reviewed the medical literature published since 1990; a search was conducted for papers published from January 1990 to May 2009 using MEDLINE (other limits: English, Human, Clinical Trials) for the following key words and subject terms: unintended pregnancy, unplanned pregnancy, unwanted pregnancy, birth control, family planning, contraception, long-acting reversible contraceptive (LARC), intrauterine device, intrauterine system, injection, implant, cost-effectiveness and counseling. Bibliographies of relevant original articles, reviews and meta-analyses were also searched for additional references. Articles were screened and selected based on their titles and abstracts. Additional resources on unintended pregnancy and LARC methods included reports from the WHO, the NSFG, the Institute of Medicine, the Guttmacher Institute and the National Collaborating Centre for Women’s Health, which were identified and retrieved via Internet searches.

### Consequences of unintended pregnancy

One of the primary outcomes of unintended pregnancies is induced abortion (Brown and Eisenberg, 1995; World Health Organization Guttmacher Institute, 2007). Annualized rates of induced abortion are declining but remain unacceptably high in low-income countries (at least 19% of ~60 million unintended pregnancies) and high-income countries (28% of an estimated 9 million unintended pregnancies; Table I; World Health Organization Guttmacher Institute, 2007). Abortion can be associated with serious health consequences, particularly in low-income countries and in countries where abortion remains illegal and where skilled providers may be scarce. Nearly half (48%) of
all induced abortions occurring worldwide are considered to be unsafe, resulting in 67 000 attributable maternal deaths, nearly all of which occur in low-income countries (World Health Organization Guttmacher Institute, 2007).

Women with unintended pregnancies, including those resulting in live births, are also at greater risk of death and morbidity, adverse behaviors (e.g. smoking and drinking) and physical violence by their partners (Brown and Eisenberg, 1995; Gazmararian et al., 1995; Goodwin et al., 2000). Evidence supports a relationship between unintended pregnancy and insufficient participation in prenatal care, as well as low birthweight (Brown and Eisenberg, 1995). Children born as a result of mistimed or unwanted conceptions may suffer from deficits in developmental skills (Baydar, 1995) and be at higher risk for abuse or neglect (Zuravin, 1991; Brown and Eisenberg, 1995). In addition, unplanned pregnancies often disrupt parents’ life plans, including educational or professional ambitions, limit the resources available for previously born children and compromise the family’s current and future financial security (Brown and Eisenberg, 1995).

Population growth and pressures raise global concerns about the future availability and quality of food and fresh water supplies, energy shortages, land use and environmental degradation. The role of population growth in exhausting these resources and environmental services is an increasingly important global issue (Gaffikin, 2010).

Figure 1 Percentages of women experiencing an unintended pregnancy with typical versus perfect contraceptive use (Trussell and Wynn, 2008).

Factors associated with unintended pregnancy

Risk factors

Unintended pregnancies are common among women of all backgrounds regardless of age or socioeconomic, racial, ethnic, religious or marital status. However, some demographic and socioeconomic characteristics appear to influence the prevalence of these pregnancies. In the USA, a greater risk for unintended pregnancy has been reported in young women who are aged 18–24 years and in women who have not graduated from high school (Brown and Eisenberg, 1995; Finer and Henshaw, 2006). Women who are poor, unmarried or Black or Hispanic are also more likely to have an unwanted pregnancy. According to the most recent Demographic and Health Surveys from 41 countries, unwanted births in the poorest quintile of the populations were more than twice that observed in the wealthiest quintile (Gillespie et al., 2007). Domestic violence is recognized as an important contributor to unwanted pregnancy, as women who experience sexual, physical and psychological abuse may be more prone to risky sexual behaviors and less able to use contraceptives correctly or consistently or negotiate contraceptive use with a partner (de Bruyn, 2000).
Table 1 Global and regional estimates of induced abortion (1995 and 2003) (World Health Organization Guttmacher Institute, 2007).

<table>
<thead>
<tr>
<th>Region/Subregion</th>
<th>No. of abortions (millions)</th>
<th>Abortion ratea</th>
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<td>World</td>
<td>45.6</td>
<td>41.6</td>
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<tr>
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</tr>
<tr>
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<td>3.8</td>
<td>3.5</td>
</tr>
<tr>
<td>Low-income countriesb</td>
<td>35.5</td>
<td>35.0</td>
</tr>
<tr>
<td>Excluding China</td>
<td>24.9</td>
<td>26.4</td>
</tr>
<tr>
<td>Regional estimates</td>
<td></td>
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</tr>
<tr>
<td>Africa</td>
<td>5.0</td>
<td>5.6</td>
</tr>
<tr>
<td>Asia</td>
<td>26.8</td>
<td>25.9</td>
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<tr>
<td>Europe</td>
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<td>4.3</td>
</tr>
<tr>
<td>Latin America</td>
<td>4.2</td>
<td>4.1</td>
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<tr>
<td>Northern America</td>
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<td>1.5</td>
</tr>
<tr>
<td>Oceania</td>
<td>0.1</td>
<td>0.1</td>
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</tbody>
</table>


Underutilization of contraceptives

A substantial proportion of women in both low- and high-income regions fail to use or are unable to access contraception, even though they want to practice family planning (Frost et al., 2007; World Health Organization Guttmacher Institute, 2007). On the basis of WHO research, two-thirds of unintended pregnancies in low-income countries occur in women who have failed to use or been unable to access any contraceptive method (World Health Organization Guttmacher Institute, 2007).

Approximately half of all unplanned pregnancies in the USA occur in women who are not using contraception (Henshaw, 1998; Finer and Henshaw, 2006). Among non-sterilized adult women at risk of unintended pregnancy surveyed in the USA, 23% stated that they were exposed to a high risk of pregnancy because of periods of contraceptive non-use in the year prior to survey (Frost et al., 2007). Lapses in contraceptive use are frequently related to switching between methods or temporary discontinuation of a chosen method due to treatment dissatisfaction (Chandra et al., 2005).

On the basis of a survey conducted in a large population of women from five European countries (France, Germany, Italy, Spain and the UK), researchers estimated that 6.5% of women aged 15–49 years were at risk of unwanted pregnancy (i.e. they were not using contraception even though they were not planning a pregnancy; Skouby, 2004). Although this percentage is better than that observed in the US, it still represents 4.7 million women at risk, indicating significant room for improvement.

