

DEPARTMENT OF GENERAL PRACTICE AND PRIMARY
HEALTH CARE
FACULTY OF MEDICINE
DOCTORAL PROGRAMME IN POPULATION HEALTH
UNIVERSITY OF HELSINKI
FINLAND

FEASIBILITY
OF
FREE-OF-CHARGE
LONG-ACTING REVERSIBLE
CONTRACEPTION

TUIRE SALORANTA

ACADEMIC DISSERTATION

To be presented, with the permission of the Faculty of Medicine of the
University of Helsinki, for public examination in Seth Wichmann
Auditorium, Haartmaninkatu 2, on November 25th 2022, at 12 noon

Supervised by Professor Oskari Heikinheimo, MD, PhD
Department of Obstetrics and Gynaecology
University of Helsinki and Helsinki University
Hospital

Associate Professor Merja K Laine, MD, PhD
Department of General Practice and Primary
Care
University of Helsinki and Helsinki University
Hospital

Reviewed by Associate Professor (tenure track), Tuomas
Koskela, MD, PhD
Faculty of Medicine and Health Technology |
Clinical Medicine
University of Tampere

Adjunct professor Eila Suvanto, MD, PhD
Department of Obstetrics and Gynaecology
University of Oulu and Oulu University
Hospital

Opponent Adjunct professor Antti Perheentupa, MD, PhD
Department of Obstetrics and Gynaecology
University of Turku and Turku University
Hospital

Cover photograph by Tuire Saloranta (A peony in Tuire Saloranta's
garden)

The Faculty of Medicine uses the Urkund system (plagiarism recognition)
to examine all doctoral dissertations.

*Dissertationes Scholae Doctoralis Ad Sanitatem Investigandam Universitatis
Helsinkiensis*

ISSN 2342-3161 (print)

ISSN 2342-317X (online)

ISBN 978-951-51-8564-8 (paperback)

ISBN 978-951-51-8565-5 (PDF)

Unigrafia, Helsinki, 2022

To my family, and the inventors of
modern contraception

CONTENTS

TERMS AND ABBREVIATIONS	8
LIST OF ORIGINAL PUBLICATIONS:.....	9
ABSTRACT.....	10
TIIVISTELMÄ.....	12
1 INTRODUCTION.....	14
2 REVIEW OF THE LITERATURE	17
2.1 Family planning services.....	17
2.1.1 Guidelines.....	18
2.1.2 Organising globally	19
2.1.2.1 Developed countries.....	19
2.1.2.1.1 Nordic countries	19
2.1.2.1.2 Finnish health services.....	20
2.1.2.2 Developing countries.....	23
2.1.3 Service users.....	24
2.2 Contraceptive methods.....	25
2.2.1 Traditional contraceptive methods	28
2.2.1.1. Withdrawal.....	28
2.2.1.2 Rhythm methods.....	28
2.2.2 Modern contraceptive methods.....	29
2.2.2.1 Long-acting reversible contraception.....	29
2.2.2.1.1. Intrauterine devices	31
2.2.2.1.2. Implants	34

2.2.2.2 Short-acting reversible contraception	37
2.2.2.2.1. Combined hormonal contraceptives.....	37
2.2.2.2.2. Progestin-only pills.....	38
2.2.2.2.3 Injectable contraceptives.....	39
2.2.2.3 Irreversible methods.....	40
2.2.2.3.1. Female sterilisation	40
2.2.2.3.2. Male sterilisation.....	40
2.2.2.4 Other modern methods.....	40
2.2.2.4.1. Condoms.....	40
2.2.2.4.2. Diaphragm and spermicides.....	41
2.3 Reasons for contraceptive failure	42
2.4 Discontinuation of contraception.....	45
2.5 Effects of contraceptive methods on health and well-being	47
2.5.1 Risk of pelvic inflammatory disease	50
2.6 Evolving guidelines and changing patterns of IUD use	51
2.6.1 Use of IUDs among nulliparous and teenaged women	51
2.6.2 Timing of insertion.....	54
2.6.3 STIs and pelvic inflammatory disease	55
2.6.4 Follow-up visits	56
2.7 Unintended pregnancies and induced abortions.....	57
2.7.1 Global perspective.....	57
2.7.2 Nordic perspective	59
2.7.3 Reimbursing contraception and reducing the rate of induced abortions.....	59
2.8 Summary of the literature review	61

3 AIMS OF THE STUDY.....	63
4 MATERIALS AND METHODS	64
4.1 Setting	64
4.1.1 Family planning services in the city of Vantaa	64
4.1.2 Free-of-charge LARC programme	64
4.2 Data sources	66
4.3 Study design.....	71
4.3.1. Defining the study cohorts	72
4.3.1.1 Study I	72
4.3.1.2 Study II	72
4.3.1.3 Study III.....	74
4.3.1.4 Study IV	76
4.4 Statistical analyses	78
4.5 Ethical considerations	85
5 RESULTS.....	86
5.1 Study population	86
5.2 Users of family planning services.....	94
5.3 Discontinuing free-of-charge LARC.....	99
5.4 Provision of free-of-charge LARC and the need for induced abortions	103
5.5 Use of reproductive health services among users of short- and long-acting reversible contraceptives	105
6 DISCUSSION	117
6.1 Summary of main findings.....	117

6.2 Comparison with previous studies	117
6.2.1 Users of family planning services.....	117
6.2.2 Discontinuing LARC.....	119
6.2.3 Provision of free-of-charge LARC and the need for induced abortions.....	121
6.2.4 Use of reproductive health services among users of short- and long-acting reversible contraceptives.....	122
6.3 Strengths and limitations.....	123
6.3.1 Data sources and participants.....	123
6.3.2 Methodological considerations.....	124
6.4 Suggestions for further research.....	126
6.5 Implications for organising family planning services .	127
7 CONCLUSIONS.....	129
8 ACKNOWLEDGEMENTS.....	130
REFERENCES:	135
ORIGINAL PUBLICATIONS.....	162

TERMS AND ABBREVIATIONS

CDC, Center for Disease Control

CHC, combined hormonal contraceptive

CI, confidence interval

COC, combined oral contraceptive

DMPA, medroxyprogesterone acetate

FDA, Food and Drug Administration

GP, general practitioner

IRR, incidence rate ratio

IUD, intrauterine device

LARC, long-acting reversible contraceptive (intrauterine devices and contraceptive implants)

LNG, levonorgestrel

OR, odds ratio

PI, Pearl Index

PID, pelvic inflammatory disease

POP, progestin-only pill

SARC, short-acting reversible contraceptive (contraceptive pills, patches, and rings)

UK, United Kingdom

UN, United Nations

US, United States

WHO, World Health Organization

LIST OF ORIGINAL PUBLICATIONS:

This thesis is based on the following original publications:

- I. Saloranta T, Gyllenberg F, But A, Gissler M, Laine MK, Heikinheimo O. Use of universally offered family planning services - a cohort study in the city of Vantaa, Helsinki metropolitan area, Finland *Scand J Public Health*. 2022 Jun;50(4):454-462. doi: 10.1177/14034948211002745. Epub 2021 Apr 5. PMID: 33818219.
- II. Saloranta TH, Gyllenberg FK, But A, Gissler M, Laine MK, Heikinheimo O. Free-of-charge long-acting reversible contraception: two-year discontinuation, its risk factors, and reasons. *Am J Obstet Gynecol*. 2020 dec;223(6):886.e1-886.e17. doi: 10.1016/j.ajog.2020.06.023. Epub 2020 June 17
- III. Gyllenberg FK, Saloranta TH, But A, Gissler M, Heikinheimo O. Induced abortion in a population entitled to free-of-charge long-acting reversible contraception. *Obstet Gynecol*. 2018 dec;132(6):1453-1460. doi: 10.1097/aog.0000000000002966.
- IV. Saloranta, TH, Gyllenberg, FK, But, A. Gissler M, Heikinheimo O, Laine MK. Use of reproductive health services among women using long- or short-acting contraceptive methods – a register-based cohort study from Finland. *BMC Public Health* 22, 1185 (2022). <https://doi.org/10.1186/s12889-022-13581-3>

In the text, the publications are referred to by their Roman numerals and reproduced with the permission of their publishers; SAGE Publishing, Elsevier, Wolters Kluwer, and Springer Nature.

Publication III has been presented as part of Frida Gyllenberg's doctoral thesis "Long-acting reversible contraception free-of-charge: initiations, user characteristics and induced abortions" in 2020. Tuire Saloranta participated in the study design, data collection, writing and editing of the manuscript for study publication III.

ABSTRACT

Long-acting reversible contraceptives (LARCs, intrauterine devices and implants) are easy to use and highly effective contraceptive methods. Increasing LARC use provides an opportunity to reduce the incidence of unplanned pregnancy and the need for abortion services.

Since 2013 the city of Vantaa, Finland, has offered all women with no history of previous LARC use the opportunity to initiate LARC methods free of charge at the city's family planning clinics. This programme combined with Finnish national registers, enabled us to evaluate several key factors in providing family planning services and the overall effects of free-of-charge LARC provision.

We aimed to evaluate the profile of family planning service users; study the real-life discontinuation rates of LARC methods; compare the need for induced abortion between free-of charge LARC initiators, women choosing other contraceptive options and age-matched controls in the population; and compare the overall use of reproductive health services between free-of-charge LARC initiators and women initiating, switching between, or continuing with short-acting reversible contraceptives (SARCs, pills patches, and rings).

All the studies included in this thesis were retrospective cohort studies. The study participants included all 15–44-year-old women living in the city of Vantaa on 1 January 2013 ($n = 54,721$). Of these women 11,790, used the family planning services of the city, 2,035 initiated free-of-charge LARCs, 1,525 initiated or switched between SARC methods and 2,626 continued with their current SARC method at the family planning clinics of Vantaa in 2013–2014. Levonorgestrel-releasing intrauterine systems (LNG-IUSs) were the most popular choice of LARC methods with 59% of women initiating free-of-charge LARC choosing it, while 32% chose implants, and 9% chose copper intrauterine devices (Cu-IUDs).

We found that young women were more likely to use family planning services and to discontinue free-of-charge LARC methods than women over 30 years of age, as were women with a history of delivery or a history of a sexually transmitted infection. Women speaking a native language other than Finnish or Swedish were less likely to use the services, but more likely to discontinue free-of-charge LARC methods.

Free-of-charge LARCs had a reasonably low discontinuation rate, with 28% of women discontinuing within two years of use. Most women discontinued due to problems with the method, and only 16% due to a wish to conceive. The most common problems with all LARC methods were bleeding disturbances. The discontinuation rate of LNG-IUSs was the lowest, with 24 % discontinuing within two years followed by implants (33%) and Cu-IUDs (38%).

Choosing free-of-charge LARCs reduced the need for abortion care by 80% compared to all other contraceptive options, and by 90–95% compared to initiating or switching between SARC methods. Compared to continuing with the familiar SARC method, free-of-charge LARCs halved the need for abortion care. Women initiating free-of-charge LARCs had a similar need for overall reproductive health services in primary and specialized care concerning gynaecological problems and method related issues as women initiating or switching between SARC methods. Women continuing with their familiar SARC method had less need for reproductive health services than women initiating or switching between methods.

Young, sexually active and fertile women were reached well with the family planning services in Vantaa, but young women with a foreign native language were underrepresented among service users. All free-of-charge LARCs had a relatively high continuation rate, but LNG-IUS use was most often continued. Increasing LARC use can be a way to reduce the need for abortion care, but the overall need for reproductive health services is similar among women initiating LARC or SARC methods. Women continuing with their familiar SARC method had the lowest overall need for reproductive health services. These service need should be acknowledged when designing free-of-charge LARC programmes and estimating resources needed for these programmes.

TIIVISTELMÄ

Pitkävaikutteiset ehkäisymenetelmät (kierukat ja kapselit) ovat helppokäyttöisiä ja tehokkaita raskaudenehkäisymenetelmiä. Kierukoiden ja kapseleiden käytön lisääminen voisi vähentää suunnitteleamattomien raskauksien määrää ja siten raskauden keskeytysten tarvetta.

Vuoden 2013 alusta alkaen Vantaan kaupunki on tarjonnut maksutta kaikille naisille heidän elämänsä ensimmäisen hormoni- tai kuparikierukan tai kapselin kaupungin ehkäisyneuvoloissa. Pitkävaikutteisten ehkäisymenetelmien ilmaisjakelu yhdessä kattavien valtakunnallisten rekistereiden kanssa tarjosi mahdollisuuden tutkia useita ehkäisypalveluihin ja maksuttomien pitkävaikutteisten ehkäisymenetelmien tarjoamiseen liittyviä seikkoja.

Tämän väitöskirjan tutkimusten tavoitteena oli selvittää ehkäisypalveluiden käyttäjien profiilia; arvioida maksutta aloitettujen pitkävaikutteisten ehkäisymenetelmien käytön lopettavien osuutta; verrata raskaudenkeskeytyspalveluiden tarvetta pitkävaikutteisen ehkäisymenetelmän tai muun menetelmän valinneiden naisten sekä näille ryhmille ikävakioitujen väestöverrokkien välillä; verrata lisääntymisterveyspalveluiden käyttöä pitkäaikaisen tai lyhytvaikutteisen ehkäisymenetelmän valitsevien naisten välillä.

Kaikki tämän väitöskirjan työt olivat retrospektiivisiä kohorttitutkimuksia. Tutkimukseen osallistuivat kaikki 15–44-vuotiaat Vantaalla 1.1.2013 asuneet naiset (n=54 721). Näistä naisista 11 790 käytti ehkäisypalveluita, 2 035 aloitti maksutta pitkävaikutteisen ehkäisymenetelmän, 1 525 aloitti tai vaihtoi lyhytvaikutteista ehkäisymenetelmää ja 2 626 jatkoi silloisen lyhytvaikutteisen ehkäisymenetelmänsä käyttöä asioidessaan ehkäisyneuvolassa Vantaalla 2013–2014. Pitkäaikaisen ehkäisymenetelmän maksutta aloittaneista naisista 59 % valitsi hormonikierukan, 32 % ehkäisykapselin ja 9 % kuparikierukan.

Alle 30-vuotiaat naiset sekä käyttivät ehkäisypalveluita enemmän, että lopettivat kierukan tai kapselin käytön todennäköisemmin kuin yli 30-vuotiaat naiset kuten tekivät myös naiset, jotka olivat synnyttäneet tai sairastaneet aiemmin seksitaudin. Naiset, jotka puhuivat muuta kuin suomea tai ruotsia äidinkielenään, käyttivät palveluita vähemmän, mutta lopettivat kierukan ja kapselin käytön useammin kuin suomea tai ruotsia äidinkielenään puhuvat.

Maksutta aloitettujen pitkävaikutteisten ehkäisymenetelmien käyttöä jatkettiin varsin usein, kahden vuoden kohdalla 28 % oli lopettanut valitsemansa menetelmän käytön. Vain 16 % naisista lopetti kierukan tai kapselin käytön raskaustoiveen vuoksi, loppuilla syy käytön lopettamiseen olivat menetelmään liittyvät ongelmat, joista yleisimpiä olivat vuotohäiriöt. Hormonikierukan käyttö lopetettiin harvimmin, kahden vuoden kohdalla 24 % käyttäjistä oli poistattanut hormonikierukan, 33 % poistattanut kapselin ja 38 % poistattanut kuparikierukan.

Pitkävaikutteisen ehkäisymenetelmän käytön maksutta aloittaneet naiset tarvitsivat raskaudenkeskeytyspalveluita 80 % vähemmän kuin ehkäisyneuvolassa asioineet muun ehkäisyn valinneet naiset, 90–95 % vähemmän kuin uuden lyhytvaikutteisen ehkäisymenetelmän aloittaneet naiset ja puolet vähemmän kuin saman lyhytvaikutteisen menetelmän käyttöä jatkaneet naiset.

Kierukan tai kapselin käytön maksutta aloittaneet naiset asioivat perusterveydenhuollossa ja erikoissairaanhoidossa menetelmään liittyvistä ja gynekologisista syistä yhtä usein kuin uuden lyhytvaikutteisen ehkäisymenetelmän käytön aloittaneet naiset. Saman lyhytvaikutteisen ehkäisymenetelmän käyttöä jatkaneet naiset tarvitsivat näitä palveluita kokonaisuudessaan vähiten.

Vantaan ehkäisypalvelut tavoittivat hyvin nuoria, seksuaalisesti aktiivisia, hedelmällisessä iässä olevia naisia. Nuoret vieraskieliset naiset käyttivät kuitenkin palveluita ikäisiään suomen- tai ruotsinkielisiä naisia vähemmän. Kaikkien pitkävaikutteisten ehkäisymenetelmien käyttöä jatkettiin usein, mutta hormonikierukan käyttöä jatkettiin kaikkein useimmin. Pitkävaikutteisten ehkäisymenetelmien käytön lisääminen voi olla keino vähentää raskaudenkeskeytysten tarvetta. Kuitenkin uuden pitkävaikutteisen tai lyhytvaikutteisen ehkäisymenetelmän käytön aloittaneet naiset tarvitsivat lisääntymisterveyspalveluita kokonaisuudessaan keskenään yhtä paljon. Tutun lyhytvaikutteisen menetelmän käyttöä jatkaneet naiset käyttivät näitä palveluita vähiten. Tämä on syytä huomioida, kun suunnitellaan maksuttoman pitkäaikaisen ehkäisyn tarjoamista ja suunnitellaan siihen tarvittavia resursseja.

1 INTRODUCTION

Before the invention of modern contraception, women were frequently pregnant, giving birth to approximately seven children within their fertile years (1). Maternal and child mortality were high. The introduction of modern contraception in the early 1960s, with the development of the birth control pill often considered one of the most impactful developments in medicine, enabled women to control their fecundity. Since then, the birth rate has rapidly declined around the world. Nevertheless, in some countries, mainly in sub-Saharan Africa, women give birth to approximately the same number of children as before the introduction of modern contraception, either due to not having access to modern contraception or for cultural reasons (2).

People in developed countries are accustomed to being able to decide whether and when their families grow. This has been made possible by modern contraceptive methods, without which our lives would be completely different. Contraception allows women to become educated, work, be empowered – or even write a doctoral thesis.

Access to safe abortion care is also crucial for women's reproductive health and rights. Globally, this access is developing in different directions. In Finland, proposals to enable easier access to abortion care with only one doctor's signature are proceeding in the Finnish Parliament. Meanwhile, in the US, universal access to safe abortion care has been revoked as the Supreme Court overturned the right of women to abortion in June 2022. Thus, even in this decade, access to modern contraception or abortion care cannot be taken for granted.

Modern contraceptive options include short-acting methods such as contraceptive pills, patches and rings, and long-acting methods such as intrauterine devices (IUDs) and contraceptive implants. Female and male surgical sterilisation as an irreversible method and condom use are also considered modern contraceptive methods. Despite the vast variety of methods developed, not all women have access to modern contraception or choose to use it, despite having no wish to conceive.

Women who want to use modern contraceptives need access to family planning services, as all options except condoms require contact with a medical professional. Worldwide, access to family planning services and the services and method mix offered vary. Family planning services may be offered in different settings for young and older women, or for women in different socioeconomic groups, and the selection of methods

offered differs among service providers (3–7). Equal access to services would reduce disparities in sexual health. In fact, women who do not use contraceptive services are also more often non-users of contraception altogether (8).

In the 2020s, there are still women who have gone through the whole repertoire of contraceptive choices without finding an acceptable, effective and suitable method for them. It is important that contraceptive methods and family planning services continue to evolve to respond to the needs of women. Every woman has the right to contraception that meets her family planning needs and fits her personal preferences.

The city of Vantaa in Finland has offered family planning services for women of all ages and socioeconomic groups since 1974 at centralised, specialised family planning clinics in the city's health centres. In other municipalities in Finland, family planning services are often offered as part of maternity or child health care, or at the general practitioner's reception (9). Globally, different age and socioeconomic groups typically have access to different service providers, and thus a different selection of services and methods (3–7).

The outcome of the typical use of short-acting contraceptive methods differs from perfect use, as in real life, users often forget the method or use it inconsistently or even incorrectly. Long-acting reversible contraceptives (LARCs), including IUDs and contraceptive implants, on the other hand, can be forgotten, as they require minimal constant efforts from the user. LARCs have been demonstrated to be highly effective in preventing pregnancy (10,11). Only discontinuing requires activity, as usually medical professionals alone can remove the devices.

Side effects of contraceptives are common, especially at the beginning of use. Discontinuation rates for short-acting methods such as pills, patches and rings are high. It is estimated that half of women initiating short-acting methods discontinue use within the first 6–12 months (12,13). Long-acting methods have substantially lower discontinuation rates, with approximately one in four to five discontinuing within the first year of use (12,14–16). Real-life studies evaluating these discontinuation rates, however, have yielded conflicting results (14,17–20).

Promoting LARC methods has been demonstrated to reduce the need for induced abortion in several study settings (21–23). However, little is known about how the use of reproductive health services differs between women choosing LARC and SARC methods. This information is vital for organising sufficient family planning services to ensure timely access to services.

At the beginning of 2013, the city of Vantaa began to offer all LARC methods free of charge for first-time users to tackle the rate of induced abortions, which was higher than that of Finland as a whole (24). In the studies of this thesis, we evaluated this ongoing intervention. First, we described the user profiles of the family planning clinics, as only women using such services can benefit from the intervention. Second, we determined the discontinuation rates of the methods provided free of charge to obtain key information for evaluating cost-effectiveness. Third, we compared the rates of induced abortion among women choosing LARC methods vs. other contraceptive options. Fourth, we compared the use of reproductive health services among women choosing free-of-charge LARC methods or initiating, switching between or continuing with SARC methods.

2 REVIEW OF THE LITERATURE

2.1 FAMILY PLANNING SERVICES

The World Health Organisation states that access to family planning services is fundamental to realizing the rights and well-being of men and women alike, and crucial for living a healthy life (25). Access to effective, modern contraceptive methods allows for planning and spacing births, and thus allows women to become educated, work and be empowered.

