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# Why do women experience untimed pregnancies? A review of contraceptive failure rates

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Contraceptive failure contributes to a substantial proportion of unintended pregnancy, particularly in the developed world. A number of socio-demographic factors seem to impact on the risk of a woman experiencing contraceptive failure. Many of the issues exist across cultural boundaries and are complex to address. In discussing the failure rates for individual contraceptive methods, this article will highlight the advantage of improving uptake of long-acting reversible methods of contraception which have a high efficacy and are less user-dependent than many of the other available methods.

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## Introduction

One in two pregnancies in the US and one in three pregnancies in the UK and France are unintended. These are primarily the result of contraceptive failure, incorrect or inconsistent use of a method or lack

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of use of any form of contraception. The contribution of contraceptive failure to these unintended pregnancies seems to vary. In the United States, 50% of women report this as the reason for the unintended pregnancy compared to 65% of women in France, and 15% of women in developing countries where levels of contraceptive use are low.[1,2] Contraceptive failure is measured using the Pearl Index or life-table analysis and the method failure rates depend on both, the intrinsic efficacy of the contraceptive method and the potential for misuse. Many demographic, behavioural and method characteristics impact on contraceptive failure rates and these seem to vary across populations.[1] Understanding the determinants of contraceptive failure may assist in reducing the substantial numbers of associated unintended conceptions particularly via targeting of specific subgroups at heightened risk of contraceptive failure.

## Defining unintended pregnancy

Most studies have tried to capture pregnancy intention by asking women to classify their pregnancies into the distinct categories of 'wanted' and 'unwanted' with a further distinction within the unwanted category between those that were mistimed or untimed (wanted later) or unwanted (not wanted at all).[3,4] For the purposes of analysis, many researchers group the unwanted together, although this risks the possibility of not being clear about the true effect of pregnancies that are never intended.[5] We have chosen to use the term 'unintended' to encompass pregnancies that are both untimed and unwanted. Evidence from the US suggests that as many as 6 in 10 of these pregnancies end in abortion.[6]

Studying why women have unintended conceptions is complicated by the fact that there is evidence that women's perception of whether the pregnancy was planned or wanted can change over time. As such, response to a pregnancy intention measure may vary depending on whether it was asked in the early stages of pregnancy or after the birth when women may view the pregnancy more favourably. Thus, retrospective measures may be inaccurate.[7,8] In contrast, prospective studies in the United States and Asia have found that women's desire for fertility is somewhat stable over time,[9–11] although personal situations may change abruptly and impact on childbearing intentions.[4]

## Behavioural factors associated with unintended pregnancies

The gap between women's stated desire to avoid pregnancy and their behaviour with respect to contraceptive use and non-use has been researched for decades.[12,13] Several theoretical frameworks have emerged to try to explain what factors moderate the interaction between attitudes and behaviour with respect to contraception.[13] All conclude that the relationship is complex and dynamic. It appears that a woman's contraceptive vigilance at any one time often depends on her weighing up her positive and negative feelings of conceiving with her positive and negative feelings about the contraceptive method she is using.[12] Thus, factors such as the cost versus the benefits of contraception, the chance of becoming pregnant and the possibility of being willing and able to terminate a pregnancy should conception occur are frequently assessed and reassessed.[13] Family planning services can potentially only have a limited influence over these machinations.

These theories have been tested in empirical studies which typically measure the strength of women's motivation to avoid pregnancy.[14–16] What emerges is that in many studies the reasons for not using contraception often involve an expressed ambivalence about falling pregnant.[16] In a study of 1568 pregnant adolescents, the most frequently endorsed reason for non-use of contraception was simply that they were not ready to prevent pregnancy.[15] Studies in non-pregnant women also demonstrate that ambivalence towards pregnancy is common and is associated not only with non-use but also with use of less effective methods.[17,18]