In low-income countries (excluding China), ~17% of married women of reproductive age have an unmet need for family planning (Kango, 2009). Countries with the highest rates of unmet need include Liberia (36%), Rwanda (38%), Haiti (38%) and Uganda (41%), whereas those with the lowest rates include Bangladesh (5%), Colombia (6%), Moldova (7%) and Indonesia (9%) (Supplementary Fig. S1).

The reasons for the underutilization of contraceptives are multifactorial. Not surprisingly, access to contraceptive supplies and services continues to be a barrier to use, particularly in low-income areas (Bongaarts and Bruce, 1995). Women who do have access to family planning programs may be unable to obtain contraception due to supply shortages, provider bias, limitations on the type of healthcare worker who can dispense contraceptives, or policies limiting contraceptives in specific groups (e.g. adolescents, nulliparous or unmarried women). Contraceptive non-use has also been attributed to lack of knowledge (myths and lack of/poor sexual education) and the disapproval of spouses and family (Bongaarts and Bruce, 1995). Comprehensive sexuality education in schools, which provides factual information about a broad range of sex-based topics, is effective in increasing contraception use among teens (Kirby, 2007). Although such broad education programs may help avoid unwanted pregnancies, in many areas of the world, they have not yet been introduced, are in early stages of development or are beset by controversy. Negative attitudes toward contraceptives, most notably, fear of adverse health effects, contribute to contraceptive non-use, discontinuation or method switching (Bongaarts and Bruce, 1995; Chandra et al., 2005; Frost et al., 2007; World Health Organization Guttmacher Institute, 2007).

Cost also plays an important role in suboptimal contraceptive utilization, as specific contraceptives and attendant healthcare services may be too expensive for some women. In the USA, out-of-pocket healthcare expenditures are 68% higher in women in their childbearing years than in men, with reproductive care and contraception explaining most of this difference (Gold, 1998). In some low-income countries, an annual supply of oral contraceptives or condoms costs more than $100 (Bulatao, 1998). In these regions, expenditures for contraceptives commonly account for 5% of the average household income and as much as 20% of income in some sub-Saharan countries.

Contraceptive ineffectiveness

Some unintended pregnancies are the result of contraceptive method failure. In the USA, an estimated 12.4% of all women experienced a contraceptive failure during the first year of use (Kost et al., 2008). However, some research suggests that actual method failure may be responsible for <10% of unintended pregnancies, with the remainder associated with poor adherence (Jones et al., 2002; National Collaborating Centre for Women’s Health, 2005). The percentages of unwanted pregnancies resulting from contraceptive failure for eight countries range from 42% in Peru to 17% in the Philippines and the Dominican Republic (Fig. 2; Bankole and Westoff, 1995; Bongaarts, 1997). The high rate in Peru is not surprising given that a relatively low proportion of the population in this country use modern contraceptive methods; conversely, the low rate in the Dominican Republic is expected due to this country’s high rate of sterilization (Bongaarts, 1997).
Long-acting reversible contraception: benefits and limitations

Healthcare providers may help women at risk of unwanted pregnancies by informing them about the full range of reliable contraceptive options available, including LARC methods, which greatly minimize the need for user dependence on adherence to a routine. LARCs—defined as methods that require administration less than once per cycle or month—include non-hormonal copper IUDs, the progestogen-only IUS and injectable and implantable contraceptives. These contraceptives provide estrogen-free options for women who are not suitable candidates for combined hormonal contraceptives. In contrast to the typical-use effectiveness of oral contraceptive pills and condoms, the corresponding effectiveness of LARC methods is not dependent on compliance or correct use by the couple (Fig. 1).

LARC methods are safe and recommended for use among the broad range of women who are seeking to control their fertility, including those with cardiovascular risk factors (such as diabetes and obesity), epilepsy, and physical or intellectual disabilities (National Collaborating Centre for Women’s Health, 2005). Further, they are not contraindicated in nulliparous or nursing women, and may be used with no or minimal restriction in adolescents and perimenopausal women. In adolescents, continuation rates for LARC methods, including IUDs, the levonorgestrel IUS and progestin-only injectables and implants, are similar to or higher than those for pills (Polaneczky et al., 1994; Zibners et al., 1999; Suhonen et al., 2004; Deans and Grimes, 2009). Longstanding concerns about the safety of IUD/IUS use in young women have recently been challenged (Hubacher et al., 2001; Lacy, 2006; Mohllajee et al., 2006; Hubacher, 2007; Prager and Darmey, 2007). Moreover, in a recent cohort study conducted in New Zealand, 1-year continuation rates for the levonorgestrel IUS among adolescents were found to be similar to those reported in adult women (Lacy, 2006; Paterson et al., 2009).

Figure 2  Percentage of unwanted pregnancies resulting from contraceptive failure in eight countries (Bankole and Westoff, 1995; Bongaarts, 1997). Reprinted from Bongaarts (1997), with permission from Wiley-Blackwell.
Use of LARC methods may be particularly attractive post-partum and post-abortion, when women may be at increased risk of poorly timed or unwanted pregnancy due to possible obstacles in obtaining effective contraception or misunderstanding when the contraceptive effects of lactation are no longer protective against pregnancy. Post-partum and post-abortion family planning services, including information sharing and counseling about LARC options, represent a critical pregnancy prevention tool that remains underserved. A woman’s selection of a LARC method immediately after childbirth or abortion has a number of potential advantages: specifically, she is known not to be pregnant at that time, may be highly motivated to use contraception and may have access to the necessary contraceptive services and supplies before leaving the healthcare facility. Women who are certain that they do not want any more children may consider LARC methods as an alternative to tubal sterilization based on comparable efficacy, lower initial costs, superior cost-effectiveness for the first 5–6 years, no requirement for surgery and ease of reversal (Trussell and Wynn, 2008; Mavranezouli, 2008). In addition, when IUDs/IUSs are inserted immediately post-partum or post-abortion, many of their early adverse effects (e.g. bleeding or cramping) are ‘masked’ by similar effects that normally occur during the puerperium and post-partum/post-abortion period.