Overpopulation is a significant driver in the destruction of global resources and the environment, and family planning is therefore also crucial also in fighting global warming and ensuring a sustainable future for our planet. Accordingly, the UN has called for universal access to reproductive health services, including family planning, in its 2030 Agenda for Sustainable Development (26). The UN emphasises that access to effective family planning is not only important to women's reproductive rights, but also improves children's health and nutrition by allowing the spacing of births and reducing maternal mortality (26). Increasing the use of modern contraception also leads to reduced infant mortality rates, as the spacing of births allows for more resources per child. The reduction in infant mortality can reduce the pressure to compensate the loss of infants by having many children (27).

According to the UN, 1.1 billion of the 1.9 billion women aged 15–49 years in the world in 2019, had a need for family planning (28). Of these women, 76% (842 million) used modern contraceptive methods, 7% (8 million) traditional methods and 17% (190 million) had an unmet need for family planning services (29). The unmet need for family planning is defined as wanting to avoid pregnancy but not using contraception.

The gap in meeting the need for family planning is greatest in sub-Saharan Africa, and the population of women of reproductive age in these countries is rapidly growing (26). Although the unmet need for family planning is greatest in low-, or low/middle-income countries, it still exists in developed countries as well, with around 7% of women not using contraception although desiring to avoid pregnancy (26). In Finland, this unmet need is among the lowest in the world, being 3.3% (95% CI 1.4–9.4) (26). The need being met with modern methods is also among the highest in Finland, at 90.1% (95% CI 79.2–95.0) (26).

2.1.1 GUIDELINES

The organisation and promotion family planning services is guided by several international and national guidelines (25,30–33). WHO emphasises a high-quality of family planning services and that providers respect and protect the human rights of all their clientele (25). The accessibility of family planning services and the ability of service providers to listen to and fulfil the individual needs of clients is essential for successful family planning programmes (25). WHO promotes the “come back any time” approach. Clients are encouraged to contact the services when problems arise, which is vital for method continuation (25). The US Center for Disease Control (CDC) recommends that family planning services are comprehensive and include the services described in Table 1.

Table 1. The components of family planning services recommended by the American Center for Disease Control.

The components of family planning services (29)

- Contraceptive services
 - Pregnancy testing
 - Counselling to achieve pregnancy
 - Basic infertility services
 - Preconception health services
 - Sexually transmitted disease services
-

The Finnish Institute of Health and Welfare recommends that municipalities arrange family planning services so that the selection of contraceptive methods is comprehensive (32). It also recommends that clients should have access to services for method initiation as soon as the need arises and that adolescents are offered an appointment within a week of first contact (32). Free-of-charge contraception is recommended for under 20-year-olds (32). The same recommendations are found in the Finnish Current Care Guidelines concerning contraception, first published in 2015 (31).

2.1.2 ORGANISING GLOBALLY

Globally, different age and socioeconomic groups typically have access to different service providers and a different selection of services and methods (3–7). Thus, the specifics of providing family planning services differ according to the local health care system.

In addition, politics and religion play a role in the offering of family planning services. In the US, the political field is divided in its opinion on abortions, and this division is also reflected in how family planning services are offered and supported both in the US and as a part of supportive programmes in developing countries. In Ireland, the use of contraception was illegal in 1935–1980, and abortion since 1861 (34,35). Contraception was first allowed in 1980 with strong restrictions, which were subsequently lifted, and abortion was legalised in 2018 (34,35). In Poland, access to both contraception and abortion remains limited, as the religious government places restrictions on access to both of these crucial services (36).

2.1.2.1 DEVELOPED COUNTRIES

In developed countries, health care services are widely offered, and family planning services as part of these services are either organised publicly or privately according to the funding or the individual country's health care system. Contraceptives are reimbursed in many countries such as the UK, the US and France, but not in all developed countries. The proportion of contraceptive need met with modern methods and the distribution of modern contraceptive methods used differ by country (29). However, as the above examples of the effects of religious and political systems on the provision of contraception and abortion demonstrate, access to family planning services is not equal or stable, even in developed countries.

2.1.2.1.1 NORDIC COUNTRIES

Nordic countries also differ in the ways in which they provide family planning services. In Sweden, midwives are predominately responsible for contraceptive services and prescriptions, with 80% of prescriptions coming from midwives (37). In Norway midwives are only allowed to prescribe contraception for 16–19-year-olds, and in Finland to provide a 3-month starting pack, and specially trained nurses to prescribe contraceptives (37). Otherwise, GPs and gynaecologists are responsible for prescriptions in the remaining Nordic countries (37). In Norway, oral

contraceptives are free of charge for 16–19-year-olds and in Sweden for under-20-year-old women (37).

2.1.2.1.2 FINNISH HEALTH SERVICES

In Finland, municipalities have been required to offer family planning services within their primary care services by law since 1972 (38). There are currently 309 municipalities, and all of these have a mandate to organize their services independently. This means that there is no single Finnish way of organising family planning services, although the Health Care Law does regulate the services (39). At the beginning of 2023, the responsibility for organizing healthcare and social welfare services will be transferred from the municipalities to 21 'wellbeing services counties'. The turmoil in reorganising primary care services is also likely to be reflected in the organisation of family planning services. The requirement in the changing Health Care Law remains that visits for contraceptive issues are to be offered without cost for the client (40).

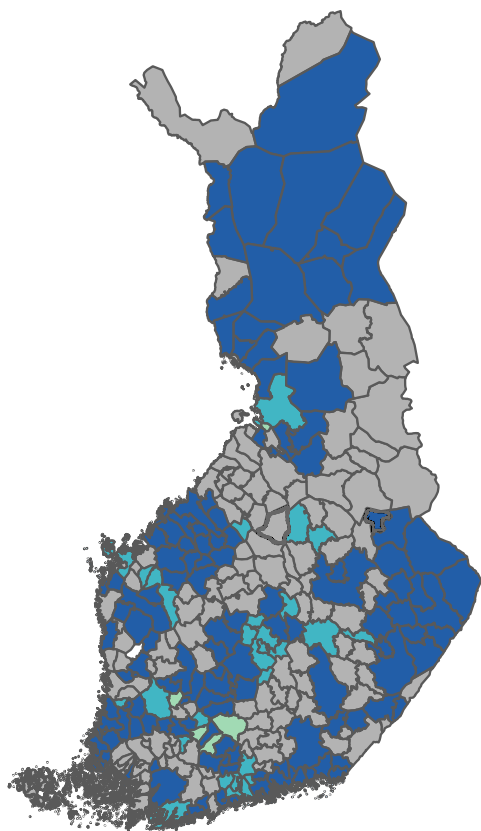
In 2008, 25% of all Finnish health centres offered family planning services at a separate family planning clinic, and 66% organised the services as a part of maternity care or child health clinics (9). A specialised family planning clinic was most common in large municipalities with more than 50,000 residents, of which 67% centralised these services (9). Almost all municipalities also offered contraceptive services as a part of general practitioners' services at health centres, and 80% in school and student health care (9). For example, the city of Helsinki, the neighbouring city of Vantaa, offers services at its centralised family planning clinics only for women with special needs regarding contraception, and other contraceptive services are offered as part of health centre and school health services (41). More current information on the ways to organise the services is unfortunately not available, only that just a few municipalities offer contraceptive services at specialised clinics for adolescents (42).

Contraceptive services are also offered in student health care and in the private sector, primarily at private obstetrician-gynaecologist offices. Notably, only a third of all family planning visits occurred in the private sector in Finland in the 1990s, but no current information is available on the use of the private sector regarding contraception (43).

Prompt access to contraceptive services is considered important, especially for adolescents (32). This seems to have been achieved, as only 13% of health centres reported in 2008 that services for adolescents aged under 20 could not be offered within a week of

contact (9). In 2008 54% of municipalities did not offer contraception free of charge for under-20-years-olds (9). The rest of the municipalities offered free-of-charge contraception at either some service points (15%) or at all health centre services (31%), but there is no information on what was included in this free-of-charge selection, or how long the contraceptives were offered free-of-charge (9). In a recent study covering the 100 largest municipalities in Finland concerning free-of-charge contraception for residents aged under 20 or under 25 years during 2000–2018, 25 municipalities offered all contraceptives, including pills, patches, vaginal rings and LARCs, free of charge for either age group (42). This number is low considering that the Finnish Institute of Health and Welfare has recommended offering free-of-charge contraception for under-20-year-olds since 2014 (32).

In 2021, the Finnish government announced a trial with free-of-charge contraception offered for under-25-year-olds and provided funding for municipalities to offer this benefit (44). Figure 1 illustrates the situation of municipalities offering free-of-charge contraception in April 2022 (45).



- No free-of-charge contraception for over 6 months
- Limited selection or time
- Comprehensive selection for under 20-year-olds
- Comprehensive selection for under 25-year-olds

Figure 1. Free-of-charge contraception offered by municipalities in Finland in April 2022. Data collected by Bayer (45).

Despite contraception not being offered free of charge for under-25-year-olds in all municipalities, the proportion of contraceptive needs met with modern methods in Finland is among the highest, and the rates of induced abortions and teenage pregnancies among the lowest in the world (46,47).

2.1.2.2 DEVELOPING COUNTRIES

Health care systems in developing countries are often not able to provide the same level of service as in developed countries. This is likely to include family planning services as well. Thus, the availability and use of modern contraceptive methods, and also the proportion of contraceptive needs met with modern methods, differs between countries (Figure 2) (29).

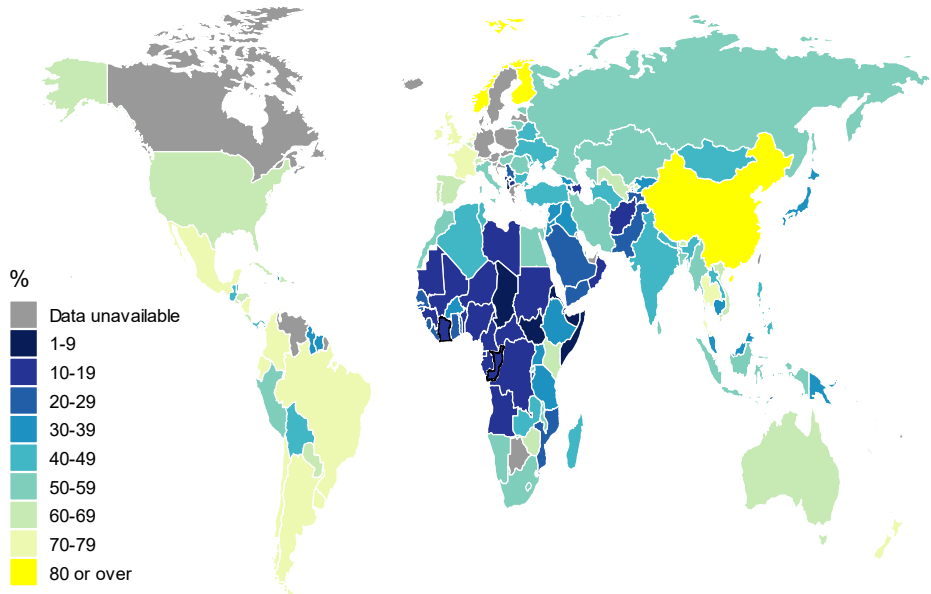


Figure 2. The percentage of married women aged 15-49 years using modern contraceptive methods (pills, patches, rings, IUDs, implants, condoms or sterilisation) in 2021 (48).

2.1.3 SERVICE USERS

Information on the users of family planning services is the first step in understanding how women are reached by and have access to effective modern contraceptive methods (pills, patches, rings, IUDs, implants, condoms, or sterilisation). Unfortunately, information on service users is scarce. This is in part due to the different ways of organising the services, but also due to the lack of research. Some information is available from institutional reports based on aggregated-level data.

There is limited knowledge regarding the associations of age, parity, immigration status, educational level and income level with the use of family planning services. Research and reports from the US and the UK indicate that public family planning services are mainly used by young, nulliparous women of lower educational and income levels (5,49–53). However, in the US, the majority of women using public family planning clinics have a low income level (5,53), and women with a low socioeconomic or educational level use contraception less and have a higher risk of unintended pregnancies compared to women with a higher socioeconomic or educational level (8,54,55). These disparities and the rates of unintended pregnancies have fortunately been declining in recent decades (8,54,55).

There are also signs of differing family planning strategies among women of different educational backgrounds. A UK study found that women with the highest educational level used contraceptive services the least (52). In Finland, a recent study demonstrated declining fecundity in all levels of education except in the highest level (56).

However, research on the use of family planning services in other countries is limited. Adolescent and young women are similarly likely to desire contraception in Northern America and Europe, and also in Australia and some Asian countries such as Japan, Southern Korea and Singapore, where the mean age at first birth has increased above 25 years of age (49–51).

Immigrants, on the other hand, use health services less than native populations (57). In the US, reproductive health services are less used by immigrant women than women born in the US (58). In Finland, women with a Russian, Somalian or Kurdish background use contraception less than native women (59).

2.2 CONTRACEPTIVE METHODS

Contraceptive methods can be divided into traditional methods and modern methods. Traditional methods remain in use, but globally the majority of couples use modern contraceptive methods (29). The introduction of modern contraception, namely contraceptive pills in the early 1960s, resulted in a sexual revolution and the liberation of women to enjoy sex without the risk of pregnancy. The sexual revolution induced by the introduction of the pill underlines the fact that traditional contraceptive methods are ineffective in preventing unintended pregnancies. The theoretical efficacy of a method in perfect use is usually much higher than its real-life effectiveness due to typical user failures such as forgetting to use or not using the method according to the instructions. Traditional methods are especially prone to user error.

Contraceptive efficacy is usually described using the Pearl Index, which is the failure rate of the method per 100 women in one year of use. The Pearl Index values, continuation rates and prices of contraceptive methods are summarised in Table 2.

Table 2. The Pearl Index values (the failure rate of the method per 100 women in one year of use) in typical and perfect use for various contraceptive methods, their continuation rates after the first year of use and the cost of initiation or per year of use in Finland (12,13,60–75).

Contraceptive method	Pearl index Perfect / Typical use	Continuation rate after the first year (%)	Price initiation/year (€)
Irreversible methods			
Male sterilisation	0.1/0.15	100	70-800*/ NA
Female sterilisation	0.5/0.5	100	110-2000*/ NA
Long-acting reversible methods			
LNG-IUS	0.2/0.2	75–88	153/22–51
Implants	0.05/0.05	83	152–177/ 35–51
Cu-IUDs	0.6/0.8	78–87	90–134/ 13–18
Short-acting reversible methods			
Combined oral contraceptive pills	0.3–1.3/ 2.2–9	40–70	NA /42–157
Progestin-only pills	0.14–0.9 /0.41–10	20–35	NA/60–147
Patch	0.3–1.0/ 1.2–9	42	NA/159
Ring	0.3–1.0/ 1.2–9	51–73	NA/91-186
DMPA injectable	0.2/6	23–70	NA/75

Other modern methods			
Male condoms	2/2-18	50-60	0.60-1.50€/condom
Diaphragm	6-14/12-18	?	59€+gel 1€ per use
Spermicides	18/28	?	Not available
Traditional methods			
Withdrawal	4/22	50-60	0
Calendar methods	0.1-5/7-14	45-60	0-67
Breast feeding	1 / 2 (6 months)	?	0

LNG-IUS, levonorgestrel intrauterine system; Cu-IUD, copper intrauterine device; DMPA, medroxyprogesterone acetate; NA, not applicable

*The price for the patient ranging from the costs in the public to the private sector

2.2.1 TRADITIONAL CONTRACEPTIVE METHODS

Traditional contraceptive methods include withdrawal, and various methods for the timing of ovulation (29). Breast feeding also delays the onset of ovulation and can be used for contraception for the first six months after birth if the infant is solely breastfed. Other traditional methods also exist such as douching, the use of medicinal plants and abdominal massage, but their effectivity remains very low and they are not described further. What is common to all traditional methods is their low contraceptive efficacy, except for some rhythm methods by a dedicated user. This low efficacy underlines the change enabled by modern contraceptive methods in the lives of women and men alike.

2.2.1.1. WITHDRAWAL

Using withdrawal, extracting the penis from the vagina before ejaculation and ejaculating outside female genitalia, is especially common practice in the former Yugoslavia and many Western Asian countries, such as Turkey, Iran, Iraq and Armenia (29). The prevalence of use varies up to 20% in these countries, but is lower in developed regions of the world, with a 4% prevalence (29). Using withdrawal correctly demands practice and may interfere with the sexual act (76). Another problem concerning the contraceptive efficacy is that motile spermatozoa are found in the pre-ejaculatory fluid in almost 40% of men (77).

2.2.1.2 RHYTHM METHODS

The rhythm methods, aimed at the timing of ovulation and avoiding intercourse during the fertile days, have made a comeback as mobile apps in recent years, perhaps due to trends in avoiding hormonal contraception (78). Traditionally, body temperature or the composition of cervical mucus have been used to determine the timing of ovulation. The most commonly used app uses body temperature together with a calendar for estimating the time of ovulation (78). Unprotected intercourse is to be avoided prior to and during the estimated ovulation period.

Problems concerning contraceptive efficacy arise especially when the woman does not have a regular menstrual cycle, thus making the determination the timing of ovulation less reliable. Even in a regular menstrual cycle, ovulation can occur as early as day 8, and only one

woman in ten ovulates on the 14th day of the cycle, even if the cycle is regular (79). The fact that fertilisation can occur after intercourse for up to five days prior to ovulation also has to be taken into account while using the method (80). The number of days in a cycle without a risk of pregnancy is low after adding all these uncertainties in the calculations. The rhythm method requires dedication from the user, and does not allow for a spontaneous sex life during peak fertile days (76).

2.2.2 MODERN CONTRACEPTIVE METHODS

Modern contraceptives can be grouped into short-acting reversible contraceptives (SARCs), long-acting reversible contraceptives (LARCs), irreversible and other methods (81).

SARC methods include the combined oral contraceptive (COC) pill and progestin-only pill (POP) introduced in the 1960s, and contraceptive patches and rings introduced to the market in the 2000s. Patches and rings are hereafter included with COCs as combined hormonal contraception (CHCs). Injectable methods containing progestins are also sometimes included in LARC methods. Injectables were developed in the 1960s and are rarely used in Finland but more used globally.

LARC methods include copper intrauterine devices (Cu-IUDs) introduced in the 1960s, contraceptive implants introduced in the 1980s, and the levonorgestrel-releasing intrauterine system introduced in the 1990s. Female and male sterilisation are irreversible, modern methods. Female sterilization has been used since the late 1800s, and male sterilization since the Second World War (82,83).

Other modern methods include condoms, cervical caps, and spermicides. A form of condoms has existed since the 15th century in Asia (84). Cervical caps and spermicides are less effective modern methods, with the first records of use in ancient Egypt. Laboratory tested spermicides were developed as early as the 1800s, and the first modern spring-stem wishbone pessary in 1880s Germany (85,86).

2.2.2.1 LONG-ACTING REVERSIBLE CONTRACEPTION

Long-acting reversible contraceptives have been revolutionary in their high efficacy, not necessitating regular effort from the user while offering reversible contraception. LARC methods are currently promoted as first-line methods as their efficacy has the potential to significantly

reduce the burden of unintended pregnancy (31,87–89). In effectiveness-based counselling, LARCs, the most effective methods, are to be presented first (21). The use of LARC methods is increasing globally, and especially among young women (29,90).

The contraceptive efficacy and adverse and beneficial effects of LARC methods are summarised in Table 3.

Table 3. Comparison of LARC methods based on efficacy, effects on bleeding, adverse and beneficial effects. (62,68,91)

	LNG-IUS	Implants	Cu-IUD
Contraceptive efficacy			
Perfect use PI	0.2	0.05	0.6
Typical use PI	0.2	0.05	0.8
Duration of use	3–6(7) years	3–5 years	5–10 years
Effects on bleeding:			
Total amount	↓	↔	↑
Irregularity	+	++	+
Adverse effects			
Acne	+	+	-
Pelvic pain	+	-	+
Mood	+	+	-
Beneficial effects			
Reduced symptoms of endometriosis / dysmenorrhea	++	+	-
Reduction of heavy menstrual bleeding	++	(+)	-

LARC, long-acting reversible contraception; LNG-IUS, levonorgestrel-intrauterine system; Cu-IUD, copper intrauterine device; PI, Pearl Index

2.2.2.1.1. INTRAUTERINE DEVICES

The first intrauterine devices were made of plastic and did not have a very high contraceptive efficacy (92). Their contraceptive effect was based on a foreign body inflammatory reaction in the uterus (93). A plastic IUD, the Lippes Loop (a double-S-formed coil in four sizes), was approved in 1966 and used from the 1960s to the 1980s (94). The Dalkon Shield, a plastic IUD used in the 1970s, was infamous for an increased risk of septic abortion, even leading to deaths among users, and was withdrawn from the market due to these effects (95). Later, the use of the Dalkon Shield was found to cause pelvic inflammatory diseases (PIDs) and tubal infertility due to the infection (96,97). The

Shield had strings made of multifilament nylon that enabled bacteria to reach the uterus (98).

The detrimental effects of the Dalkon Shield led to recommendations that IUDs should not be used by nulliparous women or populations with an increased risk of PID (99). Although studies have since shown that modern IUDs do not increase the risk of PIDs nor infertility, it has taken a long time to reassure the public and physicians of the safety of IUDs (100–102).

2.2.2.1.1.1 COPPER INTRAUTERINE DEVICES

Copper intrauterine devices (Cu-IUDs) are plastic, T-shaped devices covered with a copper wire with strings attached to the stem to enable easy removal. Cu-IUDs were introduced to the market beginning in Chile in the 1960s, and appeared on the Finnish market in 1972 when Nova-T® developed by Professor Tapani Luukkainen and the pharmaceutical company Leiras, was introduced. The Dalkon Shield catastrophe impeded the Cu-IUD from reaching the US market until 1988 (94).

Adding copper to the intrauterine device increases the contraceptive efficacy as the dissolving copper enhances the foreign body inflammatory reaction (103). The likelihood of fertilisation is reduced as the copper ions present inside the uterus are toxic to sperm, and reduce the motility and vitality of spermatozoa in the uterine cavity (103). A possibly fertilised oocyte is destroyed by the high copper quantities as it enters the uterine cavity before implantation (103).