According to the 2002 National Survey of Family Growth in conjunction with data from federal, state and non-government sources in the United States, contraceptives were used in 48% of unintended pregnancies.[19] These rates were confirmed in a study that looked at teenage pregnancy and contraceptive use. In this study, a cohort of 2,542 sexually active women, risk of pregnancy occurred in 46% from failure to use any method of contraception and in 54% from contraceptive failure.[20] Of those using

contraception and seeking abortion, 19% stated they had used birth control correctly but much more commonly, women became pregnant as a result of incorrect or inconsistent contraceptive use.[21]

## Defining contraceptive failure

Contraceptive failure rates are estimated from clinical trials and surveys. The terms used to encapsulate the reliability of a method in preventing pregnancy are 'efficacy' and 'effectiveness'. Contraceptive efficacy indicates how well something works under ideal conditions, that is, during perfect use. Contraceptive effectiveness determines how well something works under normal or 'actual' or typical use and takes compliance into account.

Contraceptive failure relies primarily on two factors: the intrinsic efficacy of the contraception and the potential for misuse, including either incorrect or inconsistent use. Some contraceptive methods have both high intrinsic efficacy and low potential for misuse such as sterilisation, intrauterine devices (IUDs) and implants.[22] Accordingly, they have a very low association with unplanned pregnancy. Some contraceptive methods have a high intrinsic efficacy and a high potential for misuse such as oral contraceptives and, to a lesser extent, injectables, and therefore are associated with a higher rate of unplanned pregnancy than their inherent efficacy would indicate.[22] Other forms of contraception such as the rhythm method, condoms and spermicides have both, a low intrinsic efficacy and a high potential for user error, and are therefore most risky in terms of unplanned pregnancy,[22] although they may be chosen for cultural and religious reasons.

The Pearl Index has been widely used in the past to describe contraceptive failure rates and relates to the total number of cycles of exposure from the time of initiation of method until a pregnancy occurs or the method is discontinued. Commonly, rates are quoted in percentages and list unplanned pregnancies for both typical use and perfect use of the method. However the Pearl Index does not take into account the fact that failure rates usually decline with time and duration of use, largely because those prone to failure do so in the first year and those that are more compliant users, less fertile and have less frequent intercourse continue.

Another method of calculating effectiveness is life-table analysis, which determines a failure rate for each month of use allowing the determination of a cumulative failure rate for a given interval of exposure. It allows for appreciation of the change in contraceptive failure throughout a particular time period of contraceptive use. This is most important for methods with a higher chance of imperfect use.[23]

## Factors associated with contraceptive failure

Aside from the inherent efficacy of the method, the user characteristics associated with contraceptive failure include age, frequency of sexual intercourse, substance use and relationship violence. Socioeconomic factors and ethnicity play a lesser role. These demographic factors impact on a number of different aspects of contraception such as contraceptive choice and effective use, which in turn affect the rate of contraceptive failure.

*Age*

The high natural fertility rates in young women mean that 82% of pregnancies in girls aged 15–19 are unintended[24] and women aged 15–24 years are more likely to experience contraceptive failure with use of the oral contraceptive pill (OCP) and condoms[25,26] compared to women aged 25–34 years. Younger women may also be less compliant with user-dependent methods, although the evidence is not consistent. Whilst a large US study found that teenaged women used the OCP as consistently as older women,[27] smaller studies have indicated that this may not be the case.[28] Indeed, in Danish adolescents, contraceptive failure is a much greater problem compared to non-use of contraception.[29,30] Improved contraceptive use, including an increase in use of intended methods, multiple methods and decline in non-use, is considered responsible for the 86% decline in adolescent pregnancy in the US between 1995 and 2002.[31]

*Frequency of intercourse*

In women adhering correctly to contraceptive use, frequency of sexual intercourse is a key factor in determining the chance of method failure.[32] In clinical trials of women using the diaphragm those women who had more frequent intercourse were more likely to become pregnant despite perfect use than those having sex less often. Contraceptive failure rates decline with age and length of marriage in line with reduced coital frequency.[22,33]

*Substance use*

Substances including alcohol and illicit drugs make risky sexual behaviours more likely in users, with drinking and drug-taking students seven and five times more likely to have engaged in sexual activity than non-drinkers, respectively.[34] Further, substance use results in less reliance on condoms.[35]