Despite the benefits of LARC methods (National Collaborating Centre for Women’s Health, 2005; World Health Organization, 2008a), they continue to be used less frequently than user-dependent methods in many regions (Fig. 3; Trussell and Wynn, 2008; Cleland, 2009). LARC methods may be underused for several reasons, including (i) women’s misperceptions and misinformation about these methods; (ii) higher initial cost (although the cost is generally lower over time); (iii) ‘provider dependence’, such as the requirements for specific clinical skills and facilities; and (iv) provider bias against the method (National Collaborating Centre for Women’s Health, 2005).

Copper IUDs

IUDs are contraceptive devices containing copper on a plastic frame or a thread (frameless) that are inserted through the cervix and placed within the uterine cavity. A small thread or ‘tail’ extends from the device through the cervical canal and into the upper part of the vagina to allow easy removal and regular checking for correct placement. Several different types of copper-containing IUDs are currently available worldwide, including plain T-shaped IUDs, banded T-shaped and frameless. These devices are approved for various durations of use (generally, 5–12 years) and differ in structural design and copper content. IUDs such as the Copper T 380A have been shown to be safe and effective for at least 12 years (United Nations Development Programme, 1997). Several improvements have been made in the design of new IUDs over the past several decades, including changes to increase efficacy (increased amount of copper), facilitate insertion and removal, reduce rates of expulsion and minimize complaints of pain or bleeding. However, the effectiveness of the devices remains dependent on proper insertion technique, which varies in complexity by individual device. For example, the anchoring knot of frameless IUDs must be securely embedded into the fundal myometrium; improper insertion technique, resulting in insufficient anchoring of these devices, has been linked with elevated rates of early expulsion (Dennis et al., 2001).

Pregnancy prevention with IUDs is achieved by impairing gamete viability and the capacity to achieve fertilization—effects that are primarily exerted via the devices’ copper ions (Mishell, 1998; Stanford and Mikolajczyk, 2002). Copper IUDs containing more than 300 mm² copper are considered as a class to be a highly effective and safe contraceptive option (Treiman et al., 1995; World Health Organization, 2008a, b). On the basis of evidence from studies of copper-containing IUDs available in the UK, the product-failure rate reported with use of IUDs containing 380 mm² copper is very

Figure 3 Estimated method-specific contraceptive prevalence by major global region (Cleland, 2009). Reprinted from Cleland (2009). Copyright (2009), with permission from Elsevier.
low—i.e. <20 pregnancies in 1000 women over 5 years (National Collaborating Centre for Women’s Health, 2005). The pregnancy rates based on the published clinical literature for commonly used individual IUDs (available in the UK) are summarized in Table II.

Expulsion of IUDs is reported in ~1 in 20 women, with a higher frequency observed within the first 3 months after insertion and during menstruation (World Health Organization Scientific Group, 1987). A summary of cumulative expulsion rates associated with UK-available devices in published clinical studies is shown in Table II (National Collaborating Centre for Women’s Health, 2005). Common adverse events of copper IUDs include increased bleeding problems (responsible for most discontinuations) and dysmenorrhea (National Collaborating Centre for Women’s Health, 2005). Cumulative discontinuation rates for all reasons are similar among the different copper IUDs, with one in four to one in two women stopping this method over 5 years of use (National Collaborating Centre for Women’s Health, 2005).

Women who use IUDs have a lower risk of ectopic pregnancy than those who use no contraception; overall, the risk of ectopic pregnancy associated with IUD use is very low (i.e. ~1 in 1000 in 5 years; National Collaborating Centre for Women’s Health, 2005). On the basis of a review of IUD clinical data from 12 randomized clinical trials (22,908 insertions and 51,399 woman-years of follow-up), the incidence of pelvic inflammatory disease (PID) is 1.6 per 1000 woman-years, regardless of the IUD type used (Farley et al., 1992). If pelvic infection ensues after insertion, it is most likely to occur within a few weeks post-insertion. The risk of uterine perforation at the time of IUD insertion is <0.1% (National Collaborating Centre for Women’s Health, 2005). There is no evidence of a reduction in fertility after removal or expulsion of copper IUDs (National Collaborating Centre for Women’s Health, 2005). In addition, use of a copper IUD in nulliparous women is not associated with an increased risk of tubal infertility (Hubacher et al., 2001).

A Cochrane Database Systematic Review of 35 randomized trials involving ~48,000 women found that, among copper-containing framed IUDs, the TCu380A device was more effective in preventing pregnancy than the MLCu375, MLCu250, TCu220 and TCu200 (Kulier et al., 2007). Despite having a higher expulsion rate, the TCu380S was associated with fewer pregnancies than the TCu380A after 1 year of use, with the difference becoming statistically significant in the fourth year. No notable differences were observed between types of IUDs regarding removal rates due to bleeding or pain, ease of insertion or pain at insertion or uterine perforation rates (Kulier et al., 2007).

On the basis of data from four trials of 5939 women, another Cochrane Database of Systematic Review was conducted to compare the effects of the frameless IUD Gynefix and the framed IUD TCu380 on expulsion and pregnancy risk and early removal rates due to bleeding or pain (O’Brien and Marfleet, 2005). Previously reported problems with expulsions in the first years of use (1995) were apparently not alleviated by the modified introducer used in the GyneFix IUD. Risk of pregnancy was lower with the frameless IUD compared with the framed device in the later years of use in one large study (Years 2–6). There were no significant differences between the types of devices in removal rates for excessive bleeding and/or pain (O’Brien and Marfleet, 2005). In a more recent comparative analysis, higher rates of failed insertions, first-year expulsions and first-year pregnancy were observed with the frameless GyneFix than the TCu380A framed IUD (Meirik et al., 2009). No differences in expulsion rates were found in the second through eighth years. Cumulative pregnancy rates were lower for the frameless device versus the framed IUD for the second through eighth years, as were 8-year cumulative rates of ectopic pregnancy and IUD removal for pain.

### Levonorgestrel intrauterine system

The levonorgestrel IUS (Mirena®, Bayer Pharmaceuticals, Deerfield, IL, USA) is a polyethylene T-shaped contraceptive device that is inserted into the uterine cavity, releasing a consistent dose of 20 μg levonorgestrel daily from a steroid reservoir located around the long vertical stem (Supplementary Fig. S2A). This IUS has an approved duration of use of 5 years, but may continue to be effective for at least 7 years (Diaz et al., 1993; Svin and Stern, 1994; Ronnerdag and Odland, 1999). The contraceptive mechanisms of action of the levonorgestrel IUS primarily involve its direct progestogenic effects on the cervical mucus and endometrium, which prevent fertilization (Barbosa et al., 1990; Critchley et al., 1998; Pakarinen et al., 1998; Jones and Critchley, 2000; Stanford and Mikolajczyk, 2002). More than 75% of women using this device will continue to ovulate during use (Nilsson et al., 1984).