While some Cu-IUDs are approved for 5 years of use, the use of models with a surface area of 380 mm² of copper can be extended up to ten years and even longer for women approaching menopause (31,91,104). Cu-IUDs increase the volume of menstrual bleeding for most users, and the duration for half of users (62,105). The increase in menstrual volume can result in iron deficiency anaemia (106). Cu-IUDs also increase menstrual pain (62,105). The adverse effects on bleeding may be reduced as the use continues beyond 6 months (105). As Cu-IUDs contain no hormones, no hormonal side effects are associated with their use (16). This and the high contraceptive efficacy make CU-IUDs a desirable alternative for many women, especially women who wish to avoid exogenous hormones. In fact, Cu-IUDs remain the only non-hormonal, effective and reversible method of contraception on the market today.

2.2.2.1.1.2. LEVONORGESTREL-RELEASING INTRAUTERINE SYSTEMS

The first levonorgestrel-releasing intrauterine system (LNG-IUS) was developed by a group led by Professor Tapani Luukkainen of the University of Helsinki, Finland, in the 1970s and was introduced to the Finnish market in 1990 (107,108). This first LNG-IUS contains 52 mg of levonorgestrel and releases on average 20 µg per day over the first five years (109).

LNG-IUSs do not inhibit ovulation for most women (110). Thus, they do not prevent pregnancy due to effects on ovarian function, but mainly by suppressing endometrial proliferation and also by thickening the cervical mucus (111,112). In addition, the high levonorgestrel concentrations in the uterus cause reduced sperm motility and function, and many factors affecting implantation and fertilisation. There is also a foreign body reaction common with all IUDs that makes the uterus a hostile environment for gametes (93).

Levonorgestrel (LNG) released in the uterus is systemically absorbed, but the hormone levels of LNG in circulation remain low compared to other hormonal contraceptives (113). In a five-year comparative study published in the 1980s, LNG-IUSs removed after five years were found to have 40% of their initial hormone content left, and the residual hormone content was estimated to give a safety period of additional two years (114). The 52-mg LNG-IUS is registered in most countries for five years of use. The duration of use was increased to six years in 2020 in the US by the Food and Drug Administration. Many international guidelines and the Finnish Current Care Guidelines on contraception allow the use of the 52-mg LNG-IUS for up to seven years (31,88,115).

The second LNG-IUS, containing 13.5 mg of levonorgestrel, was introduced to the market in 2014. The 13.5-mg LNG-IUS releases 6 µg of levonorgestrel daily for an approved three-year duration of use (116). The third device, the 19.5-mg LNG-IUS, introduced to the market in 2016, releases 12 µg of levonorgestrel daily for a duration of use of five years (117). The sizes of the LNG-IUSs are illustrated in Figure 3.

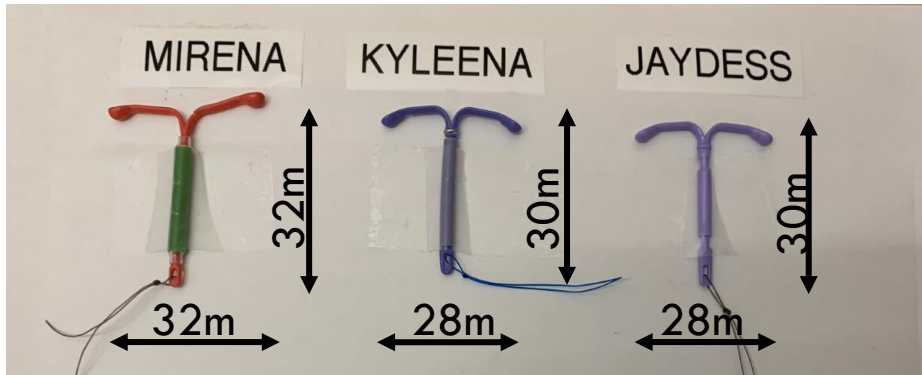


Figure 3. The three levonorgestrel-releasing intrauterine systems (LNG-IUSs) on the market in 2022: Mirena® (52-mg LNG-IUS), Kyleena® (19.5-mg LNG-IUS) and Jaydess® (13.5-mg LNG-IUS).

Endometrial suppression explains the reduced bleeding typically seen during the use of the LNG-IUS, and the timing of the endometrial changes explains the spotting and irregular bleeding associated with the beginning of use (113). The 52-mg LNG-IUS has been approved for and is recommended in the treatment of heavy menstrual bleeding by several clinical guidelines (118,119). Additional health benefits of use of LNG-IUSs include the reduction of dysmenorrhea and a reduction in the risks of endometrial and ovarian cancer (91).

The systemic side effects of LNG-IUSs are derived from the androgenic progestin levonorgestrel. Thus, acne, headaches, mood alterations and sometimes increased body hair growth can occur (91). These hormonal effects are most notable at the beginning of use, as levonorgestrel is released at higher levels during the first six months of use (109,116,117).

2.2.2.1.2. IMPLANTS

The first contraceptive implant, a system of six capsules containing levonorgestrel, was introduced to the Finnish market in the 1980s by its developer, Leiras. The product was withdrawn from the global market in 2008. There are two contraceptive implants on the market today: a single rod system containing etonogestrel and a two-rod system containing levonorgestrel (Figure 4).

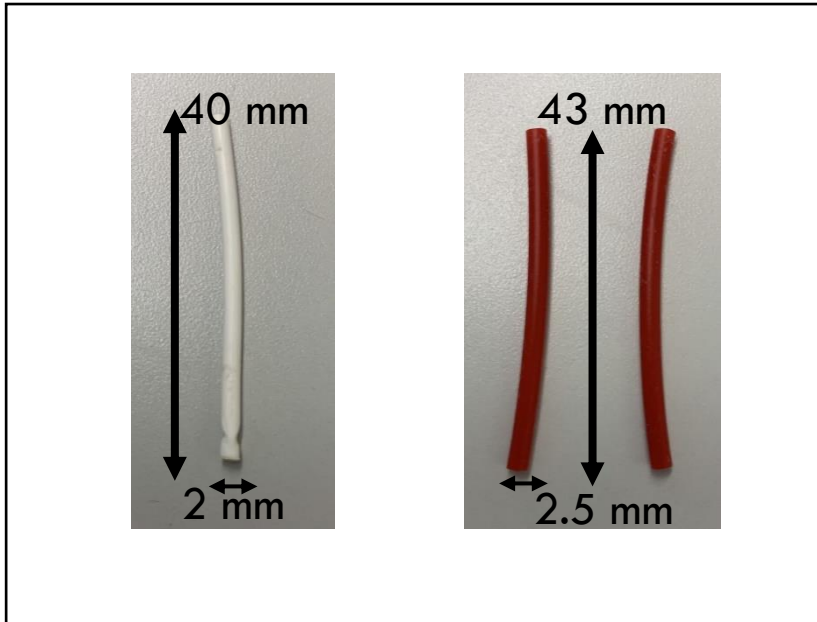


Figure 4. An etonogestrel-containing implant (Nexplanon®) on the left and the two-rod system containing levonorgestrel (Jadelle®) on the right.

The levonorgestrel-containing implant, developed by the Population Council and Leiras, has been approved by the FDA since 1996, but never marketed in the US (120). In Finland, the levonorgestrel-containing implant has been on the market since 1997 for three-year use and since 2000 for five-year use (120).

The first etonogestrel-containing implant was first introduced to market in Indonesia in 1998, in Finland in 1999, and approved by the FDA in 2006 (121). The newer version, introduced in 2010, includes barium to allow location with X-rays and an improved inserter (122).

The levonorgestrel-containing implant inhibits ovulation in almost half of cycles studied, while the rest of the cycles (55%) show some ovulatory dysfunction, such as low progesterone levels and luteal insufficiency (123). However, due to the declining serum levels of LNG the ovarian function returns close to normal from the third year of use onwards (124). The cervical mucus becomes thick and impenetrable to sperm, and this enhances the contraceptive efficacy (125).

The etonogestrel-containing implant inhibits ovulation in most users (126). Although ovulation is inhibited, ovaries still have some follicular growth and produce oestradiol (126,127). In addition to ovarian effects, the cervical mucus becomes thick and impenetrable to sperm (127).

The levonorgestrel-containing implant can be used for up to five years, and up to four years among women weighing over 60 kg (91). The etonogestrel-containing implant has been approved for three years of use, but studies suggest that the use can be extended up to four or even five years (31,91,128,129). There are data showing that obese women have lower etonogestrel concentrations than women of normal weight (130). There are, reassuringly, no clinical data that contraceptive failures would be more common among obese women using the etonogestrel-implant (129).

The most common adverse effects of contraceptive implants are bleeding disturbances, which can range from amenorrhea to irregular or prolonged bleeding (31,91). Other adverse effects are derived from the hormonal effects of progestins, which can include acne, greasiness of the skin, breast tenderness and headaches (91).

2.2.2.2 SHORT-ACTING REVERSIBLE CONTRACEPTION

2.2.2.2.1. COMBINED HORMONAL CONTRACEPTIVES

Combined hormonal contraceptives (CHCs) include combined oral contraceptive pills, patches, and rings. All these contain oestrogen (ethinyl oestradiol or oestradiol valerate) and progestin such as levonorgestrel, gestodene or drospirenone. In pills, the hormones are administered orally, in patches trans dermally, and in the ring vaginally. Transdermal and vaginal administration avoid first-pass metabolism in the liver.

The mechanism of action is similar regardless of the route of administration. All CHCs prevent pregnancy mainly by inhibiting ovulation (131). Progestin and oestrogen alone can inhibit ovulation by suppressing the pulsating secretion of gonadotropin-releasing hormone (GnRH) from the hypothalamus (131). However, administering both hormones together ensures the inhibition of ovulation, and has made it possible to use ethinyl oestradiol (EE) in very small doses, thereby reducing the risk of adverse effects such as the risk of thrombosis (131). Additionally, the cervical mucus becomes less penetrable by sperm and the endometrium possibly less susceptible to implantation (131). Administering oestrogen also enables the user to have regular withdrawal bleedings and prevents interval bleedings (131).

The first contraceptive pills introduced in 1961 contained high doses of oestrogen and thus, significantly increased the risk of thromboembolism, myocardial infarction and stroke, and also had high a discontinuation rate due to hormonal side effects such as bloating and nausea (94). Since the 1960s, user satisfaction and safety have been improved by decreasing the EE dosage and by introducing less androgenic progestins in to CHCs. However, even today, increased cardiovascular risks, especially the risk of thromboembolisms, remain an issue (132). Formulations containing oestradiol or oestradiol-valerate have been introduced in an attempt to reduce cardiovascular risks (132,133).

When the use of CHCs is discontinued, the pulsatile secretion of GnRH and ovulation returns (131). Follicular growth already resumes during the hormone-free interval and ovulation can occur when the pill-free interval is prolonged from the usual seven days by missing two pills or more at the beginning of the pack (131).

2.2.2.2.2. PROGESTIN-ONLY PILLS

Initially progestin-only pills (POPs) were developed for breastfeeding women, as oestrogen may interfere with milk production and increase the risk of thrombosis in the postpartum period. As oestrogen also has adverse effects on blood clotting outside the postpartum period, progestin-only pills offer an alternative to those women who have an elevated risk of thrombosis.

The first low-dose POPs, introduced in the 1970s and containing either levonorgestrel or norethisterone, mainly work by thickening the cervical mucus and only prevent ovulation in some users (91,131). The effect on cervical mucus is not long-lasting, and these pills must therefore be taken at the same time every day with a three-hour marginal.

Desogestrel-containing mid-dose (75µg) preparations, introduced in 2001, mainly act by inhibiting ovulation, and the effects on cervical mucus are secondary (134). This allows for a 12-hour margin for the daily remembering of the pill. Both levonorgestrel- or norethisterone-containing and desogestrel-containing POPs are administered daily without breaks.

The newest preparation on the market since 2020 and containing drospirenone (4mg), is administered for 24 consecutive days with four-day placebo intervals. Drospirenone-only pills inhibit ovulation with a 24-hour safety window for missing pills (135). They also provide a better bleeding profile than other progestin-only pills (135).

The typical adverse effect of POPs is irregular bleeding, as these contain no oestrogen, which mediates the good cycle control of CHCs (135). The profile of side effects differs between POPs containing different progestins that have different androgenic potentials (135). These differences among POPs are summarised in Table 4.

Table 4. Differences in androgenicity and side-effects between progestin-only pills containing levonorgestrel/norethisterone, desogestrel or drospirenone.

	Levonorgestrel/ norethisterone	Desogestrel	Drospirenone
Androgenicity	+	+/-	-
Side-effects			
Acne	++	+	-
Greasiness of the skin	++	+	-
Increased facial hair growth	++	+	-

2.2.2.2.3 INJECTABLE CONTRACEPTIVES

An injectable contraceptive containing progestin, medroxyprogesterone acetate (DMPA), was developed in 1967, but approved by the FDA in the US for contraception as late as 1992 (136,137). Concerns over decreased bone mineral density have reduced the use, although WHO has concluded that the benefits outweigh the risks, and no evidence of fractures or reduced bone mineral density lasting beyond the duration of use have been established (91). The return of fertility is not as instant as with other methods, but instead can be prolonged on average by four months compared to other contraceptives (91). The difference in fertility compared to COCs disappears by 16 months after discontinuation (138).

The most common DMPA brand, Depo-Provera, has not had a sales licence in Finland since 2018 (139). Globally, the use of Depo-Provera continues and is actually increasing, especially in sub-Saharan Africa and Latin America, but the use is minimal in Finland (29).

2.2.2.3 IRREVERSIBLE METHODS

2.2.2.3.1. FEMALE STERILISATION

Female sterilisation continues to be the most common contraceptive method used worldwide, but the use has been declining in developed countries since the introduction of LARCs (29). In the US, in many Latin American and Caribbean countries, and in Southern Asian countries, as many as 13–35% of women have been sterilised (29).

In Finland, the rates of female sterilisation have declined in the 21st century, similarly as in other developing countries (140). Sterilisation is regulated by law in Finland (141).

2.2.2.3.2. MALE STERILISATION

Male sterilisation is not widely used globally. The UK, Australia and Bhutan have the highest prevalence, with 8–10% of the population using male sterilisation as contraception, but in most other regions of the world the use is marginal (29). In Finland, male sterilisation has become somewhat more popular in the 21st century, and in 2016, for the first time, more men than women were sterilised (140). Nevertheless, the number of men choosing sterilisation is low with 2.5 per 1000 men aged 25–54 years being sterilised in 2020 (142,143).

2.2.2.4 OTHER MODERN METHODS

2.2.2.4.1. CONDOMS

Condoms are one of the most commonly used contraceptive methods, accounting for 20% of contraceptive use globally, and are the only method offering protection from sexually transmitted infections (STIs) (29). The male condom is the most prevalently used condom, while the female condom is rarely used.

It is common that using a condom is forgotten even though it was intended to be used, or the condom may not be used through the whole of intercourse (144). It is also common to believe that using a condom reduces sexual pleasure and stands in the way of intimacy (145).

2.2.2.4.2. DIAPHRAGM AND SPERMICIDES

Diaphragms are rubber caps inserted in front of the cervix two hours before intercourse and are to be kept in place for six hours after intercourse. Spermicides are always recommended to be used with the diaphragm.

2.3 REASONS FOR CONTRACEPTIVE FAILURE

Contraceptive failure can occur due to method failure or failure to use the method correctly or not to use it at all. In a study in the early 2000s, 36% of Swedish women opting for induced abortion had not used any contraception at the time of conception, 16% had used ineffective methods such as withdrawal and calendar methods, and 20% had changed their contraceptive method during the previous year (146). In Finland, 40% of all women undergoing an induced abortion in 2020 had not used any contraception at the time of conception, and 46% of women who had used contraception had used a condom (147). In the US, it is estimated that half of all unintended pregnancies result from the non-use of contraception and the other half from contraceptive failure (54,148).

As shown in Table 2, contraceptive methods differ in their contraceptive efficacy, ranging from the high efficacy of LARC methods to the low efficacy of traditional methods. Different methods also have differing risks of user failure. IUDs, implants and sterilisation are the least prone to user error, whereas all methods requiring daily or coital remembering are more prone.

Women's preferences regarding contraceptive methods differ. People with ambivalent predispositions towards pregnancy are more inclined to use less effective methods or no method at all, or to use the methods inconsistently (149–152). Most studies report contraceptive effectivity and effectiveness as Pearl Index values, but this reflects the number of contraceptive failures in the first year of use. As the use of the same method continues, the rate of contraceptive failures decreases as the user becomes more adept at using the method (151). In contrast, the most fertile users and users with the highest risk of user failure experience contraceptive failure early on (151). Over half, 63%, of annual contraceptive failures occur during the first six months of use (153). Lower satisfaction with the method is reflected in the inconsistent use of the method, resulting in more contraceptive failures (152).

Fertility decreases with increasing age in both women and men (154,155). Thus, it is likely that contraceptive failures also decrease with increasing age. In line with this, a study using retrospective survey data reported less frequent contraceptive failures with increasing age for all methods except implants (156). The frequency of intercourse also affects contraceptive efficacy. Additionally, it is common to have intercourse less frequently with increasing age (157–159). Parity itself has conflicting

associations with contraceptive failure. The association varies between studies and methods. An increasing risk of contraceptive failure with increasing parity was found in a US study and in a recent international study based on comprehensive survey data (153,156,160). Women using most contraceptive methods to space births, not to limit the number of pregnancies, have a higher incidence of contraceptive failure (156,160).

Some studies have demonstrated a lower contraceptive efficacy of oral contraceptives among obese women (161,162). However, a more recent Cochrane review found no clear association of BMI with contraceptive efficacy, and the direction of the association was mixed, i.e. a lower or increased efficacy was found among obese women (163). The effectiveness of oral contraceptives can be compromised by conditions inhibiting absorption from the gastrointestinal canal, such as vomiting, or severe inflammation of the bowel in inflammatory bowel diseases, especially when Crohn's disease causes severe inflammation of the small intestine (164). Some medications, such as the epilepsy medication carbamazepine, accelerate the metabolism of contraceptive steroids via the CYP450 pathway in the liver, and can thus result in contraceptive failure.

The effectiveness of IUDs can be affected by their location in the body. An IUD placed cervically or perforating the uterus can result in contraceptive failure. An IUD can also be expelled. The rates of expulsion have differed between LNG-IUSs and Cu-IUDs in different studies. In early studies, the rate of expulsion was higher among LNG-IUS users than Cu-IUD users, being 11.8 and 7.4 per 100 users during five years, respectively. A more recent study in the US found no difference between the IUDs on expulsion rates, which were 10.2 per 100 women in three years (165). In the majority of studies, nulliparity has not associated with higher rates of expulsion, but being under 20 years of age and obesity have been found to increase the risk of expulsion (165–168). There are also reports of users of tampons or menstrual cups inadvertently pulling the IUD out or lower in the uterus while removing the tampon or the cup. Studies, however, have only found an association only for using the menstrual cup with the expulsion of an IUD, not for the use of tampons (169,170).

According to an Australian study, failure to insert the implant was the most common reason for contraceptive failure in implant users, followed by an incorrect timing of insertion, expulsion of the implant and interaction with hepatic enzyme-inducing medicines (171).

Small user errors are very common while using the male condom. In one study, 74% of users reported incorrect use practices (172). In the same study, 8% of women reported that the condom had slipped, and 2% of the studied condoms had leaked, 1% had broken and 4% of women had prostate-specific antigen in their vaginas after intercourse indicating contamination with semen that was suggestive of either user failure or a broken condom (172).

Rhythm methods are also very user dependent. The methods used to detect ovulation, basal body temperature measurements and checking for variations in cervical mucus, are prone to user error. The prediction of the timing of ovulation is less exact when the cycle is irregular, and unpredictable even with a regular cycle (79). The longevity of sperm in the female reproductive tract can also cause contraceptive failure while using these methods.

What is common with all contraceptive methods is that their effectivity stops as soon as the use of the methods is discontinued. The discontinuation of a method is a high-risk situation for contraceptive failure, as 12–73% women discontinuing use are at risk of becoming pregnant, i.e., they use less effective methods or no method at all after discontinuing the current method, and 3–20% become pregnant within 3 months of discontinuation (65). Discontinuing and switching methods are thus important reasons for contraceptive failure, and ones that the service system should address, providing women with adequate services to ensure a safe transition between methods (65).

2.4 DISCONTINUATION OF CONTRACEPTION

The discontinuation of contraceptive methods is common, as shown in Table 2 (12,13,65,73). The reasons for discontinuation vary from having subjective side effects or even serious adverse events to wishing to conceive, or to changes in relationships, and sometimes to fears of adverse effects (73). Thus, the concept of discontinuing contraception is multileveled, and cannot only be discussed as occurring solely due to method-related side effects. Family planning professionals may prefer effective methods, such as LARC methods, that require assistance from a medical professional for discontinuation, but this may not be the case for women themselves, who often prefer a method they can discontinue as they wish (173). It is important to also ensure reproductive autonomy while using LARC methods and to remove the device when a woman so desires (91,173).

The discontinuation of the use of oral contraceptive pills is common, with 30–60% of women discontinuing within the first 6–12 months of use (12,13,73). In a French study, only 9% of women using progestin-only pills continued their use at two years, and more than 70% had discontinued the use by 6 months (74). In the same study, the discontinuation rate of third-generation COCs was lower than that of first and second-generation COCs (74).

The most common side effects of oral contraceptives reported to lead to discontinuation have been bleeding irregularities, nausea, headaches, mood changes, weight gain and breast tenderness (73,174). The reasons for discontinuation are diverse, and there are conflicting results regarding whether side effects are the most common reason for discontinuation (13,73). One study found subjective side effects to be the most common reason, with 37% of women discontinuing CHCs because of side effects (73). Another study found logistical reasons, namely problems receiving more pills, the most common reason (13).

With LARC methods, no efforts are required for method continuation, except when the method needs to be replaced every three to ten years. The continuation of LARC methods is higher compared to CHCs related to this, as well as to higher user satisfaction with the methods (12). Two-year continuation rates of 70–88% have been reported for Cu-IUDs, 60–91% for LNG-IUSs and 69–84% for contraceptive implants containing etonogestrel, both in clinical trials and in real-world data (14–16,18,74). The highest continuation rates were found in a French

register-based study. However, the study may have overestimated the continuation rates of LARC methods, as it relied on procedure codes entered into registers without a manual patient register review. These procedure codes may not always be used perfectly, and LARC procedures may thus have been missed in the registers (74).