In addition, prescribed substances can also affect contraceptive methods. For example, if liver enzyme-inducing drugs are used with hormonal contraception, they may reduce the contraceptive efficacy of the contraceptives. Anti-retroviral therapies, anti-epileptic medication and concomitant broad-spectrum antibiotic usage can result in OCP failure.[36]

*Relationship violence*

Until recently, much of the data relating violence and unwanted pregnancies had been collected from developed countries but there is now evidence of an association between intimate partner violence and unplanned pregnancy in many different settings.[37–39] Violence can lead to coerced sex, and/or interfere with a woman's ability to use contraceptives, including condoms.[40,41]

*Poverty*

There is some evidence from the US that contraceptive failure of those methods that are partner-dependent (condoms and withdrawal) is higher in women from lower-income groups.[14,26] In contrast there seems to be no observed difference with combined oral contraceptive (COC) failure rates between low- and high-income women.[42] Overall, contraceptive failure rates in developing countries are similar to failure rates in the US, indicating a similar ability of people in developed and developing nations to use contraception correctly.[2] However, far fewer unintended pregnancies are contributed to contraceptive failure because contraceptive use is far less prevalent and therefore non-use of contraception is a more important factor in unintended pregnancies in developing nations.[2] It is believed the poor uptake of contraception in these nations is due to a combination of barriers, for example, poverty, gender preference, inappropriate contraindications and provider bias.[43]

*Ethnicity*

Whilst discontinuation of oral contraception has been found to be higher in black women in the US,[26] with the exception of condoms, which have a higher failure rate in this group, ethnicity seems to have no effect on failure rates of contraceptive methods.[42]

**Behavioural factors associated with contraceptive failure**

A recent review of the research identified five groups of factors which lead to non-compliance with contraception: ambivalent feelings about having a child or relationship issues, holding incorrect information or misconceptions about fertility and contraception, difficult or limited access to services, behavioural errors and side effects of the methods.[44]

*Ambivalence*

The issue of ambivalence affects both non-use and inconsistent use of contraception. In a study of sexually active women who were not intending to get pregnant, women who had less motivation to avoid pregnancy were more likely to report inconsistent method use and use of less reliable methods.[45]

*Incorrect information and misconceptions*

Misunderstandings about contraception and fertility contribute to imperfect use of methods. One study estimated that miscommunication between health-care providers and patients was responsible for misuse of a contraceptive method in 14% of women seeking an abortion.[21] Further, lack of knowledge of emergency contraception (EC) as a back-up method is prevalent amongst women seeking an abortion. Thus, health professionals could potentially improve uptake of post-coital methods, although another key barrier to this seems to be that women do not always recognise when they are at risk of pregnancy. Therefore, having the information does not necessarily mean women will access the treatment when needed.[46,47]

*Access to services*

Difficulty accessing services, concerns about service quality, staff attitudes, confidentiality and medical barriers to contraception also contribute to unintended pregnancy.[48] Among low-income women in the United States, experience of the clinic interaction impacted in their compliance with contraception. Women who were satisfied with the care they had received used their hormonal method more reliably and with greater contentment.[49] Other obstacles to effective use of contraception include the use of protocols that delay initiation of contraception, or restrict access to certain methods.[1,2] Health professionals have a responsibility towards updating their knowledge and skills to eliminate unnecessary barriers to access.[49]

*Behavioural errors*

Most unintended pregnancies occurred when contraceptive methods were used incorrectly or inconsistently. In a UK study, five out of seven women using the OCP became pregnant because of either missed pills or failure to use additional protection with an intercurrent gastrointestinal illness.[50] In a US study, inconsistent use was the main cause of pregnancy in 49% of condom-users and 76% of pill-users.[27] Contraception specialists recommend that the key solution to this is for health practitioners to counsel women to take up more effective and less user-dependent methods that do not depend on daily adherence, that is, long-acting reversible contraception (LARC) such as intrauterine methods, implants and injectables.[51,52]