The levonorgestrel IUS provides highly effective contraception with a favorable safety profile. Cumulative pregnancy rates of up to 1.0% at 5 years (Andersson et al., 1992; Cox et al., 2002a) and up to 1.1% at 7 years (Svin et al., 1984; Svin et al., 1990; Svin et al., 1991) have been reported with this system (Table II; National Collaborating Centre for Women’s Health, 2005). In women who had undergone an induced abortion, use of intrauterine contraception was associated with a reduced risk (hazard ratio ≤0.45) of a repeat abortion over the 4-year follow-up period (Heikinheimo et al., 2009). Many women using the levonorgestrel IUS experience a marked reduction or complete cessation in uterine bleeding, which can prevent iron deficiency anemia. In a cross-sectional study from Brazil, which compared hematocrit and ferritin levels in women using copper IUDs versus the levonorgestrel IUS, hematological indices were found to be most favorable with the IUS (Faundes et al., 1988).

Cumulative expulsion rates range from up to 5.5% at 3 years (Cox et al., 2002a) to up to 11.8% at 7 years (Table II; Svin et al., 1984, 1990, 1991; National Collaborating Centre for Women’s Health, 2005). Irregular bleeding and spotting are also frequent adverse events of the IUS and are most likely to occur in the first 6 months after device insertion (National Collaborating Centre for Women’s Health, 2005). Oligomenorrhea and amenorrhea are frequently reported within the first year of IUS use. The overall cumulative discontinuation rate among IUS users is ~60% at 5 years. As with other contraceptives, a proportion of women who choose to discontinue the IUS do so to regain fertility when they wish to become pregnant. Unacceptable bleeding and pain are reported as the most common reasons for discontinuation. However, in a 1-year randomized study that evaluated the acceptability of the levonorgestrel IUS versus oral contraceptives in young women, a lower rate of discontinuation was reported in the IUS than oral contraceptive group (20 versus 27%; Suhonen et al., 2004). In addition, bleeding patterns reported with the IUS compare favorably with those reported with the copper IUD (Table III; Suvisaari and Lahteenmaki, 1996; Luukkainen et al., 2001). Counseling on the expected initial bleeding pattern is
### Table II Summary of cumulative pregnancy rates and expulsion rates for copper IUDs and the levonorgestrel IUS (National Collaborating Centre for Women’s Health, 2005).

<table>
<thead>
<tr>
<th>Study</th>
<th>TCu 380A</th>
<th>Multiload Cu375</th>
<th>Framelessa Nova-T 380</th>
<th>LNG-IUS</th>
<th>Measurement point (year)</th>
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<tr>
<td>Cumulative pregnancy rate (%)</td>
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<td>6–7</td>
</tr>
<tr>
<td>Cumulative expulsion rate (%)</td>
<td></td>
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<tr>
<td></td>
<td>4.5–6.7</td>
<td>5.0</td>
<td></td>
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<tr>
<td></td>
<td>5.4</td>
<td>6.5</td>
<td></td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>O’Brien and Marfleet (2005)</td>
<td>2.6</td>
<td>3.1</td>
<td></td>
<td></td>
<td>3–6</td>
</tr>
<tr>
<td>Cox et al. (2002b)</td>
<td>6.0</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
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<tr>
<td></td>
<td>10.3</td>
<td></td>
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<td></td>
<td>3</td>
</tr>
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<td></td>
<td>13.0</td>
<td></td>
<td></td>
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<td>5</td>
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<tr>
<td>Batar et al. (1999)</td>
<td>1.6</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
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<tr>
<td></td>
<td>2.8</td>
<td></td>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Luukkainen et al. (1987) Andersson et al. (1992)</td>
<td>3.4</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>4.3</td>
<td></td>
<td></td>
<td></td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>4.9</td>
<td></td>
<td></td>
<td></td>
<td>5</td>
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<tr>
<td>Sivin et al. (1984) Sivin et al. (1990) Sivin et al. (1991)</td>
<td>5.5</td>
<td></td>
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<tr>
<td></td>
<td>6.1</td>
<td></td>
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<td></td>
<td>7.4</td>
<td></td>
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<tr>
<td></td>
<td>8.4</td>
<td></td>
<td></td>
<td></td>
<td>7</td>
</tr>
</tbody>
</table>

*aCu-Fix, GyneFix, FlexiGard.

bRate per 100 woman-years.

IUD, intrauterine device; IUS, intrauterine system.
extremely important to achieve high compliance with the levonorgestrel IUS. As with the IUD, the risk of ectopic pregnancy with the IUS is very low (i.e. 1 in 1000 in 5 years) and lower than with no contraception (National Collaborating Centre for Women’s Health, 2005). Women using the levonorgestrel IUS also have a low risk of PID (National Collaborating Centre for Women’s Health, 2005). The cumulative discontinuation rate due to PID was ~1% at 5–6 years. In a randomized comparative trial, a low incidence of PID was observed with the levonorgestrel IUS regardless of age, whereas a higher incidence of PID was observed with the copper IUD control (P < 0.01), primarily due to an increased PID rate in the youngest women (Andersson et al., 2010). The risk of uterine perforation with IUS insertion is very low (i.e. <0.1%) and IUS use does not delay or impair the return of fertility after the device’s removal (National Collaborating Centre for Women’s Health, 2005).

A Cochrane Database Systematic Review of 21 randomized clinical trials was conducted to compare the contraceptive efficacy and tolerability of the levonorgestrel IUS with other reversible contraceptive methods (French et al., 2004). Pregnancy rates were not significantly different between women using the levonorgestrel IUS and those using IUDs >250 mm² (i.e. CuT 380A IUD and CuT 380 Ag IUD). However, the pregnancy rate was significantly lower in women using the IUS compared with those using IUDs ≤250 mm² (i.e. Nova-T, Multiload, CuT 200 and CuT 220 IUDs; French et al., 2004). The levonorgestrel IUS was associated with higher rates of expulsion and amenorrhea (desirable for many women) compared with IUDs >250 mm². In addition, women using the IUS were significantly more likely to discontinue use due to hormonal adverse events and menstrual disturbances (related to amenorrhea) than women using any IUD (French et al., 2004).