The one-year continuation rate of the injectable DMPA varies from 23% to 70% (63,71,72). The discontinuation of other methods, such as condoms, withdrawal and rhythm methods is equally high with 40–50% discontinuing use within 12 months according to a report based on the Demographic and Health Surveys conducted by WHO in 25 African, Asian, eastern European and Latin American countries (65). Condom use is also often inconsistent and discontinuation is not easy to distinguish from periodic non-use (144). Many women discontinue the use of condoms to switch to a more reliable method (174). One study found that 54% of women using an app to detect fertile days discontinued the use within a year, a figure even higher than with traditional calendar methods in WHO surveys (66).

The frequent discontinuation of contraceptive methods challenges family planning providers, as women may not contact professionals, but opt to switch to less reliable contraceptive methods instead (73). Up to half of women discontinuing contraception have been found to be at high risk of unintended pregnancy within three months after discontinuation (65). Discontinuing contraception also often precedes an unintended pregnancy (175). This makes addressing side effects and beliefs openly important in contraceptive counselling. Women should have the possibility to contact clinics with a low threshold when experiencing side effects or having concerns (25,65).

2.5 EFFECTS OF CONTRACEPTIVE METHODS ON HEALTH AND WELL-BEING

Different modern contraceptive methods have different beneficial and adverse effects on general health and well-being (Tables 5 & 6). Each woman weighs these effects differently. Some women prefer the benefits of hormonal contraception, while others wish to avoid possible adverse hormonal effects. In contraceptive counselling, it is important to find out and listen to the woman's individual wishes, views and previous experiences, and offer professional advice on how the methods respond to the woman's wishes.

Table 5. Beneficial effects of various methods of contraception on health and well-being (25,31,176–182).

Health benefit	Hormonal				Non-hormonal			
	CHC	POP	Implant	LNG-IUS	DMPA	Cu-IUD	Sterilization	Condom
Reduces:								
Menstrual bleeding	+	+	+	++	+/-	-	-	-
Menstrual pain	+	+	+	+	+	-	-	-
Acne	+	+/-	-	-	-	-	-	-
Excess hair growth	+++	-	-	-	-	-	-	-
Ovulation pain	+	+/-	-	-	+/-	-	-	-
Symptoms of PCO	+	-	-	-	-	-	-	-
Symptoms of endometriosis*	+	+	+	+	+	-	-	-
Protection against:								
Risk of pregnancy	++	++	+++	+++	+++	+++	+++	+
Endometrial cancer	++	++	++	+++	+++	-	-	-
Ovarian cancer	++	-	-	+	-	-	+	-
Iron deficiency	++	+	+	+++	+	--	-	-
STI	-	-	-	-	-	-	-	+
PID	+	+	+	+	+	-	-	+

CHC, combined hormonal contraceptives; POP, progestin-only pills; LNG-IUS, levonorgestrel intrauterine system; DMPA, medroxyprogesterone acetate injection; Cu-IUD, copper intrauterine device; PCO, polycystic ovaries syndrome; STI, sexually transmitted infection; PID, pelvic inflammatory disease

Table 6. Adverse effects of various methods of contraception on health and well-being (25,31,183,184)

Adverse effect	Hormonal					Non-hormonal				
	CHC	POP	Implant	LNG-IUS	DMPA	Cu-IUD	Sterilisation	Condom		
Increases:										
Risk of thrombosis	++	-	-	-	-	-	-	-	-	-
Irregular bleeding	-	++	++	+	+/-	+	-	-	-	-
Heavy menstrual bleeding	-	-	+/-	-	-	++	-	-	-	-
Menstrual pain	-	-	-	-	-	+	-	-	-	-
Acne	-	+	+	+	+	-	-	-	-	-
Excess hair growth	-	(+)	(+)	+	+	-	-	-	-	-
Risk of breast cancer	+	+	+	+	+	-	-	-	-	-
Risk of cervical cancer	+	-	-	-	-	-	-	-	-	-
Weight gain	+/-	+/-	+/-	+/-	+	-	-	-	-	-
Mood disorders	+/-	+/-	+/-	+/-	+/-	-	-	-	-	-
Decreases:										
Libido	+/-	+/-	+/-	+/-	+/-	-	-	-	-	-
Bone mineral density	+/-	-	-	-	+	-	-	-	-	-

CHC, combined hormonal contraceptives; POP, progestin-only pills; LNG-IUS, levonorgestrel intrauterine system; DMPA, medroxyprogesterone acetate injection; Cu-IUD, copper intrauterine device; PCO, polycystic ovaries syndrome; STI, sexually transmitted infection

2.5.1 RISK OF PELVIC INFLAMMATORY DISEASE

As the Dalkon Shield IUD increased the risk of serious infections, PIDs and septic abortion in the 1970s, the concerns of PIDs among IUD users have remained among health care professionals (185–187). Reassuringly, the current understanding regarding PIDs and IUD use is that an increased risk of PID is only seen shortly after initiation, and no risk of tubal infertility is seen with modern IUDs (102). Even the risk of PID among women with an STI at the time of IUD insertion is low (186). STIs may be screened at the visit for insertion and treated after the results arrive (88). The annual incidence of PID in a cohort of insured women aged 15–44 in the US in 2001–2005 ranged from 3.2 to 2.4 per 1,000 (188). The incidence estimated by WHO for women using IUDs during the first 20 days after insertion is six times higher than this estimate, and after the first 20 days it is lower than this estimate, being 1.6 cases per 1000 woman-years (one year that the woman is at risk) of use (100). The risk of PID has been found to be lower among LNG-IUS users compared to Cu-IUD users (189).

2.6 EVOLVING GUIDELINES AND CHANGING PATTERNS OF IUD USE

2.6.1 USE OF IUDS AMONG NULLIPAROUS AND TEENAGED WOMEN

The Dalkon Shield episode eventually led to all IUDs, except a progesterone-containing device (Progestasert®) for one-year of use, being withdrawn from the US market in 1986 (190). IUDs remained a widely used method in other parts of the world, Finland included, but for two years, no Cu-IUDs were available on the US market. In 1988, Paragard, a Cu-IUD widely used in WHO programmes around the world, was launched in the US, but only licenced for use in parous women.

In 1992, the American College for Obstetricians & Gynecologists (ACOG) recommended IUDs only for older, parous women (Figure 3) (190,191). In 1995 IUDs accounted for under 1% of contraceptive use (310,000 women) in the US (192). The LNG-IUS was introduced to the US market in 2000, but only licenced for parous women. The recommendation for being used only in parous women was not based on evidence, but on echoes of the Dalkon Shield. In 2005, ACOG renewed its Practice Bulletin and recommended IUDs for all women seeking reliable, reversible contraception (190,193). In 2005, the British National Institute for Health and Clinical Excellence (NICE) also issued clinical guidelines on LARC, recommending IUDs for all women, including teenagers (194). In 2007, ACOG followed, recommending LARCs for teenagers (195). The American Association for Pediatrics (AAP) was more conservative and recommended in 2007 that IUDs may be used for parous teenagers (196).

In 2009, ACOG raised LARCs as the first-line contraceptive methods, and in 2011 it stated that nearly all women were eligible for LARC use (197,198). The CHOICE study, offering no-cost contraception in the St. Louis area of the US, published findings in 2012 showing that 75% of women chose LARC methods when the most effective methods were presented first and women were provided their selected method free of charge (21). The risk of unintended pregnancy among LARC users was 20-fold lower than women choosing short-acting methods (21). Finally, in 2014, the AAP also joined in endorsing LARC as first-line choice for contraception in teenagers (199) (Figure 5).

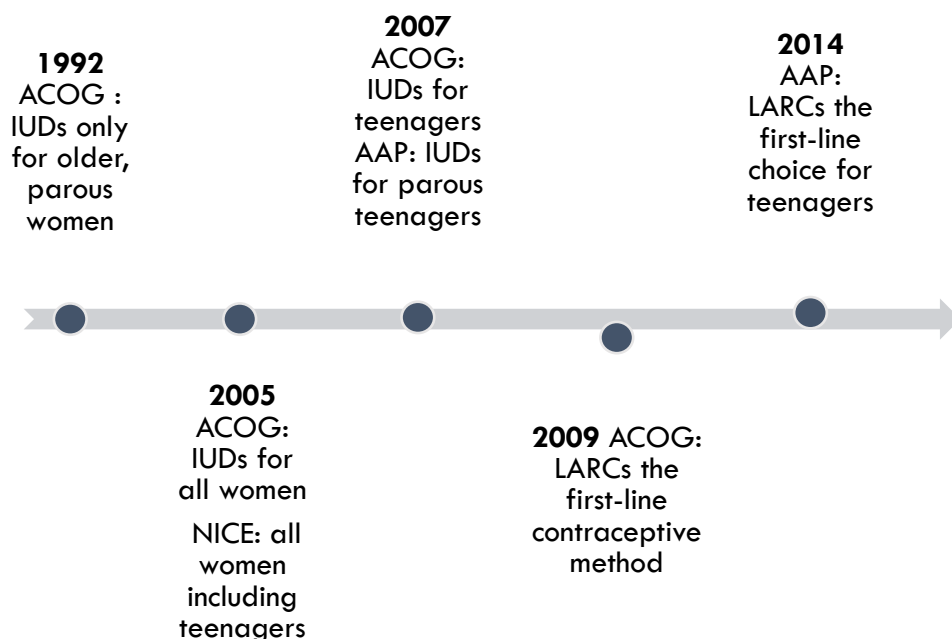


Figure 5. The development of the guidelines of the American College for Obstetricians & Gynecologists (ACOG), the British the National Institute for Health and Clinical Excellence (NICE) and the American Association for Pediatrics (AAP) on the use of IUDs among nulliparous and teenaged women (190).

Globally, the use of IUDs did not plummet similarly as in the US, and IUDs actually remained the second most used reversible contraceptive method globally in the 1980s (92,200,201). In Finland, the use of IUDs was among the highest of the world, with 25% of all women using contraception choosing an IUD in the 1980s (201). In contrast, in Britain, 7-10% of contraception users chose an IUD (200).

In 1980, WHO recommended that nulliparous women have their IUD inserted by a doctor, as the insertion may be found difficult, but did not consider nulliparity a contraindication for the use of an IUD (Figure 6) (202). This changed in 1987, as WHO recommended IUDs only for older, parous women in monogamous relationships in order to reduce the risk of PIDs and possible subsequent infertility (92). Since 1997, in the WHO medical eligibility criteria (MEC) for contraceptive use, IUDs have been categorised as category 1 (no restrictions for the use) for parous women and for women older than 20 years, and as category 2 (the advantages of using the method generally outweigh the theoretical or proven risks) for nulliparous women and for women aged under 20 years (203,204) (Figure 6). This

remains the recommendation in the newest medical eligibility criteria published in 2015 (205). Interestingly, in 2004, in WHO's recommendation on contraception for adolescents, the use of IUDs was only considered appropriate for carefully selected adolescents and generally not appropriate due to an increased risk of STIs (206).

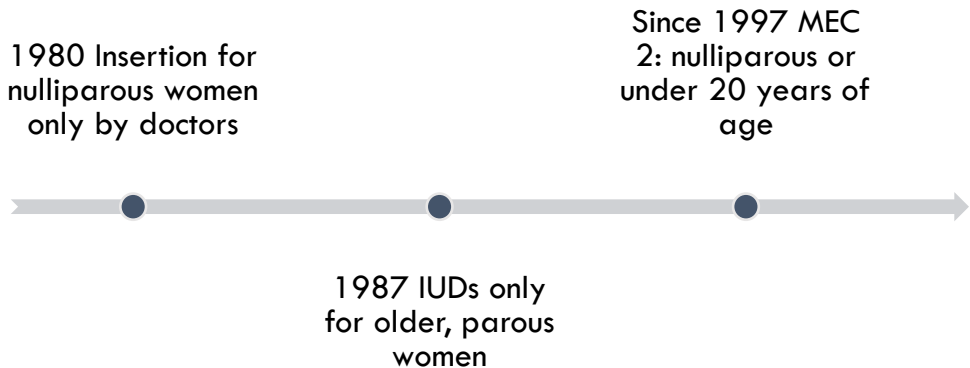


Figure 6. The development of WHO recommendations on IUD use among nulliparous or teenaged women (92,202–204).

MEC 2, Medical eligibility criteria category 2: the advantages of using the method generally outweigh the theoretical or proven risks

Several studies have demonstrated that IUDs, especially LNG-IUSs, work well among nulliparous and teenage women, but more expulsions may be experienced by teenagers (165–167,207–209). The higher risk of expulsion is the reason for the WHO's recommendation of category 2 for both nulliparous and teenage women (205).

The first Finnish Current Care Guidelines for contraception were published in 2015 and recommended IUDs for women of all ages regardless of parity, reflecting the recommendations of ACOG and NICE, and not as conservative as the WHO recommendation (31,205).

Since the recommendations have endorsed LARC methods as first-line choices, the use of LARCs, especially LNG-IUSs and implants, has been rising in the US, the UK and Europe (29,210,211). In the US, the use of IUDs changed rapidly with the change in recommendations coupled with education and promotion among health professionals. In 2014, IUDs were the contraceptive choice for 4.5 million women in USA, accounting for 12% of contraceptives used but still outnumbered by the pill, male condom and female sterilisation (190,212). In 2008–2015, the use of LARC methods

increased from 7% to 17% among Swedish 18–19-year-olds (213). The corresponding figures were 2% to 9% in Norway and 2% to 6% in Denmark (213).

2.6.2 TIMING OF INSERTION

According to the manufacturer's instructions, IUDs and IUSs are to be inserted within a week of the onset of menstrual bleeding (109,116,117,214). In 1987, WHO recommended the insertion of IUDs in the traditional way a few days after the menses, but also stated that this might not be necessary, as there were studies demonstrating no differences in outcomes according to the timing (92). In 1997, WHO's recommendation changed to state that IUDs and IUSs can be inserted at any time of the menstrual cycle, given that pregnancy can be ruled out with reasonable certainty (Table 7.) (203). Additionally, the Cu-IUD is highly effective as emergency contraception within five days after unprotected intercourse (25). In a recent randomised controlled trial, the LNG-IUS was shown to be as effective as the Cu-IUD when also used as emergency contraception within five day after unprotected intercourse (215).

As the timing of IUD insertion is more flexible, women can have their IUDs inserted at the time of the first visit to a family planning clinic.

Table 7. WHO guidance on ruling out pregnancy with reasonable certainty before the insertion of intrauterine devices (203).

Reasonable certainty in ruling out pregnancy is achieved if the woman:

- has consistently used a reliable contraceptive method or,
 - has had no intercourse since the last period or,
 - is within the first seven days after menses or,
 - is within four weeks post-partum or,
 - is in the first seven days post-abortion or,
 - is breastfeeding with no menses and within 6 months post-partum
-

2.6.3 STIs AND PELVIC INFLAMMATORY DISEASE

The guidelines have also evolved regarding STIs and the risk of pelvic inflammatory disease (PID) among IUD users. In 1987, WHO recommended removing the IUD if the woman was hospitalised or treated for PID with antibiotics (92). In the 1997 recommendation, this changed, and the IUD was advised not to be removed if the woman wished to continue its use (203). The recommendation in the latest WHO medical eligibility criteria of 2015 remains the same (204). However, the removal of an IUD, both Cu and LNG, should be considered if severe infectious symptoms, such as fever, or signs of sepsis appear. The clinical status of the patient should be taken into account.

The recommendations on the risk of STIs and the insertion of IUDs have remained similar since 1997, when WHO assigned MEC category 3 (the theoretical or proven risks usually outweigh the benefits) for the use of IUDs among women with a high risk of STIs (203). The status given for initiating IUDs among women with a high risk of STIs in the latest 2015 WHO recommendations are both categories 2 (the benefits usually outweigh the risks) and 3 (the theoretical or proven risks usually outweigh the benefits), leaving a lot of deliberation for the clinician (204). Similarly, past PID with a subsequent pregnancy yields a category 1 status, i.e., no restrictions on use, and without a subsequent pregnancy yields a category 2, the benefits usually outweighing the risks (203,204).

The Faculty of Sexual and Reproductive Healthcare (FSRH) of the Royal College of Obstetricians and Gynaecologists recommends that if an asymptomatic woman with a risk of an STI has had a negative STI test

before or at the time of insertion, no prophylactic antibiotics are required (104). ACOG similarly advises that women with a risk of an STI should be tested at the time of insertion if they have not been screened recently (216). The Finnish Current Care Guideline on contraception recommends that women initiating contraceptive methods in general should be tested for STIs (31).

2.6.4 FOLLOW-UP VISITS

The recommendations of WHO on follow-up visits after IUD insertion have changed since 1980, when a follow-up visit was recommended at one month, three months and every six months (202). In 1997, follow-up visits were recommended after 1–3 months and then annually (203). In 2008, additional follow-up visits were no longer recommended after the first follow-up visit within 3–6 weeks of insertion (217). The latest 2018 WHO recommendation is the same (91). The recommendations also state that women should not be denied IUDs even when they are not able to attend a follow-up visit (91,217).

The latest FSRH recommendation in 2019 no longer recommends a follow-up visit after the first menses, as many women do not return for these visits (104). Instead, the women should be advised to contact the clinics if problems arise (104). The Finnish Current Care Guidelines give a similar recommendation (31). In contrast to the FSRH recommendations, the Finnish Current Care Guidelines do not recommend advising women to check the IUD threads, as the threads commonly retract into the uterus (31). Thus, not finding the threads is common and does not affect contraceptive efficacy (31).

2.7 UNINTENDED PREGNANCIES AND INDUCED ABORTIONS

2.7.1 GLOBAL PERSPECTIVE

Unintended pregnancies are very common globally (218). Approximately half of pregnancies worldwide continue to be unintended (219), and half of these pregnancies end in abortion (218). The legal requirements for abortion vary and abortion remains illegal in many countries in the world (Figure 7). As the US Supreme Court overruled the right for abortion in June 2022, many Republican-run states have now banned abortion or enacted restrictions on access to abortion, and many are expected to follow (220). Thus, the US can no longer be classified as having liberal abortion laws, as this now only applies to some states on the east and west coast, states ruled by the Democrats (220).

The rates of induced abortions are not lower in countries with restrictive abortion laws (219) (Figure 8). On the contrary, if excluding China, India and Russia, the rate of abortions is higher in countries with legal restrictions on abortions than in countries having abortion broadly available (219). China and India differ from the other countries with liberal abortion laws, as it is more common to use abortion to select the gender of the offspring in these countries (221). Women in the area of the former Soviet Union, including Russia, traditionally had easy access to abortion and only limited access to effective, modern contraceptive methods, leading to a high rate of abortions as effective contraception could not be the means to achieve the desired small family sizes (221). This is reflected in the higher abortion rates in these countries today.

The differences in the rates of unintended pregnancies and abortions are substantial between the regions of the world, and between countries within the regions (46). The rates of both unintended pregnancies and abortions are lowest in Europe and Northern America and highest in sub-Saharan Africa (46). Nevertheless, in all other regions except Europe and Northern America, there are also countries that have rates of unintended pregnancies and abortions as high as countries in sub-Saharan Africa (46).

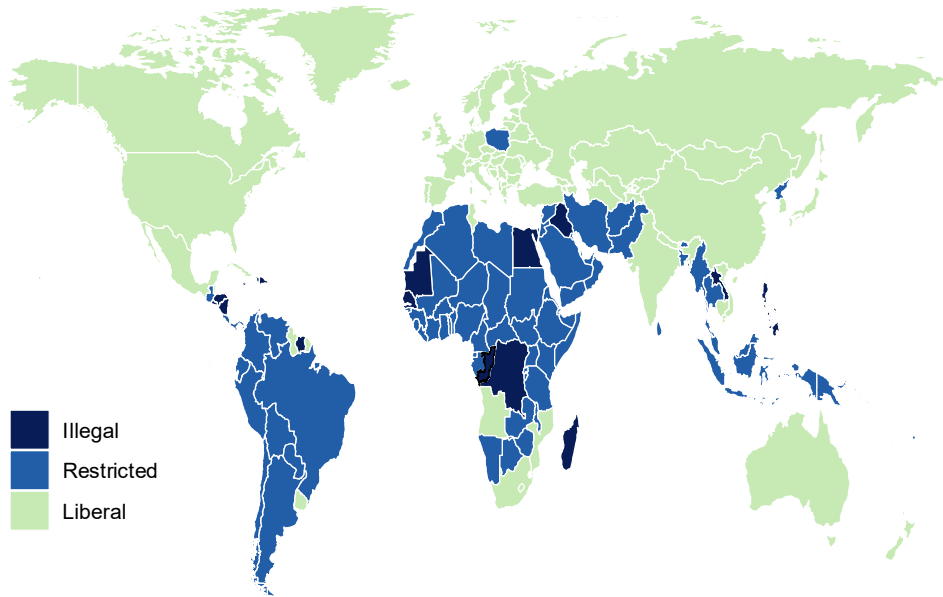


Figure 7. Countries where abortion is illegal, allowed only on restricted grounds or with liberal abortion laws in May 2022 (222,223).

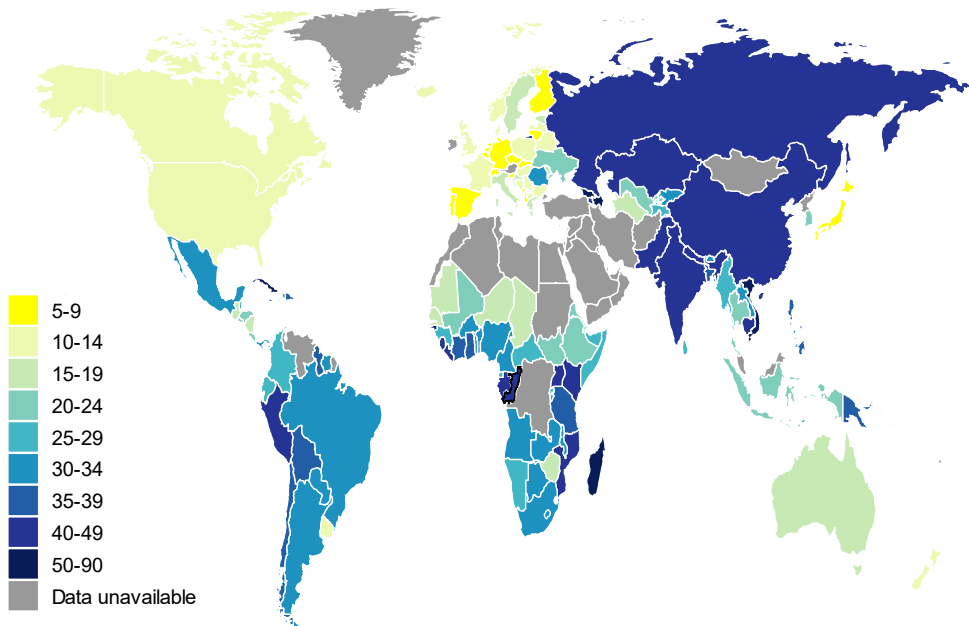


Figure 8. The estimated country-specific rates of induced abortion per 1000 women aged 15-49 years in 2015-2019 (46).