Discontinuations for reasons other than trying to become pregnant are shown to be significantly associated with untimed pregnancies compared to pregnancies of women who were not using contraception during the year prior to the pregnancy. The authors concluded that increased effort should be made to reduce contraceptive failure by increasing contraceptive continuation.[53]

*Side effects of methods*

Many women fear the side effects of methods, which can lead to both method discontinuation and inconsistent use.[49] One-third of women attending abortion services in the US, who had not used contraception, cited concerns about contraceptive methods as their reason.[27] A positive attitude towards contraception and an understanding of the benefits and risk of methods has been found to increase consistent use[54]; conversely, when women are not satisfied they seem to become less vigilant.[49] Health-care providers should give clear evidence-based information, both spoken and written, and provide ongoing support to women in continuing to use the method they choose.

## Contraceptive failure by method

The following section outlines contraceptive failure issues pertaining to individual methods. As previously discussed, it is the inherent efficacy of the method combined with its potential for imperfect use which provides the effectiveness of the method in actual practice.

### Combined oral contraceptive pill

COCs are highly efficacious if used consistently and correctly with a failure rate of 3 in 1000. Typical or ineffective use is associated with unwanted and untimed pregnancies of 8 in 100 pregnancies.[27,38] Over 1 million unplanned pregnancies in the US each year are estimated to result from oral contraception misuse or discontinuation. The main cause of misuse is missing pills.[55,56]

Compliance is the main issue with the COC and the quality of counselling for the method is likely to have a positive influence on both usage and compliance.[57] Counselling should not only emphasise the need for compliance but also identify user factors likely to promote successful use.[58] Asking women to commence the COC via the quick-start regimen appears to lead to greater continuity in the first 6 months of starting the COC.[59]

Providing women with extended supplies of the pills reduces the chance of untimed pregnancy. In one study, women dispensed 13 packs at the second visit were less likely to become pregnant compared to those who received 1 or 3 months supply (2.9% vs. 8%).[60]

Pills with a reduced pill-free interval of 4 days as opposed to usual 7 days may also improve compliance because by shortening the hormone-free interval, they may reduce the frequency of hormone withdrawal side effects that occur with traditional 21/7-day regimens.[61,62]

Extended and continuous systems (Seasonale® and Seasonique® in the US) may potentially improve compliance but as yet there is no evidence for this.

The link between high body mass index (BMI) and oral contraceptive failure is contentious. There is a suggestion that oral contraceptives may be rendered less effective in obese women as it has been noted that an additional two to four pregnancies occur per 100 women in overweight women using COCs.[63] However, a number of studies are now emerging showing that there is no statistically significant increase in oral contraceptive failure in women with a high BMI.[64] Further, compliance appears to be unaffected by BMI.[65]

### Transdermal combined patches

Compliance is potentially improved with the transdermal combined contraceptive patch (Ortho EVRA®) compared to the COC, as one study demonstrated increased number of perfect use cycles with the patch.[66] One study demonstrated that in women at or over 90 kg, contraceptive failures may be increased with the contraceptive patch and thus the summary of product characteristics of Evra® advises caution in overweight women.[67]

### Vaginal rings

A randomised controlled trial (RCT) of the contraceptive vaginal ring (NuvaRing®) compared to the COC over 13 cycles, found comparable failure rates of the two methods, with a Pearl index of 1.23 (95% confidence interval (CI): 0.40–2.86) and 1.18 (95% CI: 0.39–2.79) respectively.[68] In addition, the rates of compliance in a trial setting for both methods are 86–88%. Non-compliance in vaginal ring users was mainly due to extension of the ring-free period or temporary removal of the ring.[69,70]