In a recent, prospective, 15-month study conducted in women who had used their first IUS for more than 4 years and chose to have a second IUS inserted immediately after removal of the first, removal and replacement of the first levonorgestrel IUS was well tolerated by most women and regarded as easy by most physicians (Gemmell-Danielsson et al., 2010). In comparison with use of the first levonorgestrel IUS, use of the second IUS was associated with decreased uterine bleeding after the initial post-insertion period.

In two preliminary studies, the levonorgestrel IUS was shown to be safe and well tolerated in women infected with the human immunodeficiency virus (HIV) (Heikinheimo et al., 2006; Lehtovirta et al., 2007). The effects of the IUS on ovarian activity, menstrual bleeding and iron stores in HIV-infected women appeared to be similar to those in healthy women, and genital shedding of HIV RNA was not affected by use of the device.

### Table III Differences in menstrual bleeding patterns with the copper IUD versus the levonorgestrel IUS (Suvisaari and Lahteenmaki, 1996; Luukkainen et al., 2001).

<table>
<thead>
<tr>
<th>Type of menstrual bleeding</th>
<th>% Subjects&lt;sup&gt;1&lt;/sup&gt;</th>
<th>Copper IUD</th>
<th>Levonorgestrel IUS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Reference Period 1&lt;sup&gt;2&lt;/sup&gt;</td>
<td>Reference Period 4&lt;sup&gt;3&lt;/sup&gt;</td>
<td>Reference Period 1&lt;sup&gt;2&lt;/sup&gt;</td>
</tr>
<tr>
<td>Amenorrhea</td>
<td>0</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Infrequent bleeding</td>
<td>2</td>
<td>2</td>
<td>11</td>
</tr>
<tr>
<td>Frequent bleeding</td>
<td>19</td>
<td>0</td>
<td>13</td>
</tr>
<tr>
<td>Prolonged bleeding</td>
<td>24</td>
<td>0</td>
<td>22</td>
</tr>
<tr>
<td>Irregular bleeding</td>
<td>17</td>
<td>20</td>
<td>67</td>
</tr>
</tbody>
</table>

<sup>1</sup>Percentage of subjects meeting criteria for different patterns of bleeding during a specified 90-day reference period.

<sup>2</sup>Amenorrhea, neither bleeding nor spotting for ≥90 continuous days; infrequent bleeding, < 2 episodes of bleeding per cycle; frequent bleeding, ≥4 episodes of bleeding per cycle; prolonged bleeding, 1 episode of bleeding lasting >10 days; irregular bleeding, range of the interval between episodes of bleeding ≥17 days.

<sup>3</sup>Days 1–90.

<sup>4</sup>Days 271–360.

IUD, intrauterine device; IUS, intrauterine system.

### Progestin-only injectable contraception

Two slow-release, progestogen-only contraceptives are available in more than 100 countries: (i) medroxyprogesterone acetate [DMPA; Depo-Provera® (Pharmacia & Upjohn Company, Kalamazoo, MI, USA) and Megestron® (N.V. Organon, Oss, The Netherlands)]; and (ii) norethisterone enanthate [NET-EN; Noristerat® (Bayer Schering AG, Berlin, Germany) and Doryxus® (Richter Gedeon Ltd., Budapest, Hungary)]. A dose of 150 mg of DMPA is given every 3 months, whereas a dose of 200 mg of NET-EN is given every 2 months (Lande, 1995). An initial sharp increase in progestogen serum levels after i.m. depot injection is followed by a gradual decrease over the subsequent weeks. DMPA is also available in a micronized formulation for subcutaneous administration every 12 weeks (Supplementary Fig. S2B). The subcutaneous preparation delivers a 30% lower total dose (104 mg) than the i.m. preparation but has been shown to suppress ovulation for at least 13 weeks, without being affected by body mass (Jain et al., 2004). Contraceptive mechanisms of action for both DMPA and NET-EN (like all systemic progestogens) include ovulation suppression, thickening of the cervical mucus that blocks sperm motility and endometrial changes that impede/prevent implantation (Mishell, 1996; National Collaborating Centre for Women’s Health, 2005).

DMPA and NET-EN are highly effective and generally well-tolerated contraceptives. For DMPA, cumulative pregnancy rates of 0.1–0.7% have been reported at 1 year (Task Force on Long-Acting Agents for the Regulation of Fertility, 1983; World Health Organization Special Programme of Research Development and Research Training...
Progestogen-only injectable contraceptives are equivocal (Cundy et al., 1993; Lopez et al., 2009). BMD normalizes after study drug discontinuation, although a concern in adolescents is that peak bone mass is never reached. Approximately 50% of women using DMPA discontinue use by 1 year, primarily because of altered bleeding patterns (National Collaborating Centre for Women’s Health, 2005). Comparable discontinuation rates are observed with NET-EN use (Task Force on Long-Acting Agents for the Regulation of Fertility, 1983; Draper et al., 2006). Amenorrhea is 21% more likely to occur in women using DPMA than in those using NET-EN, although the duration of bleeding and spotting events seem comparable (Draper et al., 2006). Weight gain of up to 2–3 kg over 1 year has been reported with use of these contraceptives in clinical trials (National Collaborating Centre for Women’s Health, 2005). Progestogen-only injectable contraceptives are associated with a delay of up to 1 year in the return to fertility after discontinuing use (National Collaborating Centre for Women’s Health, 2005).

Data associating a reduction in bone mineral density (BMD) with progestogen-only injectable contraceptives are equivocal (Cundy et al., 1998; Gbolade et al., 1998; Paiva et al., 1998; Bahamondes et al., 1999; Scholes et al., 1999; Tang et al., 1999; Petitti et al., 2000). Progestogen-only injectable contraceptives are associated with reduced BMD but since the ‘fracture threshold’ is not breached, an increased risk for fracture has yet to be demonstrated (Lopez et al., 2006). BMD normalizes after study drug discontinuation, although a concern in adolescents is that peak bone mass is never reached.

There is a possible etiological association between highly effective contraceptives such as DMPA and NET-EN and the risk of acquiring sexually transmitted infections, including HIV. In a recent review of prospective studies published from January 1966 to August 2008, DMPA did not increase HIV risk among women in the general population although further investigation is needed to verify this finding (Lopez et al., 2009). Findings from a recent randomized study suggest an association between exposure to DMPA and the risk of HIV disease progression, which also urgently requires additional research (Stringer et al., 2009).