2.7.2 NORDIC PERSPECTIVE

Abortion is legal in all Nordic countries, with some differences in legislation. The abortion law in Sweden is among the most liberal in the world, and liberal even compared to other Nordic countries. In Sweden, abortion has been allowed on demand until the 18th gestational week since 1975. Interestingly, Sweden has no consistent national register on induced abortions, perhaps reflecting a conflict between liberality and stigma. In Finland, Denmark and Norway, abortion is granted on request until 12 weeks of gestation and until 22 weeks in Iceland (224). In Finland, a woman can also apply for permission for induced abortion on social grounds until the 20th week from National Supervisory Authority for Welfare and Health (225).

In 2015–2019, the Nordic countries had quite similar annual rates of unintended pregnancies, ranging between 30–35 per 1000 women, but Sweden had the highest rate of abortions, 18 per 1000, and Finland the lowest rate, 8 per 1000 women aged 15–49 years (46).

2.7.3 REIMBURSING CONTRACEPTION AND REDUCING THE RATE OF INDUCED ABORTIONS

In Sweden, different communities have different strategies for reimbursing hormonal contraceptives for teenagers, although a recommendation to reimburse contraceptives for women under 25 years of age was made in 2013 by the Swedish Association of Local Authorities and Regions (226). These differences in the reimbursement of contraceptives, however, are not reflected in the rates of induced abortion in these counties (227). Similarly, the UK has reimbursed contraceptives since 1974, but the abortion rate in the UK is still among the highest in Europe (224,228). Finland, on the other hand, does not reimburse or uniformly provide contraceptives, but the rate of induced abortions is among the lowest in Europe (46,224).

Reimbursing contraceptives per se does not appear to have a clear association with low rates of abortion, as areas with reimbursed contraception do not have lower rates of abortion than areas with no reimbursement of contraceptives. The association of low abortion rates is clear only with providing LARC methods free of charge. The CHOICE project in the St. Louis area of the US revealed that providing LARC methods free of charge reduced the rates of induced abortion in the area (21). The project enrolled women at abortion and contraceptive clinics and provided contraception free of charge (229,230). Women predominately chose LARC methods. The abortion rate among women choosing LARC methods was only 10% of the abortion rate that was seen among women choosing short-acting

methods (21). A project in Colorado increased the funding for LARC methods, resulting in both an increase in the use of LARC methods and a reduction in the rates of induced abortion and fertility among women aged 15–24 years (22). A comparison of municipalities with different contraceptive services in Finland revealed that providing free-of-charge contraception was associated with lower teenage pregnancy rates (42).

In the US, the price of LARC methods is high, being 0–1300\$, which is likely to comprise a marked barrier for LARC initiation (22,231). The prices of LARC methods in Finland are lower, being 80–180€, and the barrier is thus somewhat lower.

2.8 SUMMARY OF THE LITERATURE REVIEW

Although family planning services, contraception and abortion services are pivotal for the health and well-being of women and men alike, these services are not equally or stably available globally. Politics and religion, in addition to funding, play a substantial role in the availability of these vital services. While restrictive abortion laws do not mean low abortion rates, the US is heading for more restrictions on access to abortion. The development in Finland is going in the other direction, as proposals for more liberal access to abortion are proceeding in the parliament.

The family planning services in Finland are a success story, as the rates of abortion and teenage pregnancies are among the lowest in the world (26). There is no single Finnish way of organising family planning services, but the services are organized by each municipality individually. At the beginning of 2023, the organisation of health services will transfer from the municipalities to 21 'wellbeing services counties'. Although recommended, not all municipalities offer free-of-charge contraception for under-25-year-olds. Only some large municipalities offer family planning services at specialised family planning clinics, such as the city of Vantaa. The services are commonly offered as part of maternity health clinic or basic health centre services.

Contraceptive methods differ in effectiveness, continuation rates and effects on health and well-being. Traditional contraceptive methods such as withdrawal and calendar methods are very unreliable. Condoms provide protection from sexually transmitted diseases, but they are not very effective in preventing pregnancy. Modern contraceptive methods (IUDs, implants, pills, patches, rings and sterilisation) are more effective in preventing unintended pregnancies. Long-acting reversible methods (LARCs, IUDs and implants) are more effective and have higher continuation rates than short-acting reversible contraceptives (SARCs, pills, patches and rings). This higher effectiveness is due to fewer user failures. LARCs can be forgotten without compromising their effectivity, while SARCs cannot. The effects on bleeding profiles differ among modern methods. Combined hormonal contraceptives cause withdrawal bleeding at regular intervals, while methods based solely on progestins (progestin-only pills, implants, levonorgestrel-releasing IUDs) have more variable bleeding profiles with commonly experienced interval bleedings. Copper IUDs often increase the amount of bleeding and the number of days of bleeding. (31)

Discontinuation of contraception is common, and effects on bleeding are often a reason for discontinuation. Many other reasons, including adverse

effects, logistical reasons and fears, can result in discontinuation. Discontinuing contraception often leads to contraceptive failure. Addressing side effects and fears, and providing adequate services when women discontinue contraception is a challenge for the service system.

Reimbursing contraception per se does not appear to reduce the need for abortion care. However, increasing the use of the most effective methods, LARCs, by offering them free of charge or by increasing their funding has been shown to reduce the need for abortion care (22,229).

3 AIMS OF THE STUDY

This thesis evaluates four aspects of offering LARC methods free of charge in primary care. First, information on the users of family planning services is needed to determine who the free-of-charge programme reaches. To estimate the benefits, it is pivotal to know how long women use their free-of-charge contraceptives. Thus, we evaluated the discontinuation of the LARC methods in a real-world setting. As the free-of-charge programme was designed to reduce the need for induced abortion in the city of Vantaa, comparison between women choosing to initiate free-of-charge LARC and women not choosing to do so was needed. Finally, choosing to initiate a LARC method or instead choosing to initiate, switch between or continue a SARC method can associate with different needs for reproductive health and gynaecological services. Information on these needs is important for organising sufficient services. The fourth aim was to evaluate the overall use of reproductive health services, including induced abortion, and the incidence of specific gynaecological diagnoses among LARC initiators and SARC initiators, switchers and continuers.

In brief, the aims were:

1. To identify the characteristics of women associated with the use of municipal family planning services in the city of Vantaa (Study I);
2. To determine the discontinuation rates of the different LARC methods provided free of charge, characteristics associated with discontinuation and the reasons for discontinuing (Study II);
3. To compare the risk of induced abortion between women choosing LARC methods free of charge, women using family planning clinics but choosing other contraceptive options, and age-matched population controls (Study III);
4. To compare the use of public reproductive health services among women initiating LARC methods or initiating, switching between or continuing SARC methods (Study IV).

4 MATERIALS AND METHODS

4.1 SETTING

4.1.1 FAMILY PLANNING SERVICES IN THE CITY OF VANTAA

The city of Vantaa has offered family planning services as a part of primary health care since 1974, when the health care law made it mandatory for municipalities to offer these services (38). The services gradually grew, and nowadays, the annual work of approximately 10 public health nurses or midwives, two assistants and two general practitioners goes into offering the services at three family planning clinics within the city of Vantaa's health centres.

The clinics operate with a nurse-led approach. Public health nurses and midwives are responsible for initiating, switching and check-ups of SARC methods, and general practitioners for prescriptions, consultation, and insertions of LARC methods. The clinics offer comprehensive services, including testing for STIs, counselling on sexual matters, primary care for infertility, and a wide mix of hormonal contraceptive methods. Currently, in 2022, online services for questions and follow-up are also provided. The clinic's services have remained open for all women of a fertile age without age limits, even during and after the 1990s recession, when many municipalities in Finland substantially cut family planning services. In many municipalities, these cuts meant offering specialised family planning services only for young women or for women with recent births, and offering services to other women only as a part of routine health centre services.

4.1.2 FREE-OF-CHARGE LARC PROGRAMME

The rate of induced abortions in Vantaa remained on average at 11/1000 15–49-year-old women from 2000–2012, higher than the overall national level (9/1000) in Finland, despite the comprehensive and frequently used family planning services. Until the beginning of 2013, only copper IUDs and a three-month supply of oral contraceptives when initiating or switching a method were offered free of charge. The cost of LNG-IUSs and implants remained a barrier to choosing these methods for many women in Vantaa.

The physician responsible for the family planning services, Mia Venhola, along with colleagues and nurses, advocated the removal of this barrier and to offering all LARC methods free of charge for all first-time users. On 1 January 2013, the city of Vantaa took up this proposal, and initiated an

ongoing programme offering women of all ages their first LARC free of charge. Women were informed of this possibility at visits to family planning clinics, in maternity health care and on the city's official web page. First-time use was determined based on the women's own statement and by data in Vantaa's patient records.

The first LARC methods on offer were the 52-mg LNG-IUS (Mirena®, Bayer), contraceptive implants (both levonorgestrel- and etonogestrel-containing, Nexplanon®, Organon and Jadelle®, Bayer, respectively) and Cu-IUDs (Nova-T®, Bayer). When the 13.5-mg LNG-IUS and 19.5-mg LNG-IUS were introduced to the market in 2014 and 2016, respectively, these were included in the selection.

4.2 DATA SOURCES

The data used in this thesis were originally acquired from registers as part of Frida Gyllenberg's doctoral thesis "Long-acting reversible contraception free of charge: initiations, user characteristics and induced abortions". Additional data on discontinuation and family planning clinic service use were derived from the city of Vantaa's electronic patient records.

Data acquired from the registers are presented in more detail in Tables 8 and 9. The pseudonymised data were combined on an individual basis.

Table 8. Variables used in each study with details of categorization and the registers the variables were acquired from.

Register	Variables	Analysed as	Used in studies
The city of Vantaa's Central Population Register	The number of women living in Vantaa on 1.1.2013		I, III
	Age at the start of follow-up	Age categories: 15–19, 20–24, 25–29, 30–34, 34–44	I, IV
	Native language	15–19, 20–29, 30–44 Finnish or Swedish/ other	II, III I, II, III, IV
	Marital status	Married/ not married	I, II, III, IV
	Date of moving away from the city of Vantaa	Date	II, IV
Statistics Finland	Educational level	Basic 9-year mandatory education or unknown / longer (10 years or more)	II, III
		Doctoral, master's, or equivalent level/ Bachelor's or equivalent level/ Short-cycle tertiary education/ Upper secondary education/ Unknown	I, IV
	Socioeconomic status	Upper-level employees/ Lower-level employees or manual workers/ Students /Long-term unemployed/ Entrepreneurs,	I, II, IV

pensioners and others not elsewhere classified/ Unknown

III

Upper-level employees/
Lower-level employees /Manual
workers/ Other

The Register on Induced Abortions*	History of abortion	Yes/no	I, II, III, IV
	Date of abortion(s)	Date	III, IV
	Duration of the pregnancy	Numeric	III
	Pregnant at start of follow-up	Yes/ no	III
The Register on Sterilisations*	Sterilised prior to follow-up	Yes/ no	I, II, III, IV
	Date of sterilisation during follow-up	Date	II, III, IV
Hospital Discharge Register (Hilmo)*	Diagnoses of gynaecological disorders prior to follow-up	Yes/ no	I, IV
	Diagnoses of mental health disorders (ICD-10 codes F10–F16, F18-69, F99) disorders prior to follow-up	Yes/ no	I, IV
	ICD-10 diagnoses of gynaecological or obstetric disorders during follow-up	Date/ number of diagnoses	II, IV
	Gynaecological procedures according to the Classification of Surgical Procedures of the Nordic Medico-Statistical Committee during follow-up	Date/ number of procedures	II, IV

Primary Care Register (AvoHilmo)*	ICD-10 diagnoses of gynaecological or mental health disorders prior to follow-up	Yes/ no	
	ICD-10 diagnoses and ICPC2-codes of gynecological or obstetric disorders during follow-up	Date/ number of diagnoses	II, IV
Register on Infectious Diseases*	Diagnoses of STIs prior to follow-up	Yes/ no	I, IV
	Diagnoses of STIs during follow-up	Number of diagnoses	IV

ICD-10, The International Statistical Classification of Diseases and Related Health Problems, 10th Revision; ICPC2, International Classification of Primary Care – 2nd Edition; STI, sexually transmitted infection

*Maintained by the Finnish Institute of Health and Welfare

Table 9. Data retrieved from the city of Vantaa’s electronic patient registers.

Variable	Means of retrieval	Used in studies
Date of LARC initiation	Computerized search	III
Type of LARC initiated	Manual review *	II, III
Whether the LARC was free of charge or not	Manual review*	II, III, IV
Date of visit to family planning clinics	Computerized search	III, IV
Reason for visiting the family planning clinic	Computerized search	IV
Date of discontinuing LARC	Manual review*	II
Reason for discontinuing LARC	Manual review*	II

* By three members of the study group (Tuire Saloranta, Frida Gyllenberg and a study nurse)

4.3 STUDY DESIGN

The thesis is comprised of four studies described in detail in Table 10.

Table 10. Studies in this thesis, their specific study designs, and outcomes.

Study	Study design	Outcome
I	Cross-sectional cohort study	Use of family planning services
II	Retrospective cohort study	Discontinuation rate of free-of-charge LARC methods
II	Retrospective cohort study	Factors associated with discontinuation
II	Retrospective cohort study	Reasons of discontinuation for each LARC method
III	Retrospective cohort study	Rate of induced abortion among women choosing free-of-charge LARC or choosing other contraceptive options
IV	Retrospective cohort study	Use of reproductive services within two years of choosing to initiate free-of-charge LARC or to initiate, switch between or continue SARC methods

4.3.1. DEFINING THE STUDY COHORTS

4.3.1.1 STUDY I

This study aimed to identify characteristics associated with the use of universally offered family planning services in the city of Vantaa. The aim was to evaluate the use of contraceptive services, and women aged 15–44 years were thus selected for the study. It is not very common to use contraception under the age of 15, and above the age of 44 women's fertility decreases. All 54,721 women in this age group living in Vantaa on 1 January 2013 were included in the study and divided into women using ($n = 11,790$) and not using ($n = 42,931$) the city's family planning services.

4.3.1.2 STUDY II

This study included all women initiating free-of-charge LARCs in 2013–2014 at Vantaa's family planning clinics. Only the first LARC initiated was included in the analyses. As the aim was to evaluate the discontinuation rates of LARCs primarily used for contraceptive purposes, women aged above 44 years were excluded, as the use of LNG-IUSs for medical reasons is common in this age group. LARC use in women younger than 15 was uncommon, and hence this age group was also excluded. Women with prior sterilisation were excluded as well, as they did not use LARC for contraceptive purposes, as seen in Figure 9.

The women were followed until the first of the following: LARC removal ($n = 514$); migration from Vantaa ($n = 287$); death ($n = 0$); data extraction date ($n = 17$); two years of LARC method use; or on 6 August 2016 ($n = 269$), i.e., 21 weeks before the end of 2016. The latter date was selected to allow for all pregnancies to be detected from the data based on the ultrasound screening programme or the register of induced abortions.

Altogether, nine women were excluded, as estimates would have led to a negative time of follow-up, either because the women had moved away from Vantaa prior to initiating LARC or a woman was presumed to be pregnant at the time of Cu-IUD insertion based on the estimates used to calculate the dates of discontinuation for women presenting with pregnancy without a specific removal event in the registers. The estimate was formed from the group of women with a removal in the family planning clinic registers and a pregnancy afterwards by calculating the mean time from removal to detecting the pregnancy in the registers as an ultrasound visit.

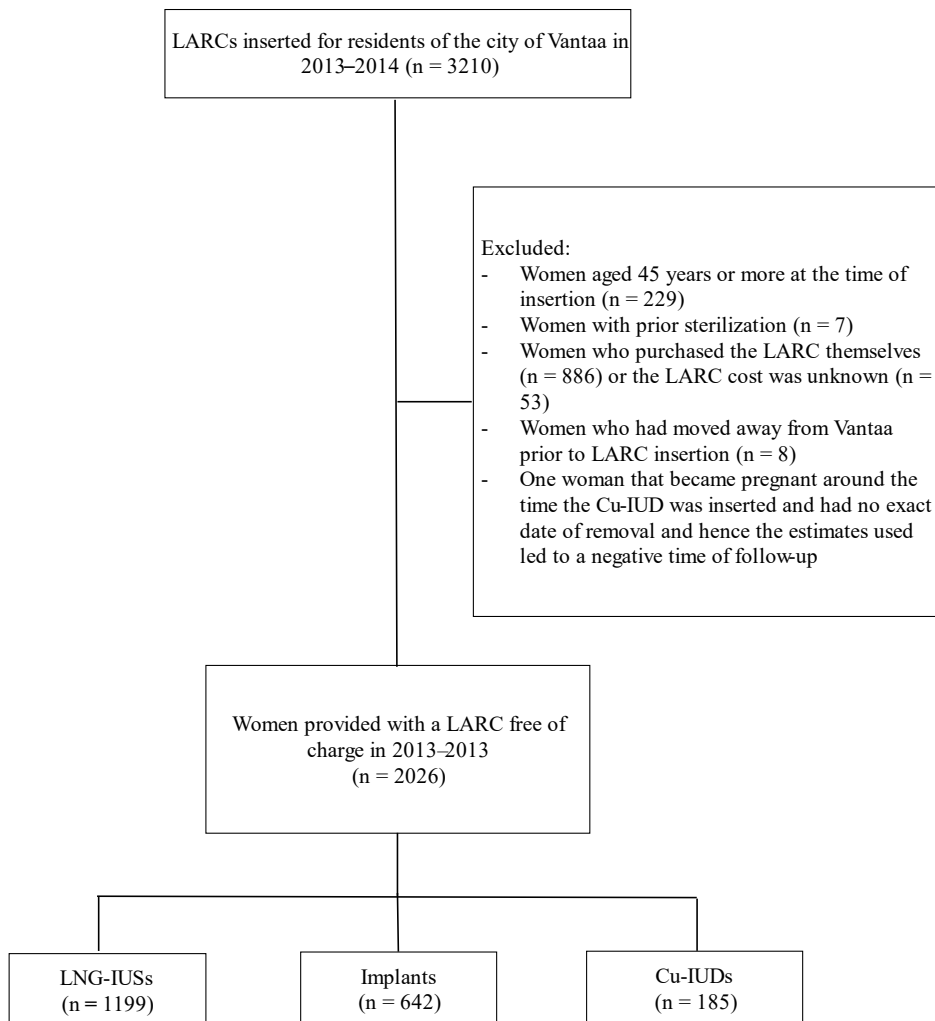


Figure 9. Flow chart illustrating the formation of the study cohorts in study II.

Reproduced with permission from Elsevier, previously published in Saloranta T et al. Free-of-charge long-acting reversible contraception: two-year discontinuation, its risk factors, and reasons, *American Journal of Obstetrics and Gynecology* 2020;223(6):886. doi: 10.1016/j.ajog.2020.06.023. Copyright © [2020] (Elsevier).

4.3.1.3 STUDY III

The third study aimed to evaluate the risk of induced abortion among women initiating free-of-charge LARCs compared to women not choosing to do so despite being eligible. Thus, all women with known previous use of LARC were excluded, as they were not eligible for free-of-charge LARC. As the aim was to examine contraceptive use and the risk of abortion, sterilised women were excluded (Figure 10). Controls from the female population of the city of Vantaa were age-matched with both free-of-charge LARC users and women using family planning services.

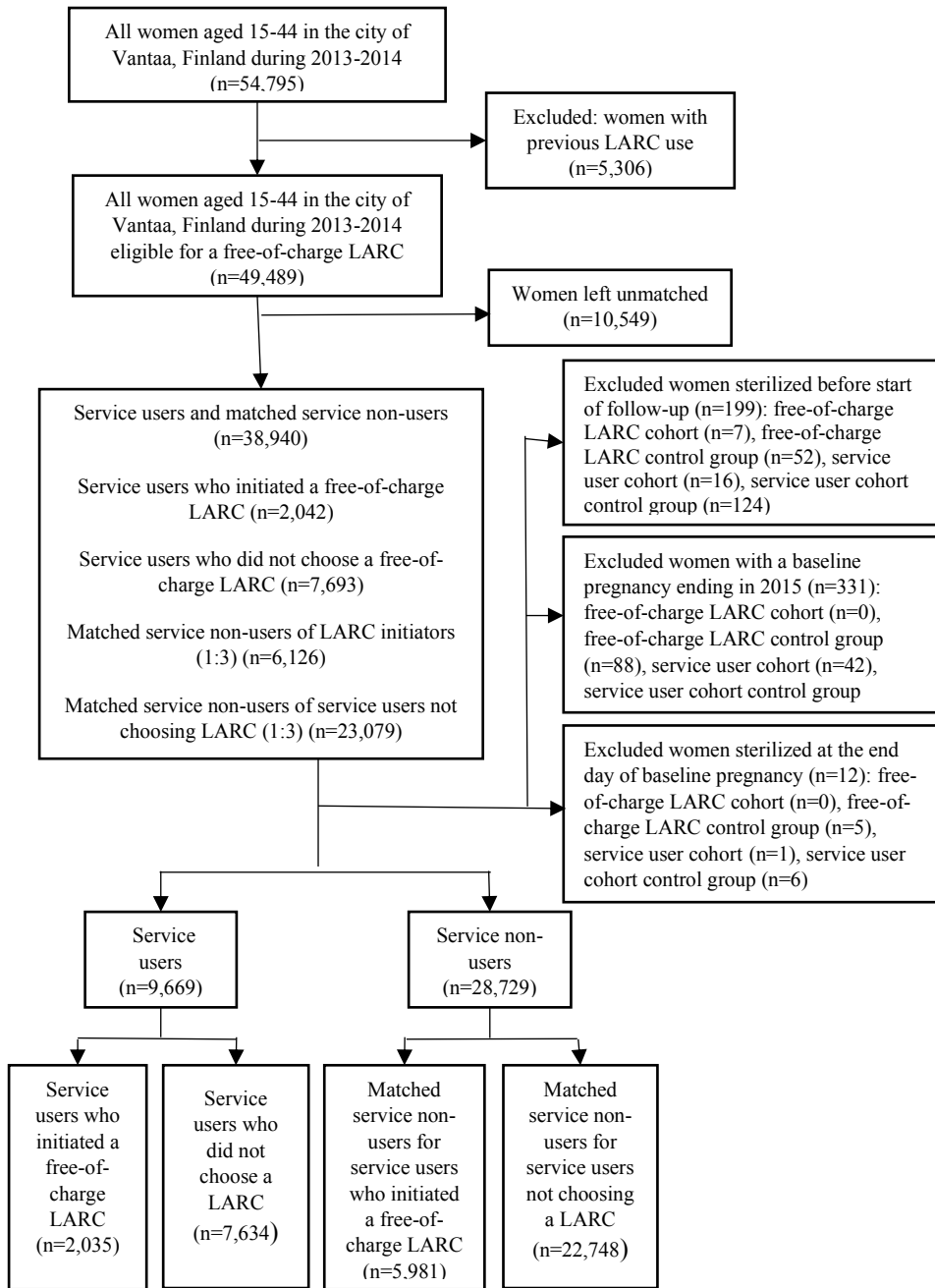


Figure 10. Flow chart illustrating the formation of study cohorts in study III.