### Progestogen-only pill

Population-based data from the US reporting typical use of contraceptive methods are not able to separate COC data from progestogen-only pill (POP) data. Both failure rates are quoted as 0.3–8 per 100 women years (WY) (Table 1).[32] About 5% women aged 16–49 years in the UK use the POP, and similarly the contraceptive failure rates are 1 per 100 WY for consistent and correct usage.[71] Failure

rates of traditional POPs reduce with age and are much lower for women over 40 (0.3 per 100 WY).[72] Whilst the traditional POPs (containing norethisterone, levonorgestrel (LNG) or etynodiol diacetate) primarily act by thickening cervical mucus to prevent sperm penetration, the desogestrel-only pill's primary mode of action is inhibition of ovulation. However, whereas there is direct evidence that the desogestrel pills are more efficacious[73], there is no direct evidence of reduced efficacy of POPs in women weighing over 70 kg (faculty of family planning and reproductive healthcare). Liver enzyme-inducing drugs have potential to increase the metabolism of progestogen and decrease the efficacy of POP. Hence their use with these types of medication is not recommended.

### Injectables

From the 2002 National Survey of Family Growth in the US, the probability of failure of injectables during the first 12 months of use was reported as 7% [42], but Trussel, using clinical trial and survey data, estimates much lower failure rates from perfect to typical use of 0.3–3% (Table 1).[32,74–76] One of the main contributors to contraceptive failure is discontinuation, with up to 50% of progestogen-only injectable contraceptive users stopping the method by 1 year due to menstrual disruption.[77]

**Table 1**
Percentage of women experiencing unwanted pregnancies during the first year of typical and perfect use and the continuation rates.

| Method (1) | Women experiencing an unintended pregnancy within the first year of use (%) | | Women continuing use at 1 year (%) | Oxford FPA study Lancet report in 1982 overall |
|---|---|---|---|---|
| | Typical use | Perfect use | | |
| No method[d] | 85 | 85 | | |
| Spermicides[e] | 29 | 18 | 42 | |
| Withdrawal | 27 | 4 | 43 | |
| Fertility-awareness-based methods | 25 | | 51 | |
|   Standard Days method | | 5 | | |
|   Two Day method | | 4 | | |
|   Ovulation method | | 3 | | |
| Sponge | | | | |
|   Parous women | 32 | 20 | 46 | |
|   Nulliparous women | 16 | 9 | 57 | |
| Diaphragm[g] | 16 | 6 | 57 | |
| Condom[h] | | | 49 | |
|   Female | 21 | 5 | 53 | |
|   Male | 15 | 2 | | |
| Combined pill and progestin-only pill | | | 68 | |
| Patch | 8 | 0.3 | 68 | |
| Ring | 8 | 0.3 | 68 | |
| 3-month injectable | 8 | 0.3 | 56 | |
| | 3 | 0.3 | | |
| Intra-uterine devices | | | | 0.02 |
|   Copper T | 0.8 | 0.6 | 78 | 0.13 |
|   Levonorgestrel intra-uterine system | 0.2 | 0.2 | 80 | |
| 3-year implant | 0.05 | 0.05 | 84 | |
| Female sterilization | 0.5 | 0.5 | 100 | |
| Male sterilization | 0.15 | 0.10 | 100 | |

Adapted from Trussell, 2006 and Guillebaud your questions answered Churchill Livingstone fifth edition 2009.

[d] The percentage becoming pregnant in columns 2 and 3 are based on data from populations where contraception is not used and from women who cease using contraception in order to become pregnant. Among such populations, about 89% become pregnant within 1 year. This estimate was lowered slightly to 85% to represent the percentage who would become within 1 year among women now relaying on reversible methods of contraception if they abandoned contraception altogether.

[e] Foams, creams, gels, vaginal suppositories, and vaginal film.

[g] With spermicidal cream or jelly.

[h] Without spermicides.