**Subdermal progestin implant**

Contraceptive implants are matchstick-sized rods containing progestin that are embedded beneath the skin in a woman’s upper arm. The first implant system, Norplant® (Leiras Oy Pharmaceuticals, Helsinki, Finland), consisted of six levonorgestrel-releasing rods and has since been replaced by simpler implant systems consisting of single or double rods. Currently the most commonly used implant systems are Implanon® (Schering Corp., a division of Merck & Co.), Jadelle® (Schering Oy, Pharmaceuticals, Turku, Finland) and Sino-Implant II®/Zarin® (Shanghai Dahua Pharmaceutical Co., Ltd, Shanghai, China). In addition to their contraceptive effectiveness, subdermal progestin implants frequently result in lighter, less frequent or absent bleeding, which may decrease the risk of iron deficiency anemia but can also cause unscheduled or unpredictable bleeding patterns.

**Implanon**

Implanon is a single-rod, progestogen-only contraceptive implant (Supplementary Fig. S2C) that provides effective contraceptive coverage for 3 years. A trained healthcare provider inserts the implant under local anesthesia in the correct subdermal plane of the inner upper arm. The implant contains 68 mg of etonogestrel, the active metabolite of desogestrel, a third-generation progestogen. The initial etonogestrel release rate of 60 μg/day decreases slowly and steadily over time (Implanon [package insert], 2009), although serum etonogestrel levels are maintained at sufficiently high levels to effectively suppress ovulation in most women. In one study, ovulation was observed for the first time with Implanon after 30 months and ovulation rapidly resumed after removal of the implant (Makarainen et al., 1998).

On the basis of results from 11 international clinical trials of 942 healthy women aged 18–40 years, no pregnancies occurred while Implanon was in place, but six pregnancies were reported within 14 days of implant removal (Darney et al., 2009). When these six pregnancies were included in the efficacy analysis, the cumulative Pearl Index was 0.38. Pearl Indices of 0.27 and 0.30 were calculated for Years 1 and 2, respectively (Darney et al., 2009). The failure rate of this implant is lower than or comparable to that of the oral contraceptive pill, most IUDs, the IUS and female sterilization (Trussell and Wynn, 2008).

As Implanon contains no estrogen, the most common adverse events associated with its use are related to changes in bleeding patterns or progestin-related hormonal side effects. Reported unpredictable bleeding patterns include amenorrhea (incidence, 22.2%) and bleeding that is infrequent (33.6%), frequent (6.7%) and/or prolonged (17.7%). In most women, the bleeding pattern experienced during the first 3 months predicted future patterns. Women with initial favorable bleeding patterns tended to continue with these patterns during the subsequent 2 years of use; however, women with initial unfavorable bleeding patterns had at least a 50% chance of experiencing improved patterns during subsequent use (Mansour et al., 2008). An integrated safety analysis of the 11 international clinical trials, which included findings from 942 women followed for 1–5 years, revealed that the overall discontinuation rate of Implanon was 32.7% (Blumenthal et al., 2008). The most commonly reported reasons for discontinuation were adverse events (13.9%), bleeding irregularities (10.4%) and planning pregnancy (4.1%). Seventy-seven serious adverse events were reported in 56 women (5.9%), the most common being gastrointestinal system disorders, which were reported in 10 women (1.1%). Headache (15.3%), weight increase (11.8%), acne (11.4%), breast pain (10.2%), emotional liability (5.7%) and abdominal pain (5.2%) were the most commonly reported drug-related adverse events. Short insertion (1.3 ± 1.9 min) and removal (3.8 ± 4.9 min) times were reported, with few complications (1.0 and 1.7%, respectively). Implanon use is associated with modest, clinically insignificant effects on insulin resistance and plasma lipid levels (Biswas et al., 2001, 2003; Merki-Feld et al., 2008).

Researchers of a comparative study conducted in 79 healthy women using either Implanon or a non-hormonal IUD observed slightly higher estradiol levels in Implanon users than in IUD users, which were not correlated with changes in BMD (Beerthuizen et al., 2000). Implanon users showed no clinically significant BMD loss (defined as ≥ 1 standard deviations from normative Z-scores).
A recent systematic review was conducted to compare the contraceptive effectiveness, tolerability and acceptability of subdermal contraceptive implants (Power et al., 2009). Eight trials involving 1578 women compared Implanon with Norplant (Affandi, 1998; Croxatto and Makarainen, 1998; Egberg et al., 1998; Huber and Wenzl, 1998; Makarainen et al., 1998; Mascarenhas, 1998; Urbancek, 1998; Suherman et al., 1999; Zheng et al., 1999). Both implant systems were highly effective in preventing pregnancy, with no pregnancies reported in any of the studies. No differences were found between Implanon and Norplant in rates of contraceptive effectiveness, continuation, hormonal adverse events or overall adverse events over 4 years. Changes in bleeding pattern were the most common adverse events with both implants. Bleeding patterns were initially more variable in women using Implanon. Bleeding became less frequent over time with both systems. Implanon was associated with a significantly higher rate of amenorrhea after 2 years of use and significantly shorter insertion and removal times.

**Jadelle**
Approved in Europe and the USA (although never commercially available in the USA) for a duration of 5 years’ use, Jadelle consists of two thin, flexible rods each containing 75 mg of the progestin levonorgestrel (Population Council, 2010). Jadelle provides protection from pregnancy within 24 h of insertion when insertion is performed during the first week of the menstrual cycle. In clinical trials, the cumulative pregnancy rate associated with use of Jadelle was 0.3% for 3 years and 1.1% for 5 years.

Similar to other progestogen-only contraceptives, the most common adverse events associated with Jadelle are changes in menstrual bleeding patterns; other common complaints are generally those reported by women using other hormonal contraceptives (Population Council, 2010). Many women who experience an altered menstrual bleeding pattern while using Jadelle will become more regular within 6–9 months of use, although some women will have persistent bleeding irregularities throughout the entire 3–5 years of use. In clinical studies, 14.1 per 100 women discontinued use of Jadelle over a 3-year period because of menstrual irregularities and 14.7 per 100 women discontinued because of other adverse events, including headaches, depression, weight gain or hair loss (Population Council, 2010).