Reproduced with permission from Wolters Kluwer Health, Inc., previously published in Gyllenberg, F; Saloranta, T et al. Induced Abortion in a Population Entitled to Free-of-Charge Long-Acting Reversible Contraception, *Obstetrics & Gynecology*: 2018;132(6):1453-1460 doi: 10.1097/AOG.0000000000002966

4.3.1.4 STUDY IV

The fourth study evaluated the overall use of reproductive health services among women initiating free-of-charge LARCs or initiating, switching between or continuing SARC methods. The reproductive health services included the use of family planning clinic services, or attending primary or specialised care for gynaecological reasons, but not maternity care. All women initiating free-of-charge LARC or initiating, switching SARC or visiting for SARC follow-up were included if they had two years of follow-up available in the registers. Women were excluded if they had moved away from the city of Vantaa during the two-year follow-up and were thus not able to use the family planning clinic services in Vantaa. Only women aged 15–44 years were included, as they represented women in their most fertile years, and thus with most reproductive service use. We excluded women who were not eligible for free-of-charge LARC, i.e., had previously used a LARC. One priorly sterilized woman was excluded, as she would have had lower needs for reproductive services (Figure 11).

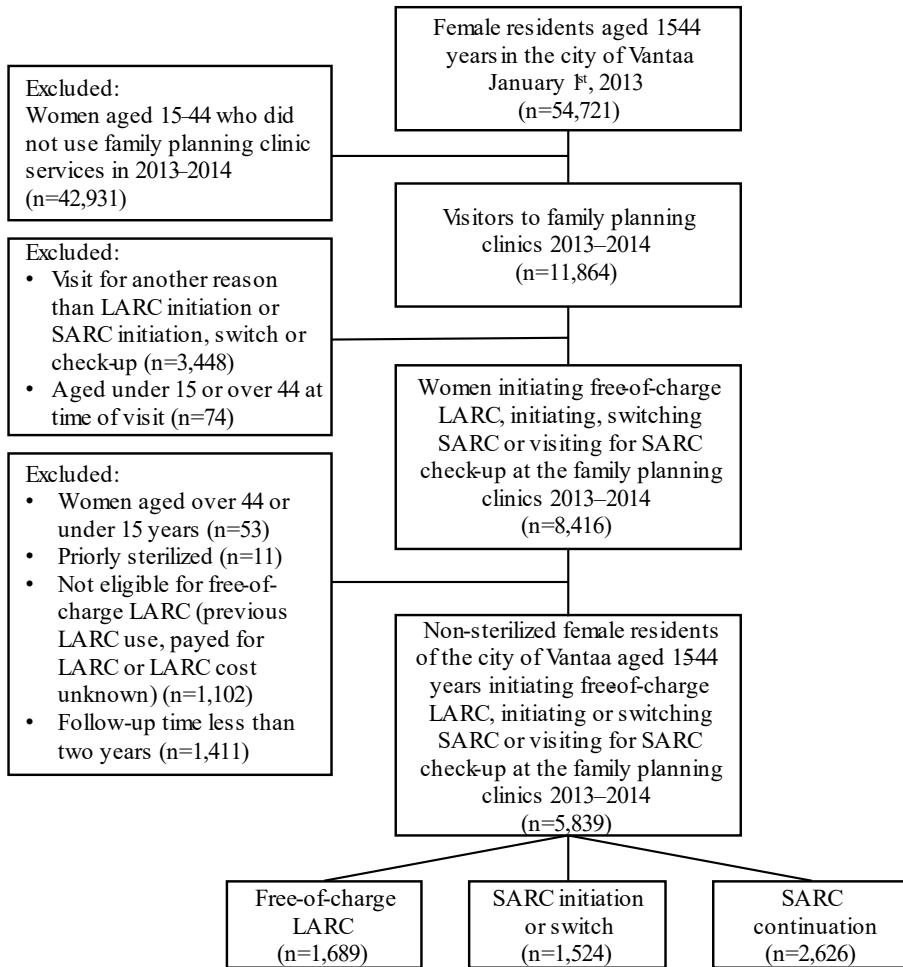


Figure 11. Flow chart illustrating the formation of study cohorts in study IV.

Reproduced with permission from Springer Nature, previously published in Saloranta, T.H., Gyllenberg, F.K., But, A. et al. Use of reproductive health services among women using long- or short-acting contraceptive methods – a register-based cohort study from Finland. BMC Public Health 22, 1185 (2022). <https://doi.org/10.1186/s12889-022-13581-3>

4.4 STATISTICAL ANALYSES

All statistical analyses were conducted using statistical software R versions 3.3.2–4.0.2 (232). The details of the methods used and of the variable selection for multivariate modelling are summarised in Table 11.

Table 11. Outcomes, statistical methods, details of the variable selection in the multivariate models, and variables included in multivariate models in each study I–IV.

Study	Outcome	Statistical method	Variable selection to the multivariate model	Variables included in the multivariate model
I	Use of family planning services	Univariate and multivariate logistic regression models to calculate odds ratios (ORs) with 95% confidence intervals (CIs)	Significant ($p < 0.05$) association with service use in univariate analysis + significant when added to multivariate model.	Categorical age, native language, socioeconomic, educational and marital status; history of sterilisation, delivery, induced abortion, STI, excessive, frequent and irregular menstruation (N92), or pain and other conditions associated with female genital organs and the menstrual cycle (N94)
II	Discontinuation rate of free-of-charge LARC methods	Cumulative 2-year discontinuation incidences with 95% CIs Poisson regression models for crude and adjusted incidence rate ratios (IRRs) of discontinuation with 95% CI	Significant ($p < 0.05$) association with discontinuation in univariate analyses + including the variable in the multivariate model improved the model by decreasing the Akaike information criterion (AIC) + the variable had a significant association with discontinuation with a manual	Categorical age, delivery in the year preceding LARC initiation, native language, and STI within 2 years prior to LARC initiation

		forward and backward selection process.
Cumulative incidence curves assessed with log-rank test		
II	Factors associated with discontinuation	Poisson regression models to calculate IRRs with 95% CIs
II	Reasons of discontinuation for each LARC method	Comparing frequencies with the chi-squared test
III	Rate of induced abortion among women choosing free-of-charge LARC or choosing other contraceptive options with age-matched population controls	<p>Calculation of crude induced abortion rate per 1,000 woman-years</p> <p>Univariate and multivariate Poisson regression models for crude and adjusted IRRs</p> <p>Survival curves with Kaplan-Meier estimates assessed with the log-rank test</p>
III	Rate of induced abortion among women choosing free-of-charge LARC or choosing other contraceptive options with age-matched population controls	<p>Significant ($p < 0.05$) association with the rate of induced abortions + including the variable in the multivariate model improved the model by decreasing the Akaike information criterion (AIC) + the variable had a significant association with induced abortions in the multivariate model with a manual forward and backward selection process.</p>
IV	Use of reproductive services within two years of choosing to	<p>All variables previously identified to associate with choosing a LARC and using</p> <p>Categorical age, history of pregnancy (history of delivery and induced</p>

<p>initiate free-of-charge LARC or to initiate, switch or continue SARC methods</p>	<p>and percentages, and incidence rate per 100 person years with 95% CIs for each reason were calculated.</p> <p>Incidence rate per 100 person years with 95% CIs for each reason.</p> <p>Crude and adjusted incidence rate ratios (IRRs) for service use for various reasons with 95% CIs were calculated from a negative binomial regression model.</p>	<p>family planning services were first included. Then, with backward selection, variables with less than 10% or 0.1 effect on the estimate were removed. The removed variables were introduced one-by-one back into the model. If the estimates changed by 10%/0.1 or more when the adding the removed variable back into the model, the variable was included in the final model.</p>	<p>abortion combined), and use of reproductive services within the previous year (visits to the family planning clinic, and in primary or specialized care for gynaecological reasons and having had an STI within the previous year combined)</p>
---	---	--	--

LARC, long-acting reversible contraception; SARC, short-acting reversible contraception; STI, sexually transmitted infection

In study II, an estimate for the time of removal was formed for the women presenting with pregnancy without a specific removal event in the registers. The estimate was formed from the group of women with a removal in the family planning clinic registers and a pregnancy in the registers afterwards by calculating the mean time from removal to detecting the pregnancy in the registers as an ultrasound visit or an abortion.

In study III, a sensitivity analysis was performed to evaluate the potential effect of an immortal time bias. The woman-years accumulated for women in the LARC cohort from the first visit to a the family planning clinic to the LARC initiation visit (altogether, 400 woman-years) were added to the no-LARC cohort woman-years to account for the time the woman was within the services.

In study IV, the history of gynaecological diagnoses in primary or specialized care, attending family planning clinics and diagnoses of STIs within the previous year were combined as a variable analysed dichotomously; history or no history. This variable was used to adjust for previous service use. Data on visits to the family planning clinic during the follow-up were classified according to the reason for the visit and by using ATC drug codes and ICPC2 codes recorded at the visits. The appointments were categorised as visits for a routine check-up or for other reasons, such as concerns with the method or side effects, for abortion care, or for LARC procedures. In addition, data on visits for gynaecological reasons to primary and specialized care were included. These visits were categorised according to ICD-10, ICPC2 and the medical and surgical procedures according to Nordic Medico-Statistical Committee (NOMESCO) Classification of Surgical Procedures at all visits. The overall number of these visits within the two years were calculated for each woman. Visits to the family planning clinics were divided into visits for routine check-ups and for other reasons. Instead of the commonly used Poisson regression for counts, the data were modelled using negative binomial regression, as the visit counts displayed overdispersion.

As the aim was to evaluate use of reproductive services according to the contraceptive choice, we created a multivariate model to adjust for confounders. We primarily included all confounders associated with both choosing a LARC (230,233–238) and using reproductive services in Vantaa according to study I. We assessed the dependencies between these potential confounding variables, the outcome and the variable of interest, the choice of contraception, by drawing a directed acyclic graph (DAG; Figure 12). As observed in the DAG, the dependencies between the factors studied were complex. To prevent these background dependencies from obscuring the results and to prevent

overfitting, we aimed to simplify the multivariate model by using stepwise selection. We first removed variables that had less than a 10% effect on the estimate. We then added the removed variables back into the model one-by-one. If the estimate changed by more than 10%, the variable was taken back into the model. This resulted in a multivariate model including age, the history of pregnancy (abortions and deliveries) and the use of reproductive services within the previous year (appointments at family planning clinics, and in primary or specialized care for gynaecological reasons and having had an STI combined).

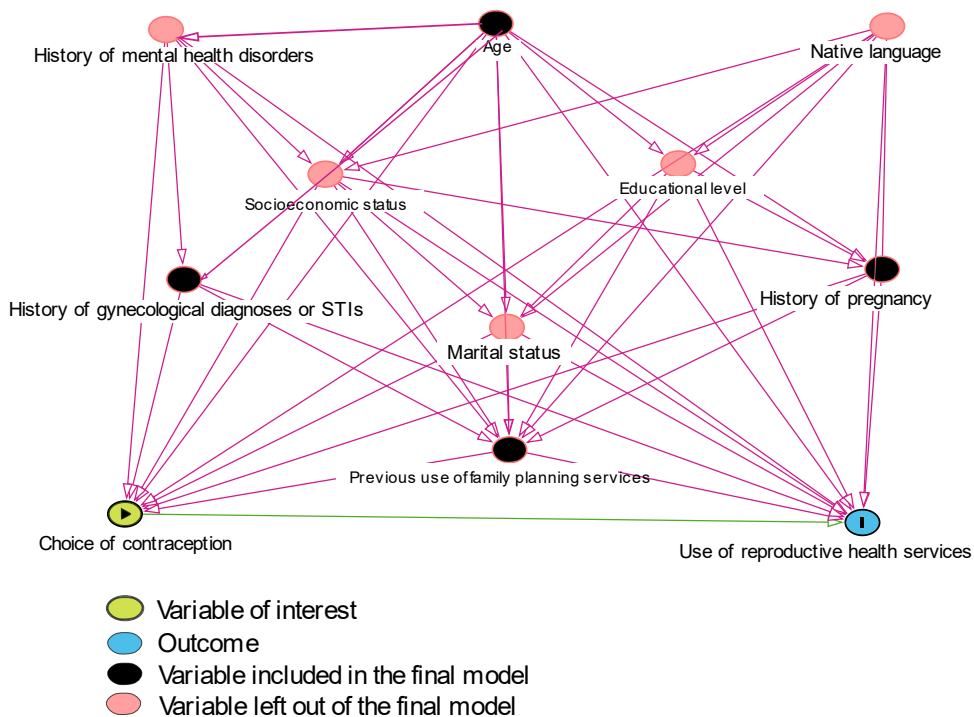


Figure 12. A directed acyclic graph (DAG) illustrating the dependencies among confounding variables, and with the outcome and selecting LARC methods. Variables included in the final model are marked with black ovals, the outcome with blue ovals, the variable of interest with green ovals, and variables left out of the final model with pink ovals.

Reproduced with permission from Springer Nature., previously published in Saloranta, T.H., Gyllenberg, F.K., But, A. et al. Use of reproductive health services among women using long- or short-acting contraceptive methods – a register-based cohort study from Finland. BMC Public Health 22, 1185 (2022). <https://doi.org/10.1186/s12889-022-13581-3>

Visits for all gynaecological reasons to primary or specialized care, and visits for other reasons than routine check-ups to family planning clinics were also analysed in different age groups. As age displayed a significant interaction with several of the factors, the numbers of visits, incidences per 100 woman-years with 95% CIs, and adjusted IRRs with the same binomial regression model as for the whole cohort were also calculated for age groups. Similar analyses were additionally conducted for the different LARC methods.

4.5 ETHICAL CONSIDERATIONS

The data used in this study were also used in Frida Gyllenberg's doctoral thesis "Long-acting reversible contraception free of charge: initiations, user characteristics and induced abortions." Approvals were obtained from the ethics committee of the Hospital District of Helsinki and Uusimaa (303/13/03/03/2015). All the register-keeping organisations (The Finnish Institute of Health and Welfare, THL/572/5.05.00/2016; Statistics Finland, TK-53-611-17; and the city of Vantaa, VD/2786/13.0000/2015) approved the use of their data. No informed consent was required, as this was a register-based study.

5 RESULTS

5.1 STUDY POPULATION

The sociodemographic characteristics of the residents of the city of Vantaa were close to those of the whole of Finland. However, there were more fertile-aged women (i.e. 15–44-year olds [21% vs. 18% in 2013]), more non-native language speakers (13.4% vs. 5.3%) and fewer unemployed (10% vs. 12% in 2013-2014), but a similar proportion of students (7% vs. 8%) (239).

All the studies in this thesis had slightly differing populations, as the study designs and the exclusion criteria differed. The base population for all the studies consisted of women aged 15–44 years in the city of Vantaa.

The characteristics of women using and not using the family planning services in Vantaa are presented in the Table 12.

Table 12. Characteristics of women according to the use of family planning services

Characteristic	All (n = 54,721) n (%)	Service- users (n = 11,790) n (%)	Non-service users (n = 42,931) n (%)
Age, median (IQR), years	28.8 (22.1, 36.2)	26.5 (21.2, 33.1)	29.6 (22.5, 37.0)
Married	19,771 (36)	3,483 (30)	16,288 (38)
History of delivery	19,918 (36)	4,906 (42)	15,012 (35)
Sterilized	978 (2)	123 (1)	855 (2)
History of induced abortion	7,711 (14)	2,089 (18)	5,622 (13)
Native language other than Finnish or Swedish	11,438 (21)	1,776 (15)	9,662 (23)
Socioeconomic status^a			
Upper-level employees ^b	6,493 (12)	1,001 (8)	5,492 (13)
Lower-level employees or manual workers ^c	28,438 (52)	6,796 (58)	21,642 (50)

Students	8,778 (16)	2,000 (17)	6,778 (16)
Long-term unemployed	3,782 (7)	912 (8)	2,870 (7)
Entrepreneurs, pensioners and others not elsewhere classified	4,631 (8)	1,018 (9)	3,613 (8)
Unknown	2,599 (5)	63 (1)	2,536 (6)
Education level			
Doctoral, master's, or equivalent level	5,093 (9)	705 (6)	4,388 (10)
Bachelor's or equivalent level	9,074 (17)	1,770 (15)	7,304 (17)
Short-cycle tertiary education	2,642 (5)	302 (3)	2,340 (5)
Upper secondary education	20,774 (38)	5,280 (45)	15,494 (36)
Unknown ^d	17,138 (31)	3,733 (32)	13,405 (31)
History of sexually transmitted infection^e	5,423 (10)	1,813 (15)	3,610 (8)
History of mental health disorder diagnoses in adulthood (F10–69,99)^{f,g}	5,860 (11)	1,610 (14)	4,250 (10)

^a Socioeconomic status of the youngest age group could also be derived from their family's socioeconomic status. ^b Administrative, managerial, professional and related occupations. ^c Administrative and clerical occupations or manual workers. ^dComprises women with only basic education, as well as without education in Finland, and those not graduating from elementary school. ^e Chlamydia, gonorrhoea or syphilis. ^f Diagnosed within two previous years in primary or specialised care. ^g Excluding nicotine dependence (F17), IQR, interquartile range.

Modified from Saloranta T et al. Use of universally offered family planning services – a cohort study in the city of Vantaa, Helsinki metropolitan area, Finland. *Scand J Public Health*; 1–9 Copyright © [2021] (SAGE Publishing). DOI: <https://doi.org/10.1177/14034948211002745> and reproduced with permission from SAGE publications.

In studies II–IV, the emphasis was on women initiating free-of-charge LARCs. They differed from women choosing other contraceptive options, as shown in Table 13.

Table 13. Summarised characteristic differences of the study populations in studies II–IV

Characteristic	Women initiating free-of-charge LARC methods n=2026/2035/1689 (studies II/III/IV)	Women attending family planning clinics but not choosing free-of-charge LARCs	
		All (n=7,634, study III)	Women initiating or switching SARCs (n=1524, study IV)
Age, years (median, IQR)	29 (23–33)	24 (20–30)	24 (20–29)
Married (%)	40	20	18
History of delivery (%)	64–67	24	17
History of induced abortion (%)	24	14	11
Native language Finnish or Swedish (%)	82	87	88
Socioeconomic status ^a			
Upper-level employees ^b (%)	11	7	5
Lower-level employees or manual workers ^c	57	57	47
Students	14	-	36
Long-term unemployed	7	.	5

Entrepreneurs, pensioners, and others not elsewhere classified	11	.	7	6
Unknown	0.4	-	0.3	0.2
Educational attainment (%)				
Doctoral, master's, or equivalent level	9	-	2	4
Bachelor's or equivalent level	19	-	7	15
Short-cycle tertiary education	2	-	1	2
Upper secondary education	40	-	32	54
Unknown ^d	30	34	58	25
History of sexually transmitted infection within the previous year ^e (%)				
Visit for gynaecological reasons to primary or specialized care or visit to a family planning clinic within the previous year (%)	69	-	33	48
History of mental health disorder diagnoses in adulthood (ICD-10 codes F10–F16, F18-69, F99) ^f (%)				
IQR, interquartile range; ICD-10, The International Statistical Classification of Diseases and Related Health Problems, 10 th Revision	14	-	11	9

^a Socioeconomic status of the youngest age group could also be derived from their family's socioeconomic status. ^b Administrative, managerial, professional and related occupations. ^c Administrative and clerical occupations or manual workers. ^d Comprises women with only basic education, as well as without education in Finland, and those not graduating from elementary school. ^e Chlamydia, gonorrhoea or syphilis. ^f Diagnosed within the previous years in primary or specialized care.

Women initiating various LARC methods also had different characteristics, as illustrated in Table 14. Implant initiators were younger, more often nulliparous, unmarried, smoked more often, more often had only basic-level education and had more often experienced an STI or attended family planning clinic services or primary or specialized care for gynaecological reasons than LNG-IUS or Cu-IUD users. Compared to LNG-IUS users, Cu-IUD users more often spoke a native language other than Finnish or Swedish.

Table 14. Characteristics of women initiating a free-of-charge LARC by initiated method.