*Contraceptive implants*

Contraceptive implants are extremely effective with an estimated 0.5% women experiencing an unintended pregnancy in the first year of use (Table 1). The overall pregnancy rate reported in the National Institute for Health and Clinical Excellence (NICE) guidelines on LARC (UK) was 1 in 1000 over 3-year use.[78] Pregnancies in implant users are not usually true method failures but may occur due to other reasons such as existing pregnancy, drug interactions and failure to implant the rod as reported in the Australian post-marketing surveillance study.[79] A recent French publication which included 11 international studies from data collected over 9 years of marketing experience (1998–2007) reported the pregnancy rate as 0.049%.[80] The reported failure with Norplant is estimated to be higher at 1.5–1.8%.[81,82] Efficacy of progestogen-only implants is not reduced in women with a BMI $> 30 \, kg \, m^{-2}$. Discontinuation rates vary with age, quality of counselling and tolerability of side effects, particularly menstrual disruption.[83,84]

*IUDs and intrauterine systems*

The lowest failure rates for any contraceptive method are with IUDs.[78] Failure occurs largely due to expulsion and, less commonly, with the device *in situ* in which case an ectopic pregnancy may result.[85]

Copper-bearing devices are more effective if they contain copper on the arms. At the end of the first year of use, there are twice as many pregnancies reaching statistical significance with Nova T 380 compared to Gynae T380. The 5-year comparative failure rate in the Norwegian publication was 4.4% for Nova T 380 and 2.2% for Gynae T 380 Slimline.[86] A Cochrane review of over 23 180 years of use identified comparable failure rates for framed Copper T 380A and frameless devices (Gynefix), although the efficacy of Gynefix may be compromised by the increased risk of expulsion in the early months.[87] There is no randomised data on the clinical effectiveness of the Flexi T 380. Age, parity, operator experience and dislocation of the device are significant factors affecting IUD-related contraceptive failures.[85]

The Levonorgestrel Intrauterine system (LNG IUS) has a Pearl Index of 0.1–0.2 per 100 WY and is more effective in preventing pregnancies compared to IUDs containing <250 sq mm copper.[88,89] The first year failure rates for LNG IUS users were similar to that for Copper T 380 A users.[90]

*Male condoms*

Trussell reports true method failures and typical use failures for male condoms in the first year of use as 2% and 15%, respectively.[32] Three randomised trials have examined the contraceptive efficacy of male condoms, two of which reported no significant difference in pregnancy rates between latex and non-latex condoms.[91,92] Secondary analysis on a cross-sectional survey of women in 16 developing countries showed a condom failure rate of 9% at 12 months compared to 6% with the OCP.[93] It is interesting that 48% of women using a condom at the time of an unwanted conception confirmed the observation of method failure.[94]

Men and women should be appropriately counselled on the use of male and female condoms – the five key points are to use a new condom for every act of sexual intercourse, put on a condom before genital contact, unroll the condom down to the base of the penis, remove it immediately after ejaculation and appropriate use of lubricant. These tips will go a long way towards effective use and pregnancy prevention.

Breakage and slippage rates of condoms are generally used as surrogate markers for contraceptive compromise but are poor indicators of condom failure leading to pregnancy.[95] A Cochrane review of RCTs compared eight latex male condom studies with four non-latex male condom studies and concluded that non-latex male condoms had significantly higher clinical breakage rates during sexual intercourse compared to latex condoms.[96] The factors determining condom failure include background fertility, coital frequency and correct and consistent use of the method. The correct and consistent use of male condoms is linked to pregnancy prevention and reduction in risk of human immunodeficiency virus (HIV), chlamydia, gonorrhoea, genital herpes, syphilis, genital warts and trichomonas vaginalis infection.

*Female condoms*

The method failure rate with consistent and correct usage of female condoms is 5%, while the typical use failure rate is 21%.[32] Breakage rates for female condoms are very low.

*Diaphragms, caps and contraceptive sponge*

The method failure rate for diaphragms with spermicides is estimated to be 4–8% in the first year of use and the typical use failure rate without spermicides is 16%.[32] Failure can vary with inconsistent usage but there is no difference in failure between parous and nulliparous women.[33] When used consistently and correctly, latex cervical caps are between 92% and 96% effective in preventing pregnancy, but the typical use failure rate is estimated as 32% for parous women and 16% for nulliparous women.[97] The efficacy of a silicone cap is lower compared to conventional caps. The efficacy of the contraceptive sponge was reported in a systematic Cochrane review that included two RCTs. This review found that 12-month cumulative life-table pregnancy rate for the sponge was 17.4 per 100 WY compared to 12.8 for the diaphragm (odds ratio 1.5, 95% CI: 1.1–2.1).[97]