In three clinical studies (n = 544) Jadelle statistically significantly decreased total cholesterol, HDL-C, LDL-C and triglycerides by 12, 14, 10 and 25%, respectively (Population Council, 2010). The effects of Jadelle on glycemic control are considered to be minimal.

In one study of 1198 women, no difference was observed between Jadelle and Norplant with respect to rates of contraceptive effectiveness or continuation (Power et al., 2007). Removal times were significantly shorter for Jadelle compared with Norplant.

**Sino-Implant II/Zarin**
Approved for use in China, Indonesia and Kenya, Sino-Implant II/Zarin was introduced as a lower-cost alternative to other contraceptive implants. This implant is composed of two thin, flexible rods that each contains 75 mg levonorgestrel (Family Health International, 2008). Currently labeled as effective for 4 years, Sino-Implant II has a reported annual pregnancy rate below 1%. A favorable safety and efficacy profile has been demonstrated in clinical trials that included more than 11,800 women for up to 5 years.

**The cost-effectiveness of LARCs**
Cost is considered one of the major barriers to more widespread use of LARC methods, especially the cost of treatment initiation. However, when their contraceptive efficacy is considered along with the cost of pregnancy, LARC methods are more cost-effective than no method of contraception and more widely accepted contraceptive options.

In a USA cost-benefit analysis that included direct medical costs, adverse events and the cost of unintended pregnancies in the model, all 15 different contraceptive methods assessed were found to be more effective and less costly than no contraceptive method (Trussell et al., 1995). Over 5 years, the copper IUD, and progestin-only injections and implants, prevented ~4.2 pregnancies per person (unintended pregnancy total cost estimate of $14,663). They were identified as the most cost-effective methods, with reported savings of $14,122, $13,373 and $13,813, respectively (Fig. 4; Trussell et al., 1995). Oral contraceptives saved $12,879 over 5 years and prevented 4.1 pregnancies. Barrier methods were costly because of their high failure rates but were nonetheless associated with cost savings over 5 years (Trussell et al., 1995). Although the dollar amounts reported in this analysis are no longer representative of actual costs, the relationships between costs and method use are likely still applicable, thus preserving the overall validity of the conclusions. On the basis of this analysis, the researchers concluded that initial acquisition costs are inaccurate predictors of the overall economic costs of alternative contraceptive methods (Trussell et al., 1995).

Data from a USA cost-effectiveness study revealed that the costs of providing contraceptive methods in a publicly funded family planning program were dominated by the savings from the estimated pregnancies averted with those methods (Foster et al., 2009). The cost savings per dollar spent varied considerably by individual method (Foster et al., 2009). LARC methods were found to be the most cost-effective options, with the progestin-only implant associated with the highest cost savings per dollar, followed by the IUD (Foster et al., 2009).

In the development of its 2005 guidelines, the National Institute for Health and Clinical Excellence conducted an economic evaluation of the LARC methods in comparison with the combined oral contraceptive pill and the male condom (National Collaborating Centre for Women’s Health, 2005). All LARC methods were shown to be the most cost-effective options, with the progestin-only implant associated with the highest cost savings per dollar spent. LARC methods were significantly more effective and less costly than both the pill and male condom for up to 15 years of contraceptive use (National Collaborating Centre for Women’s Health, 2005). The IUD and the injectable contraceptive were more effective and less costly than both the pill and male condom for 1 year of use. For periods of at least 2 years, all of the LARC methods were superior in terms of effectiveness and cost compared with the pill and male condom (National Collaborating Centre for Women’s Health, 2005). Among the LARC methods, the IUD, IUS and the implant were more cost-effective than the injectable contraceptives. Among the IUD, IUS and implant, the IUS was found to be the least cost-effective (National Collaborating Centre for Women’s Health, 2005).
Counseling to prevent unintended pregnancy

Counseling from healthcare providers is essential in helping women make informed choices about family planning. Through counseling and provision of evidence-based, up-to-date information, providers can allow women to choose a contraceptive method that they will feel most comfortable with, given their individual preferences and lifestyles.

Supporting evidence

Women who are well informed about contraceptive options are more likely to be satisfied with and continue use of their chosen method. In a Finnish survey of levonorgestrel IUS users, satisfaction was associated with the advance information they received about bleeding disturbances, PID, oiliness of hair or skin and pregnancy risk. Women who were better informed about their chances of experiencing amenorrhea at the time of contraceptive insertion were more satisfied than those who were less informed (odds ratio 5.0, 95% confidence interval 4.1–5.9; Backman et al., 2002). Studies conducted among new DMPA users in Bolivia (Hubacher et al., 1999) and Mexico (Canto De Cetina et al., 2001) showed at least 2-fold higher continuation rates in women who received more detailed information on this contraceptive’s efficacy, adverse events profile and the likelihood of inducing amenorrhea profile than in those who did not receive this information.

According to a UK survey of family planning physicians, patient counseling contributed to high patient acceptance of progestin-only implantable contraception. Counseling was provided to all women before implant insertion by physicians and nurses (78 and 39% of the time, respectively). Bleeding irregularities were reported by 13% of women; the implants were accepted by 82% of women (Davie et al., 1996). In USA surveys, both private and public healthcare providers of contraceptive care considered improved counseling to be one of the most important steps needed to improve use (Landry et al., 2008). Although all providers reported providing extensive contraceptive counseling at the initial visit, many admitted that this was not necessarily the case at follow-up visits (Landry et al., 2008). Insurance reimbursement was reported to be a barrier to providing contraceptive counseling in these surveys, particularly among private providers (Landry et al., 2008).

The success of community-based contraceptive distribution programs also supports the importance of contraceptive counseling in pregnancy prevention. These programs rely on local distributors, who are trained and trusted members of the community, to provide full contraceptive services to women in their own homes, in the distributors’ homes, or in community health posts, so that women can more conveniently access family planning services. Community-based distribution of injectable contraception has consistently been shown to be an extremely effective way to provide family planning services in Asia, Latin America and Africa, helping to overcome shortages of healthcare professionals in these areas (Weil et al., 2008). In a recent non-randomized trial evaluating the safety, acceptability and continuation rates associated with DMPA provision by community workers versus clinic nurses and midwives in Uganda, 95% of community worker clients were satisfied or highly satisfied with the services they received (Stanback et al., 2007). No significant differences were observed in outcomes between groups receiving care in community programs versus the clinic setting.