	Any LARC (n = 2026)	LNG-IUS (n = 1199)	Implant (n = 642)	Cu-IUD (n = 185)
Age				
Median (IQR)	28.6 (23.1–33.4)	30.7 (25.7–35.0)	23.2 (19.5–29.2)	28.5 (25.0–32.7)
Age categories, years				
15–19	237 (12)	49 (4)	183 (29)	5 (3)
20–29	922 (46)	502 (42)	314 (49)	106 (57)
30–44	867 (43)	648 (54)	145 (23)	74 (40)
Married	802 (40)	563 (47)	155 (24)	84 (45)
History of delivery	1,304 (64)	953 (79)	225 (35)	126 (68)
Delivery in the year preceding LARC initiation	774 (38)	557 (46)	147 (23)	70 (38)
History of induced abortion	479 (24)	309 (26)	120 (19)	50 (27)
Induced abortion in the year preceding LARC initiation	163 (8)	89 (7)	53 (8)	21 (11)
Socioeconomic status ^a				
Upper-level employees ^b	224 (11)	166 (14)	34 (5)	24 (13)
Lower-level employees or manual workers ^c	1,171 (58)	728 (61)	340 (53)	103 (56)
Entrepreneurs, pensioners or unknown	206 (10)	120 (10)	69 (11)	17 (9)
Students	287 (14)	105 (9)	157 (24)	25 (14)

Long-term unemployed	128 (6)	74 (6)	39 (6)	15 (8)
Unavailable	10 (0)	6 (1)	3 (0)	1 (1)
Education				
Basic level (9-years mandatory education) or unknown ^d	596 (29)	269 (22)	279 (43)	48 (26)
Longer (10 years or more)	1,430 (71)	930 (78)	363 (57)	137 (74)
Native language Finnish or Swedish	1,669 (82)	1,008 (84)	539 (84)	122 (66)
History of sexually transmitted infection^e	61 (3)	25 (2)	34 (5)	2 (1)
Smoking^f				
Yes	422 (21)	204 (17)	187 (29)	31 (17)
No	1,186 (59)	718 (60)	367 (57)	101 (55)
Missing	418 (21)	277 (23)	88 (14)	53 (29)

LARC, long-acting reversible contraception; LNG-IUS, levonorgestrel-releasing intrauterine system; Cu-IUD, copper intrauterine device

Data are n (%) unless otherwise mentioned.

P-values for differences between groups calculated with the Kruskal–Wallis test for continuous variables and the χ^2 -test for categorical variables were all <0.001, except for a history of induced abortion (0.002), and induced abortion in the year preceding LARC initiation (0.183).

^a The socioeconomic status of the youngest age group can be derived from their family's socioeconomic status.

^b Administrative, managerial, professional, and related occupations

^c Administrative and clerical occupations or manual workers

^d Comprises women with only basic education, as well as without education in Finland, and those not graduating from elementary school.

^e Chlamydia, gonorrhoea or syphilis two years prior to LARC initiation

^f As entered in the electronic patient records within two years before LARC insertion

Modified from Saloranta T et al. Free-of-charge long-acting reversible contraception: two-year discontinuation, its risk factors, and reasons, *American Journal of Obstetrics and Gynecology* 2020;223(6):886. doi: 10.1016/j.ajog.2020.06.023. Copyright © [2020] (Elsevier). and reproduced with permission from Elsevier.

5.2 USERS OF FAMILY PLANNING SERVICES

Women using the services were younger than the women who did not use the services, and the probability of using the services peaked at the age of 23 years (Figure 13).

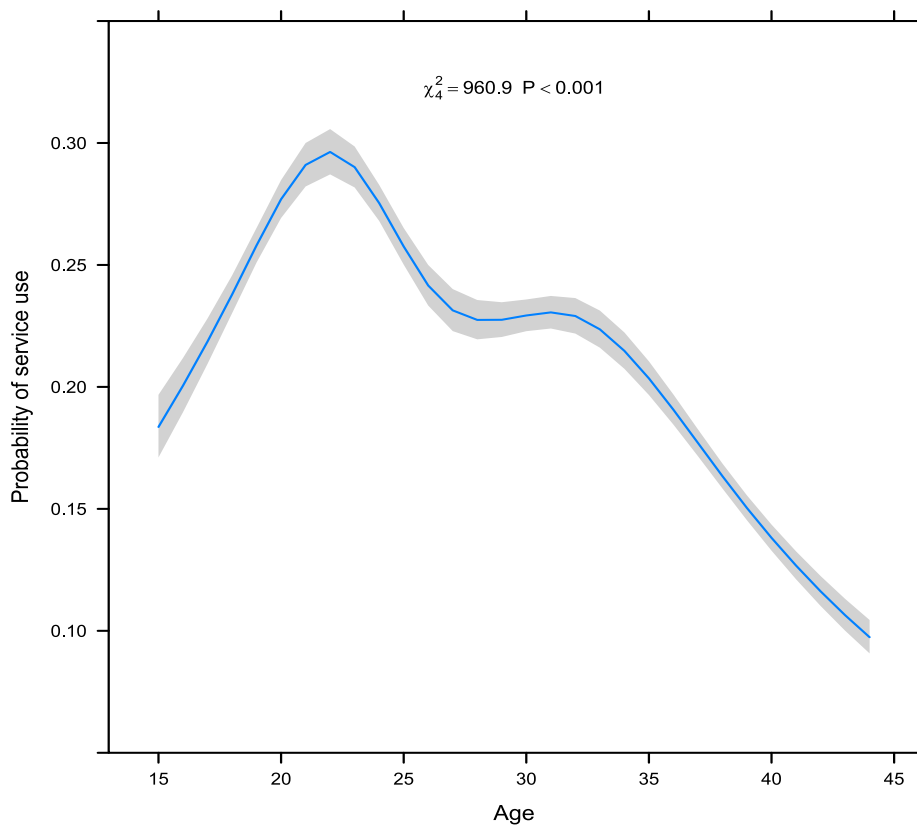


Figure 13. A restricted cubic spline of differences in the probability of using family planning services according to continuous age. The probability of service use is the proportion of all women of the corresponding age living in Vantaa using the services.

Reproduced with permission from SAGE publications previously published in Saloranta T et al. Use of universally offered family planning services – a cohort study in the city of Vantaa, Helsinki metropolitan area, Finland. *Scand J Public Health*; 1–9 Copyright © [2021] (SAGE Publishing). DOI: <https://doi.org/10.1177/14034948211002745>

In univariate logistic regression analysis, all the sociodemographic and reproductive characteristics evaluated, i.e., age, history of delivery or induced abortion, STI, gynaecological and psychiatric diagnoses described previously, socioeconomic and marital status, and educational attainments, had a statistically significant association with service use. All these variables were also included in the final multivariable logistic regression model, as these remained significant when added to the multivariate model. In both univariate testing and multivariate modelling, the association of service use was positive with young age, being non-sterilised and having a history of delivery, induced abortion, STI, and excessive, frequent and/or irregular menstruation (N92), or pain and other conditions associated with female genital organs and the menstrual cycle (N94). The associations of high socioeconomic and educational status with service use were negative.

As many of the variables had significant interactions with age, we stratified the multivariate model by age groups. Table 15 shows how the odds of service use varied with age for several factors, such as marital status, history of delivery, native language, socioeconomic status, and education in the age-stratified logistic regression model. Teenagers who were not married, had a history of delivery, induced abortion, STI or of pain and other conditions associated with female genital organs and the menstrual cycle (N94) were more likely to use the services. Women speaking a native language other than Finnish/Swedish were less likely to use the services when aged under 30 years, but as likely when aged 30–34 years, and more likely in the age group of 35–44 years than women speaking Finnish/Swedish (Table 15).

Table 15. Adjusted odds ratios (AORs) for factors associated with using family planning services calculated with multivariate logistic regression stratified in age groups.

Characteristic	15–19 years	20–24 years	25–29 years	30–34 years	35–44 years
	AOR (95% CI)	AOR (95% CI)	AOR (95% CI)	AOR (95% CI)	AOR (95% CI)
Marital status					
Married	Ref.	Ref.	Ref.	Ref.	Ref.
Not married	3.51 (2.44–5.06)	1.82 (1.60–2.07)	1.38 (1.24–1.53)	1.15 (1.04–1.29)	1.04 (0.94–1.14)
History of delivery					
No	Ref.	Ref.	Ref.	Ref.	Ref.
Yes	1.67 (1.05–2.66)	2.01 (1.74–2.32)	2.44 (2.20–2.72)	2.51 (2.24–2.81)	2.50 (2.21–2.83)
History of induced abortion					
No	Ref.	Ref.	Ref.	Ref.	Ref.
Yes	1.47 (1.11–1.96)	1.35 (1.18–1.55)	1.07 (0.94–1.22)	1.24 (1.09–1.41)	1.15 (1.03–1.28)
Native language					
Finnish or Swedish	Ref.	Ref.	Ref.	Ref.	Ref.
Other	0.48 (0.39–0.57)	0.54 (0.47–0.63)	0.79 (0.69–0.91)	1.04 (0.90–1.21)	1.23 (1.08–1.40)
Socioeconomic status					
Upper-level employees					
Lower-level employees or manual workers	Ref. ^a	Ref. ^a	1.11 (0.92–1.34)	1.30 (1.10–1.53)	1.29 (1.11–1.48)
Students	0.49 (0.43–0.55)	0.75 (0.67–0.85)	1.20 (0.94–1.52)	1.20 (0.92–1.58)	1.46 (1.10–1.94)
Long-term unemployed	0.72 (0.55–0.93)	0.91 (0.75–1.10)	1.19 (0.93–1.52)	1.32 (1.04–1.66)	1.46 (1.19–1.79)

Entrepreneurs, pensioners, and others not elsewhere classified	0.76 (0.61–0.95)	0.79 (0.67–0.93)	0.95 (0.75–1.21)	1.04 (0.83–1.30)	1.15 (0.94–1.41)
Unknown	0.04 (0.01–0.11)	0.08 (0.05–0.14)	0.20 (0.12–0.33)	0.19 (0.11–0.36)	0.33 (0.18–0.60)
Education level					
Doctoral, master's, or equivalent level			Ref.	Ref.	Ref.
Bachelor's or equivalent level	Ref. ^b	Ref. ^b	1.41 (1.13–1.76)	1.12 (0.94–1.33)	1.26 (1.06–1.49)
Short-cycle tertiary education			1.98 (1.08–3.64)	0.65 (0.38–1.13)	0.73 (0.60–0.88)
Upper secondary education			1.82 (1.46–2.26)	1.20 (1.00–1.44)	1.18 (1.00–1.40)
Unknown ^c	1.86 (1.63–2.13)	1.16 (1.03–1.31)	1.67 (1.31–2.12)	1.30 (1.06–1.61)	1.11 (0.92–1.34)
History of STI^d					
No	Ref.	Ref.	Ref.	Ref.	Ref.
Yes	1.70 (1.33–2.19)	1.66 (1.46–1.88)	1.32 (1.17–1.51)	1.30 (1.13–1.49)	1.60 (1.36–1.89)
History of excessive, frequent, and irregular menstruation (N92)^e	1.12 (0.74–1.69)	1.37 (0.97–1.94)	1.17 (0.80–1.69)	1.04 (0.71–1.53)	1.27 (0.98–1.65)
History of pain and other conditions associated with female genital organs and the menstrual cycle (N94)^e	1.86 (1.32–2.61)	1.38 (0.96–2.00)	1.20 (0.74–1.94)	1.15 (0.64–2.10)	1.48 (0.85–2.57)

History of mental health

disorder diagnoses in adulthood (F10–69,99)^{e,f} 1.15 (0.99–1.34) 1.08 (0.94–1.23) 0.97 (0.83–1.14) 1.04 (0.88–1.23) 1.47 (1.28–1.70)

^a The two categories were combined due to small numbers among women younger than 25 years. ^b The four categories were combined due to small numbers among women younger than 25 years. ^c Comprises women with only basic education, as well as without education in Finland, and those not graduating from elementary school. ^d Sexually transmitted infection, chlamydia, gonorrhoea, or syphilis ^e Diagnosed within the two previous years in primary or specialised care ^f Excluding nicotine dependence (F17)

Modified from Saloranta T et al. Use of universally offered family planning services – a cohort study in the city of Vantaa, Helsinki metropolitan area, Finland. *Scand J Public Health*; 1–9 Copyright © [2021] (SAGE Publishing). DOI: <https://doi.org/10.1177/14034948211002745> and reproduced with permission from SAGE publications.

5.3 DISCONTINUING FREE-OF-CHARGE LARC

Altogether, 2026 women initiated free-of-charge LARC. Most women (59%, 1199 women) chose LNG-IUS. Almost all, 90% (1075), initiated the 52-mg LNG-IUS, and only 10% (124) the 13.5-mg LNG-IUS. Thus, both LNG-IUSs were combined in the analyses. The etonogestrel-containing implant was chosen by 633 women (99% of women initiating implants) and the levonorgestrel-containing implant only by nine (1%). All 642 (32%) women choosing implants were combined as one group. The Cu-IUD was the least popular choice, as only 185 women (9%) chose it.

The median follow-up of the study was 1.9 years (interquartile range 1.0–2.0). During this time, 514 women discontinued, yielding a two-year cumulative discontinuation rate for all LARC methods of 28.3 per 100 women-years (95% CI 26.2–30.4). Of those discontinuing, 263 were LNG-IUS, 187 implant and 64 Cu-IUD users. LNG-IUS users had the lowest cumulative discontinuation rate, with 24.2 (95% CI 21.7–26.9) discontinuing at two years, followed by implants, with 33.3 (95% CI 29.5–37.4) discontinuing and Cu-IUDs, with 37.8 discontinuing per 100 women-years (95% CI 31.0–45.7). The cumulative discontinuation incidence curves for LNG-IUSs and Cu-IUDs differed significantly ($p < 0.001$) (Figure 14).

When compared to LNG-IUSs, the crude IRRs of discontinuation were 1.38 (95% CI 1.15, 1.67) for implants and 1.80 (95% CI 1.37, 2.37) for Cu-IUDs. The categorical age, delivery in the year preceding LARC insertion, native language, a history of STI two years prior to LARC insertion, socioeconomic status, and having only basic education were significantly associated with LARC discontinuation in univariate analysis. Socioeconomic status and basic education were significantly associated with age and were, thus, left out of the final multivariate model. No significant association was found for marital status, parity, history of abortion, having only basic education at the age of 25 years or over, and smoking status.

When compared to LNG-IUSs with the adjusted Poisson regression model, the IRRs for discontinuation were 1.29 (95% CI 1.05, 1.58) for implants and 1.68 (95% CI 1.27, 2.22) for Cu-IUDs. Women aged 15–19 years (IRR 1.58; 95% CI 1.17, 2.14) and 20–29 years (1.35; 95% CI 1.11, 1.63) were more likely to discontinue LARC methods than women aged 30–44 years. Women who had delivered within the previous year (IRR 1.36; 95% CI 1.13, 1.65), spoke another native language than Finnish or Swedish (1.31; 95% CI 1.06, 1.63) or had a history of a sexually transmitted infection (1.62; 95% CI 1.07, 2.46) were also more likely to discontinue using their chosen LARC method.

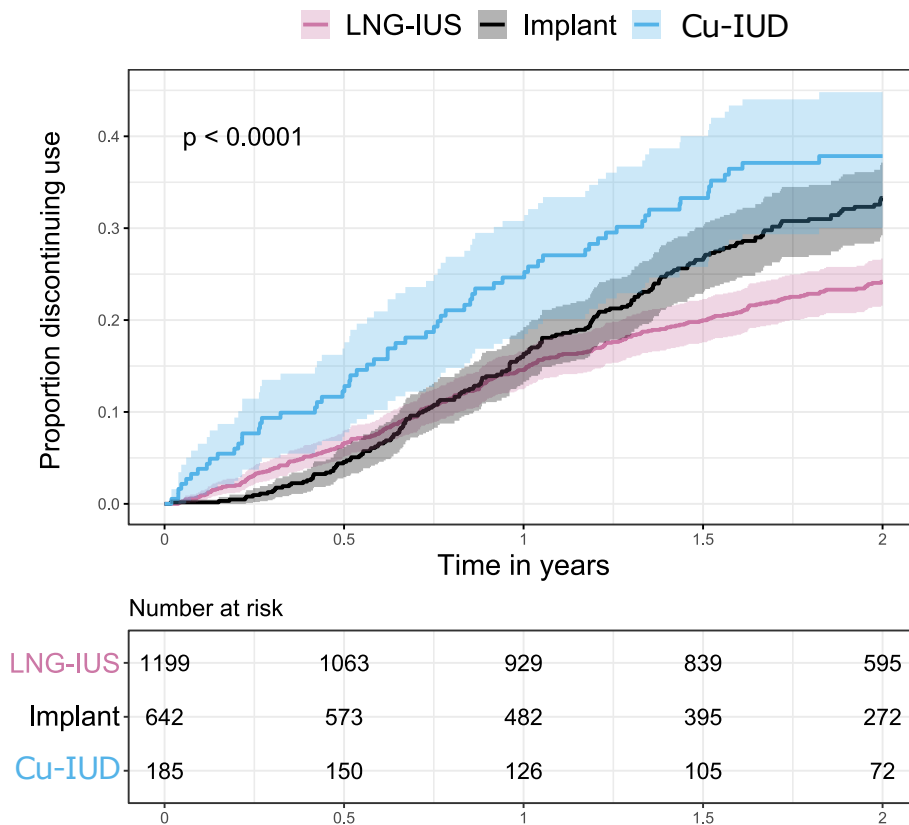


Figure 14. Cumulative two-year discontinuation of different LARC methods.

LNG-IUS, levonorgestrel-releasing intrauterine system

Cu-IUD, copper intrauterine device

P-value calculated with the log-rank test for LNG-IUS and Cu-IUD curves as LNG-IUS and implant curves crossed

Reproduced with permission from Elsevier, previously published in Saloranta T et al. Free-of-charge long-acting reversible contraception: two-year discontinuation, its risk factors, and reasons, *American Journal of Obstetrics and Gynecology* 2020;223(6):886. doi: 10.1016/j.ajog.2020.06.023. Copyright © [2020] (Elsevier). and reproduced with permission from Elsevier.

Bleeding disturbances were the most common reason for discontinuation. One in five women discontinuing LNG-IUSs, seven out of ten discontinuing implants and four out of ten discontinuing Cu-IUDs reported this (Figure 15). Heavy bleeding was more common among women discontinuing Cu-IUDs than among women discontinuing LNG-IUSs or implants. One in five IUD users reported abdominal pain as a reason for discontinuation but few women discontinuing implants reported this reason.

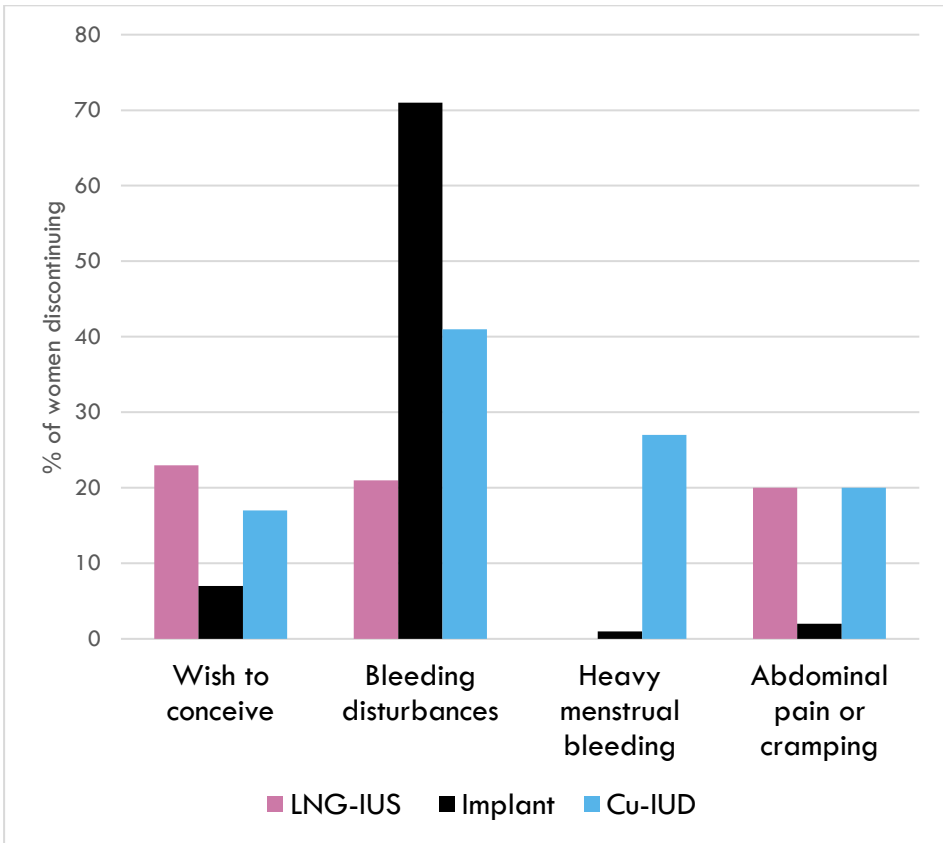


Figure 15. The most common reasons for discontinuation of different LARC methods.

In the age-stratified analysis conducted as a sensitivity analysis, no significant associations of socioeconomic status or basic education with discontinuation were found. Among women aged 20–29 years, the crude cumulative discontinuation rate of LNG-IUSs was lower than that of implants and Cu-IUDs. In other age groups, parallel but not significant differences between LNG-IUSs, implants, and Cu-IUDs were observed. When excluding women aged 15–19, the same variables were associated with discontinuation as in the whole study cohort.

As a sensitivity analysis, we also evaluated discontinuation among the 58% of women who attended family planning clinics during the follow-up. Among these women, the cumulative discontinuation incidences were much higher than those in the whole study cohort, including many women with no contacts to the service systems and thus assumed to continue use. Nevertheless, the method-specific IRRs for discontinuation were similar to those in the whole study cohort.

5.4 PROVISION OF FREE-OF-CHARGE LARC AND THE NEED FOR INDUCED ABORTIONS

During the mean follow-up of 2.0 years (SD 0.7) between 1 January 2013 and 28 February 28 2016, altogether 78,500 woman-years of follow-up were accumulated. During this time, 996 women in total experienced an induced abortion in the study cohorts, yielding a crude incidence rate of induced abortions of 12.3 per 1,000 woman-years (95% CI 11.6–13.1).

Of the abortions, 259 (26%) were among women using the services of family planning clinics, and 737 (74%) among women not using these services. This yielded crude induced abortion rates of 12.92 (95% CI 11.44–14.54) and 12.60 (95% CI 11.73–13.53) per 1000 woman-years for service users and service non-users, respectively.