*Fertility awareness-based methods*

Knowledge of fertility awareness methods amongst health professionals is often incomplete and reliance on fertility awareness-based (FAB) methods results in the highest probability of failure in the US (25%).[27,42] Lower contraceptive failure rates for withdrawal (10.1%), spermicides (21.7%) and periodic abstinence (7.7%) were reported in a French publication, although discontinuation rates at 1 year are higher than all other methods.[1,32]

*Lactational amenorrhoea method*

Four prospective clinical studies of the contraceptive effect of lactational amenorrhoea method (LAM) demonstrated cumulative 6-month llife-table perfect use pregnancy rates of 0.5%[98], 0.6%, 1% and 1.5%[98,99] among women who rely solely on LAM. This method requires that the baby be fully breast-fed, less than 6 months of age and the mother remains amenorrhoeic.

*Male and female sterilisation*

Female sterilisation is very reliable with a lifetime risk of failure of 1 in 200 procedures. Failures do occur and parity and duration of use is associated with the risk of an unplanned pregnancy.[100] Certain techniques seem to have a reduced risk of failure, particularly the Filshie Clip method.[101]

The failure rate of vasectomy is 0.15 (see Table 1.[32] These failures can be early or late. Early failures may be due to unprotected sexual intercourse before semen testing has confirmed sterility, early re-canalisation of the vas, undiagnosed duplication of the vas or misidentification of the vas. Late failures can be due to late re-canalisation of the vas many years after the procedure. The effectiveness of incisional and no-scalpel method for vasectomy was compared in a recent Cochrane systematic review and no difference in clinical effectiveness was observed but the sample size may have been too small.[102]

*Emergency contraception*

The effectiveness of hormonal emergency contraception, as estimated from the earlier trials, is likely to be overstated as combined data from two randomised trials comparing the combined emergency contraception regimen with progestogen-only regimen (Levonelle®) indicated that the LNG only regimen prevented at least 49% of the pregnancies expected with the combined regimen.[103] The recently licensed emergency contraceptive preparation – ulipristal – has the advantage of being licensed for use for up to 120 h of unprotected sexual intercourse and is at least effective as levonorgestrel emergency contraception. The pregnancy rate with post-coital insertion of copper-bearing IUDs is only 0.2%.[104]

## Conclusion

A number of social and demographic factors impact on the risk of contraceptive failure and untimed pregnancy, but age is particularly important: younger women are more fertile and may be less compliant with contraception and are therefore more prone to contraceptive failure and untimed pregnancy. There is a growing consensus that the most effective strategy to address the public health issue of untimed pregnancy is to encourage greater use and acceptability of LARC methods. Increasing uptake of methods with higher intrinsic efficacy that are less prone to misuse will assist in preventing over 50% of untimed pregnancies.

## Conflict of interest statement

Kirsten Black is involved is currently involved as a sub-investigator in a Bayer Schering Pharma trial of a low dose levonorgestrel intrauterine system. Sunanda Gupta has attended conferences sponsored by pharmaceutical companies. Ali Kubba takes *ad hoc* lecturing and consultancy assignments for pharmaceutical companies involved in women's health products. He has attended conferences sponsored by pharmaceutical companies.

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**Practice points**

- Contraceptive failure contributes to over 50% of all unplanned pregnancies.
- Failure due to contraceptives occurs mainly because of inconsistent or incorrect use.
- A range of demographic and behaviour factors impact on the risk of contraceptive failure.
- The best methods are those with high intrinsic efficacy and low potential for misuse, the long-acting reversible methods of implants and IUDs.

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**Research agenda**

- To develop interventions that will improve women's understanding of their fertility.
- To examine ways to maximise the clinical interaction in order to improve uptake and compliance of contraceptive methods.
- To improve acceptability of long-acting methods amongst women and health providers.

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