Figure 4 Cost savings and pregnancies avoided over 5 years for contraceptive methods versus no method (Trussell et al., 1995). Reprinted with permission from Trussell et al. (1995), American Public Health Association.
Increasing use of long-acting reversible contraception

Table IV Summary of the benefits and limitations of LARC methods (National Collaborating Centre for Women’s Health, 2005).

<table>
<thead>
<tr>
<th>Mechanisms of action</th>
<th>Copper IUD*</th>
<th>Levonorgestrel IUS</th>
<th>Progestin-only injectable contraception</th>
<th>Subdermal progestin implant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Failure: &lt; 20 in 1000 women over 5 years (IUDs with ≥380 mm² copper)</td>
<td>Non-hormonal method Prevents fertilization</td>
<td>Hormonal method Prevents fertilization</td>
<td>Hormonal method Inhibits ovulation Prevents fertilization</td>
<td>Hormonal method Inhibits ovulation Prevents fertilization</td>
</tr>
<tr>
<td>Discontinuation rates (1 year)</td>
<td>Expulsion: &lt; 1 in 20 women over 5 years</td>
<td>Expulsion: &lt; 1 in 20 women over 5 years</td>
<td>41 – 77%</td>
<td>20 – 25%</td>
</tr>
<tr>
<td>Most common reasons for discontinuation</td>
<td>Vaginal bleeding and pain</td>
<td>Altered bleeding pattern (e.g., amenorrhea) and pain</td>
<td>Altered bleeding pattern (e.g., persistent bleeding)</td>
<td>Irregular bleeding</td>
</tr>
<tr>
<td>Adverse effects</td>
<td>Heavy/longer menstrual periods</td>
<td>Irregular bleeding and spotting common in first 6 months</td>
<td>Oligo/amenorrhea likely (more common over time; not harmful)</td>
<td>Irregular bleeding patterns can occur throughout use</td>
</tr>
<tr>
<td></td>
<td>Dysmenorrhea</td>
<td>Oligo/amenorrhea likely by 1 year</td>
<td>Weight gain may occur (2–3 kg over 1 year)</td>
<td>Acne may occur</td>
</tr>
<tr>
<td>Return to fertility on discontinuation</td>
<td>No delay</td>
<td>No delay</td>
<td>Delay in return to fertility of ≤ 1 year</td>
<td>No delay</td>
</tr>
</tbody>
</table>

* IUDs with ≥380 mm² copper and banded copper on arms.

Although, when compared with methods such as implants and IUDs, injectables are not truly ‘long-acting’, many women do use them continuously for long periods of time, and in practice, injectables may be acting over a long period of time for a given woman. In addition, the ‘demedicalization’ of the provision of this method, largely by training lower-level or non-healthcare workers to provide counseling and safely and correctly administer the injections at the community level, is a very promising means of increasing access to and continuation of this highly prevalent contraceptive (Stanback et al., 2007; World Health Organization, 2009).

Management strategies

When providing contraceptive counseling, healthcare providers need to focus on information that will be critical to the patient in making a choice and using the method consistently and correctly. They should assess the amount of time available to cover critical information and tailor the counseling session to meet an individual’s needs. It is important that the provider be sensitive to women’s cultural differences and religious beliefs. Interpreters should be sought when counseling women who do not speak the provider’s language. Ideally, healthcare professionals will establish an open dialogue with women so that they feel comfortable asking questions and returning for services in the future.

First-time contraception users, continuing users and users who may be seeking to switch methods all require information and counseling to stay informed about their choices and options. For women who are considering use of LARC methods, essential information should be provided—both oral and written—that describes each method’s mechanism of action, relative efficacy, duration of use, adverse events, expected bleeding patterns and effects on fertility after discontinuation (Table IV). In addition, procedures required for initiation/insertion and removal and steps to be taken if problems arise should be described.

Healthcare providers should also address relevant ‘myths’ and potential knowledge gaps that may affect women’s perceptions and choices. For many women, access to sexual information may be limited via sources such as the school curriculum, mass media and Internet. Moreover, when accessible, the media and Internet can deliver both reliable sex education as well as harmful or erroneous messages. It is therefore important for healthcare providers to determine patients’ level of knowledge as a baseline for counseling and communicate the needed information in a targeted fashion. Findings from a UK study indicated that women underestimate the effectiveness of hormonal contraceptives (particularly implants) and overestimate the risk of thrombosis (Edwards et al., 2000). In a Finnish cohort study including 1269 women followed for 5 years after an induced abortion, postponing contraceptive use was the highest risk
factor for repeat abortion. Women who received an IUD immediately after the abortion had a significantly (P < 0.001) lower rate of repeat abortion (Heikinheimo et al., 2008).

Conclusions

Despite widespread availability and use of contraceptives, unintended pregnancy remains an alarming global public health problem and a personal and socioeconomic challenge for individuals, families and society. Numerous strategies have been proposed to reduce the rate of unplanned pregnancies. Many of them are cost-effective, particularly LARC methods, which provide better prevention of unintended pregnancy and greater cost savings than the adherence-dependent methods, the pill and condom. More comprehensive counseling and provision of information are certainly required to motivate women to use contraceptives, to reinforce the need for contraception in women who wish to delay or avoid pregnancy, to correct misunderstandings and fear of side effects, to educate about the benefits and risks of the various contraceptive options available and to encourage continuous and appropriate use once a method is chosen.

Increasing use of reliable long-term contraceptive methods that do not depend on user adherence is also likely to have a positive impact on women’s ability to control their reproductive lives. LARC methods, including the copper IUD and progestogen-only IUS, injections and implants, provide highly effective protection against pregnancy that does not require daily or post-coital vigilance on the part of the user or her partner. These methods allow women to avoid the potential health risks and adverse events associated with estrogen-containing contraceptives and, unlike sterilization, allow a return to fertility after discontinuation. It is important that women who are considering LARC methods thoroughly review the benefits and potential side effects of these methods, along with other details on method initiation, correct use and removal, with their healthcare providers. Thorough knowledge and understanding of the contraceptives’ advantages and disadvantages will allow women to make an informed decision about the method that will best suit their individual needs.

Supplementary data

Supplementary data are available at http://humupd.oxfordjournals.org/.

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