Among the service users, only 16 abortions (6%) were among women initiating free-of-charge LARCs and 243 (94%) were among women not choosing LARC methods. These figures produced a crude induced abortion rate of 3.88 (95% CI 2.40–6.01) per 1,000 woman-years among LARC users and 15.25 (95% CI 13.45–17.23) among women not choosing LARCs. Among non-service users age-matched with LARC users, this rate was 11.10 (95% CI 9.33–13.11), and among women age-matched with women not choosing LARCs the rate was 12.97 (95% CI 11.98–14.02).

The Kaplan-Meier estimates of the probability of not having an induced abortion for the four cohorts during follow-up are presented in Figure 16.

When adjusting for age, socioeconomic status, marital status, previous pregnancy and previous abortion, the incidence rate ratio (IRR) of induced abortions among LARC users was significantly lower compared to women not choosing LARCs (0.20, 95% CI 0.11–0.32), and also compared to age-matched non-service users (0.26, 95% CI 0.14–0.43). The IRRs were similar when comparing the women not choosing LARCs with their age-matched non-service users (1.01, 95% CI 0.87–1.18).

When accounting for potential immortality time bias as a sensitivity analysis, a similar crude incidence rate for induced abortions (14.88, 95% CI 13.12–16.80) was found as in the main results (15.25, 95% CI 13.45–17.23). Immortality bias means a time period during the follow-up when the exposed group cannot experience the outcome and are thus “immortal”. An immortality time bias in this study could have formed between a visit to the family planning clinic to receive counselling on LARCs and the LARC insertion.

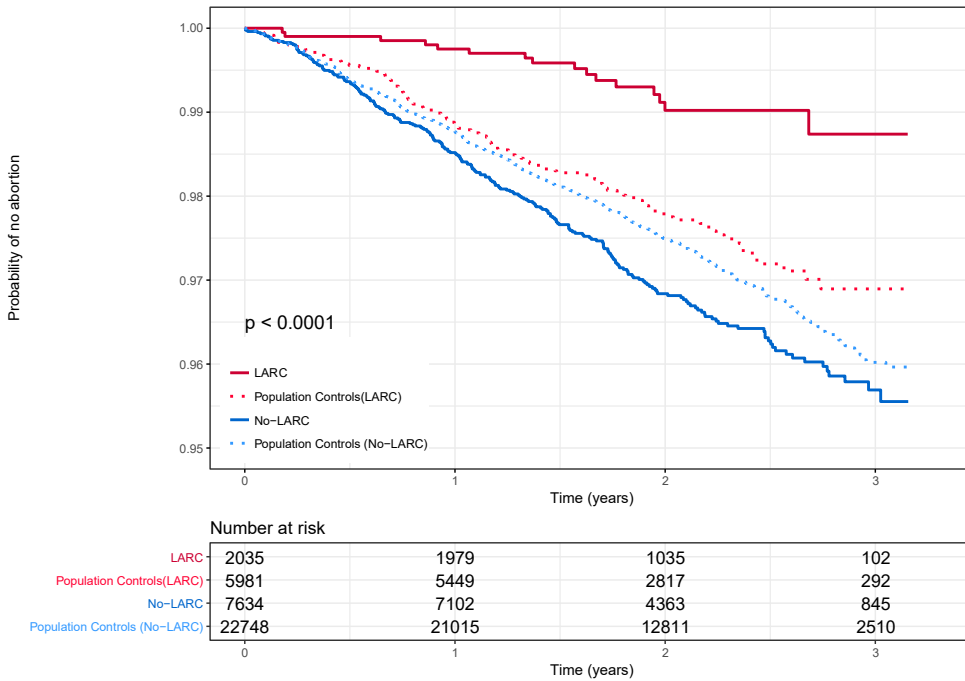


Figure 16. Kaplan-Meier estimates of survival without the need for an induced abortion among the four study cohorts.

LARC, long-acting reversible contraception

LARC cohort, women initiating LARC methods free of charge in 2013–2014

No LARC cohort, women attending the family planning clinics, but not initiating LARC methods. The reasons for attending the clinics, and the contraceptive methods used varied, but did not include LARC methods.

Population controls (LARC), women not using family planning services age-matched with free-of-charge LARC initiators

Population controls (No LARC), women not using family planning services age-matched with women attending the clinics but not initiating free-of-charge LARC methods

The difference between curves assessed with the log-rank test.

Reproduced with permission from Wolters Kluwer Health, Inc., previously published in Gyllenberg, F; Saloranta, T ; But, A; Gissler, M; Heikinheimo, O Induced Abortion in a Population Entitled to Free-of-Charge Long-Acting Reversible Contraception, *Obstetrics & Gynecology*: 2018;132(6):1453-1460 doi: 10.1097/AOG.0000000000002966

5.5 USE OF REPRODUCTIVE HEALTH SERVICES AMONG USERS OF SHORT- AND LONG-ACTING REVERSIBLE CONTRACEPTIVES

Altogether 5,839 women attending family planning clinic services and initiating free-of-charge LARCs or initiating, switching between, or continuing SARC methods in 2013–2014 were followed for two years. During the follow-up, 4,397 women (75.3%) had at least one visit to a family planning clinic, or to primary or specialized care for gynaecological reasons. During these two years, a total of 11,290 visits accumulated. Most visits, 7,260 (64.3%), were to family planning clinics. Of the family planning clinic visits, 3,804 (52.4%) were for routine follow-up and 3,456 (47.6%) for other reasons such as method switching, troubleshooting or discontinuation. Of all visits 4,030 (35.7%) were for gynaecological reasons, 3,385 (84.0%) to primary care, and 645 (16.0%) to specialized health care.

Altogether, there were 96.1 visits (95% CI 92.8–99.5) per 100 woman-years among LARC initiators, 124.5 (95% CI 120.6–128.5) among SARC initiators or switchers and 80.9 (95% CI 78.5–83.4) among SARC continuers, including all visit reasons to family planning clinics and for gynaecological reasons to primary or specialized care.

When excluding routine follow-up visits, LARC initiators had similar rates of additional visits for gynecological reasons to primary or specialized care, or for other reasons than routine checkups to family planning clinics (adjusted IRR 0.93, 95% CI 0.82–1.05) as SARC initiators or switchers. SARC continuers, on the other hand, had lower rates of these additional visits (adjusted IRRs 0.65, 95% CI 0.59–0.72) than SARC initiators or switchers (Figure 17).

B. Any gynecological reasons and other than routine checkups at family planning clinics

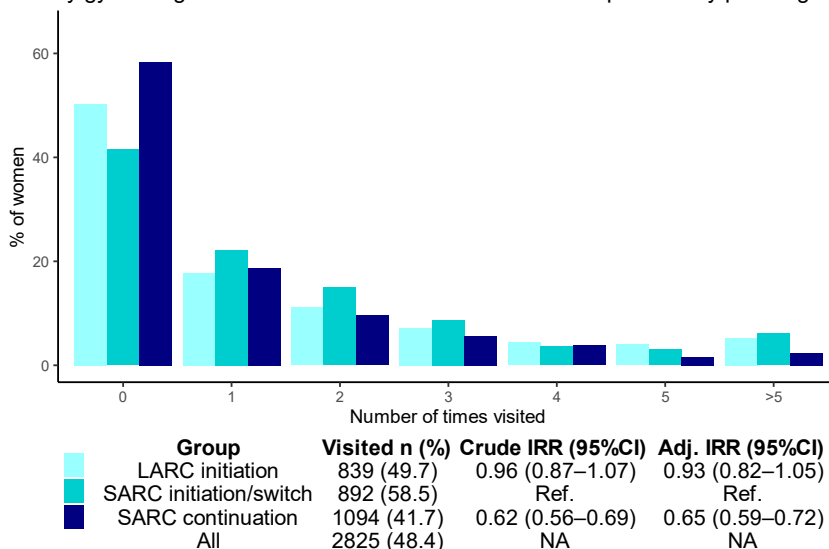


Figure 17. Visits at the family planning clinics for reasons other than routine checkups and visits for all gynecological reasons in primary and specialized care.

LARC, long-acting reversible contraception

SARC, short-acting reversible contraception

IRR, incidence rate ratio

Both groups of SARC users had more routine follow-up visits than LARC initiators (56.9% and 55.1% vs 39.1%). During the time of the study, SARC initiators were recommended a follow-up visit within 12 to 18 months. In 2013, LARC initiators were recommended a follow-up visit within six months of initiation, but this follow-up visit was no longer recommended in 2014. Table 16 presents the total numbers of visits and the total costs for the municipality, taking the cost of the contraceptive and the use of reproductive services into account.

Table 16. The costs for the municipality of the contraceptive method and the use of reproductive health services within two years per 100 women (240,241).

	LARC initiation (n=1,689)	SARC initiation or switching (n=1,524)	SARC continuation (n=2,626)
Routine check-ups^{a,b}			
Total number of visits	702	1,413	1,689
Visits/100 women	20.8 (19.3–22.4)	46.4 (44.0–48.8)	32.2 (30.6–33.7)
Cost (€) of visits / 100 women	1,290 (1,197–1,389)	2,877 (2,728–3,026)	1,996 (1,897–2,089)
Other than routine check-ups^{a,b}			
Total number of visits	1,180	969	1,044
Visits/100 women	34.9 (33.0–37.0)	31.8 (29.8–33.9)	19.9 (18.7–21.1)
Cost (€) of visits / 100 women	2,164 (2,046–2,294)	1,972 (1,848–2,102)	1,234 (1,159–1,308)
Visits for gynaecological reasons to primary care^a			
Total number of visits	1,108	1,103	1,174
Visits/100 women	32.8 (30.9–34.8)	36.2 (34.1–38.4)	22.4 (21.1–23.7)
Cost (€) of visits / 100 women ^c	2,722 (2,565–2,888)	3,005 (2,830–3,187)	1,859 (1,751–1,967)
Visits for gynaecological reasons to specialized care^a			
Total number of visits	238	133	274
Visits/100 women	7.0 (6.2–8.0)	4.4 (3.7–5.2)	5.2 (4.6–5.9)
Cost (€) of visits per 100 women ^d	2,030 (1,798–2,320)	1,276 (1,073–1,508)	1,508 (1,334–1,711)

Visits for pre and post abortion care to family planning clinics^b			
Total number of visits	19	177	67
Visits/100 women	0.6 (0.3–0.9)	5.8 (5.0–6.7)	1.3 (1.0–1.6)
Cost (€) of visits per 100 women ^d	37 (19–56)	360 (310–415)	81 (62–99)
Induced abortions			
Total number of abortions	10	67	36
Abortions/100 women	0.3 (0.1–0.5)	2.2 (1.7–2.8)	0.7 (0.5–0.9)
Cost (€) of abortions per 100 women ^d	232 (77–386)	1,698 (1,312–2,162)	540 (386–695)
Additional post-abortion visits to specialized care^d			
Total number of visits	17	218	44
Visits/100 women	0.5 (0.3–0.8)	7.2 (6.2–8.2)	0.8 (0.6–1.1)
Cost (€) of visits per 100 women ^d	145 (87–232)	2,088 (1,798–2,378)	232 (174–319)
Cost (€) of method/100 women for the municipality^f	10000	0	0
Total cost (€) in two years per 100 women	18,620 (17,789–19,565)	13,276 (11,899–14,778)	7,450 (6,763–8,188)

LARC, long-acting reversible contraception, SARC, short-acting reversible contraception

^a Excluding visits for abortion care.

^b Visits to family planning clinics. In 2017, the cost of a doctor appointment in primary care was €83 and for a nurse visit €45. At family planning clinics, 45% of visits were appointments with a doctor and 55% with a nurse. The mean cost of a visit was €62.

^c In 2017, the cost of an appointment with a primary care doctor was €83.

^d In 2021, the cost of an outpatient gynaecological visit in was €235 and an emergency visit €345. Half of the visits were assumed to be emergency visits, and the mean cost was thus €290.

^e In 2021, the cost of a medical induced abortion under 10 weeks of gestation with one visit at the clinic was €750 and a surgical abortion €1180. 95% of the abortions were medical, yielding a mean price of €772 per abortion.

^f The mean cost for a LARC method was €100 in 2021 according to the pricing of the Hospital District of Helsinki and Uusimaa.

Altogether, 114 (7.5%) women among SARC initiators and 131 (5%) among SARC continuers attended family planning clinics for a LARC procedure, namely a LARC insertion, during the two-year follow-up.

LARC initiators used health services for all gynaecological reasons similarly to SARC initiators or switchers, as seen in Table 16. In contrast, compared to SARC initiators or switchers, SARC continuers used the services less often for all gynaecological reasons, including menstrual problems and vaginal infections. Compared to SARC initiators or switchers, LARC initiators and SARC continuers had less need for abortion care. LARC initiators had more visits with a diagnosis of pelvic inflammatory disease (PID) than SARC initiators or switchers, but were less often diagnosed with an STI. (Table 17)

Table 17. The adjusted incidence rate ratios (IRRs) for service use for gynaecological reasons in primary and specialized care among women initiating free-of-charge LARC, or initiating, switching between or continuing SARC methods.

Reason for visiting	LARC initiators n=1689 (95% CI)	SARC initiators or switchers n=1524 (95% CI)	SARC continuers n=2626 (95% CI)
All gynaecological reasons ^a	0.84 (0.70–1.01)	Ref.	0.68 (0.58–0.79)
Menstrual problems ^a	0.86 (0.69–1.09)	Ref.	0.58 (0.47–0.71)
Vaginal infections ^a	0.85 (0.61–1.17)	Ref.	0.59 (0.45–0.78)
Visits for abortion care ^a	0.05 (0.03–0.08)	Ref.	0.16 (0.11–0.24)
Diagnoses of STIs ^b	0.62 (0.41–0.94)	Ref.	0.75 (0.55–1.03)
Pelvic inflammatory disease diagnoses ^a	3.06 (1.54–6.06)	Ref.	1.06 (0.53–2.11)

Calculated with negative binomial regression, adjusted with categorical age, history of pregnancy and history of sexually transmitted infection or visits for gynaecological reasons to primary or specialized health care or visits to family planning clinics within the previous year.

LARC, long-acting reversible contraception; SARC, short-acting reversible contraception; STI, sexually transmitted infection

^a In primary or specialized health care. ^b According to the register of infectious diseases, including chlamydia, gonorrhoea and syphilis.

In age-categorized analyses (Figure 18, Table 18), women aged under 20 had the highest number of visits for all gynaecological reasons and other reasons than routine follow-up. As age increased, service use decreased. In absolute numbers, LARC initiators aged under 30 years used services more than SARC initiators or switchers of the same age. When adjusting for prior pregnancies and service use within the previous year, this difference disappeared. No difference in service use was found between LARC initiators aged 30–34 years and SARC initiators, switchers or continuers of the same age. In all other age groups, SARC continuers attended services less than LARC initiators or SARC initiators or switchers.

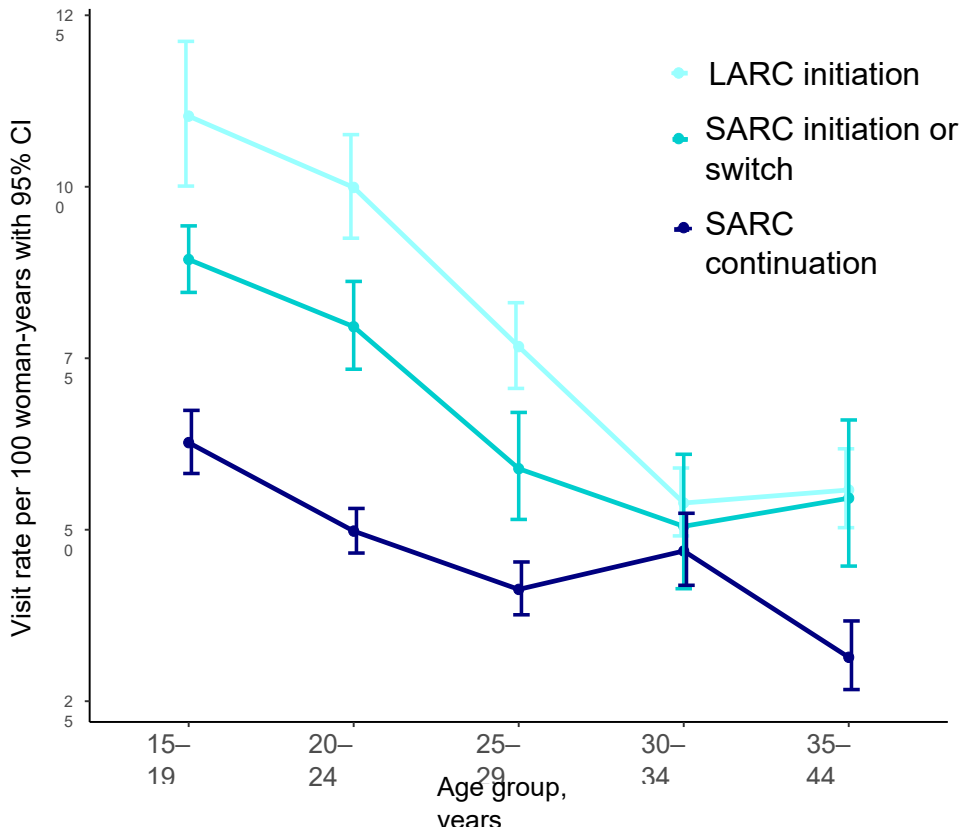


Figure 18. Visit rate with 95% confidence intervals (CI) to primary and specialized care for all gynaecological reasons and for other reasons than routine check-ups to family planning clinics according to five age groups and study groups.

LARC, long-acting reversible contraception; SARC, short-acting reversible contraception; CI, confidence interval

Reproduced with permission from Springer Nature, previously published in Saloranta, T.H., Gyllenberg, F.K., But, A. et al. Use of reproductive health services among women using long- or short-acting contraceptive methods – a register-based cohort study from Finland. BMC Public Health 22, 1185 (2022). <https://doi.org/10.1186/s12889-022-13581-3>

Table 18. Visits for gynaecological reasons to primary and specialized care according to study groups divided into five age categories.

Age category	Visited n (%)	Visits per 100 woman- years (95% CI)	Crude IRR (95%CI)	Adjusted IRR (95%CI)
15–19 years				
LARC initiation (n = 195)	128 (65.6)	110.3 (100.1– 121.2)	1.23 (1.01–1.51)	0.88 (0.70–1.09)
SARC initiation or switch (n = 744)	485 (65.2)	89.4 (84.6– 94.3)	Ref.	Ref.
SARC continuation (n = 577)	300 (52.0)	62.7 (58.2– 67.4)	0.70 (0.60–0.81)	0.58 (0.50–0.68)
All (n = 1,516)	913 (60.2)	93.8 (90.4– 97.3)	Not applicable	Not applicable
20–24 years				
LARC initiation (n = 342)	208 (60.8)	99.9 (92.5– 107.6)	1.25 (1.01–1.56)	1.05 (0.83–1.32)
SARC initiation or switch (n = 385)	216 (56.1)	79.6 (73.4– 86.2)	Ref.	Ref.
SARC continuation (n = 914)	383 (41.9)	49.8 (46.6– 53.1)	0.63 (0.52– 0.75)	0.65 (0.54– 0.78)
All (n = 1,641)	807 (49.2)	67.2 (64.4– 70.1)	Not applicable	Not applicable
25–29 years				
LARC initiation (n = 390)	207 (53.1)	76.7 (70.6– 83.1)	1.30 (0.98– 1.72)	1.06 (0.79– 1.43)
SARC initiation or switch (n = 191)	94 (49.2)	58.9 (51.5– 67.1)	Ref.	Ref.

SARC continuation (n = 547)	207 (37.8)	41.3 (37.6–45.3)	0.70 (0.53–0.92)	0.70 (0.53–0.93)
All (n = 1,128)	509 (45.0)	56.5 (53.5–59.7)	Not applicable	Not applicable
30–34 years				
LARC initiation (n = 428)	170 (39.7)	53.9 (49.1–59.0)	1.07 (0.72–1.58)	0.86 (0.57–1.28)
SARC initiation or switch (n = 106)	48 (45.3)	50.5 (41.4–61.0)	Ref.	Ref.
SARC continuation (n = 338)	128 (37.9)	46.9 (41.9–52.4)	0.93 (0.62–1.40)	0.90 (0.60–1.36)
All (n = 872)	346 (39.7)	50.7 (47.5–54.2)	Not applicable	Not applicable
35–44 years				
LARC initiation (n = 334)	128 (37.7)	55.8 (50.3–61.8)	1.02 (0.67–1.56)	0.87 (0.56–1.35)
SARC initiation or switch (n = 98)	49 (50.0)	54.6 (44.7–66.0)	Ref.	Ref.
SARC continuation (n = 250)	76 (30.4)	31.4 (26.7–36.7)	0.58 (0.37–0.90)	0.57 (0.36–0.90)
All (n = 682)	251 (36.8)	46.7 (43.1–50.5)	Not applicable	Not applicable

LARC, long-acting reversible contraception; SARC, short-acting reversible contraception; CI, confidence interval; IRR, incidence rate ratio, calculated with negative binomial regression, adjusted with history of pregnancy and history of sexually transmitted infection, or visits for gynaecological reasons to primary or specialized health care or visits to family planning clinics within the previous year

Reproduced with permission from Springer Nature, previously published in Saloranta, T.H., Gyllenberg, F.K., But, A. et al. Use of reproductive health services among women using long- or short-acting contraceptive methods – a register-based cohort study from Finland. *BMC Public Health* 22, 1185 (2022). <https://doi.org/10.1186/s12889-022-13581-3>

We also analysed the users of different LARC methods separately. Cu-IUD users attended family planning clinics more in comparison to LNG-IUS users for other reasons than routine follow-up (adjusted IRR 1.48, 95% CI 1.12–1.94), but similarly for gynaecological reasons in primary or specialized care. Cu-IUD users needed abortion care more often than LNG-IUS users (adjusted IRR 13.81, 95% CI 2.28–83.80). Implant users attended the family planning clinics less for routine follow-up (adjusted IRR 0.41, 95% CI 0.33–0.52) compared to LNG-IUS users. They also attended primary and specialized care less for vaginal infections (adjusted IRR 0.55, 95% CI 0.33–0.93) and PID diagnoses (adjusted IRR 0.41, 95% CI 0.18–0.91), but more for abortion care (adjusted IRR 6.69, 95% CI 1.48–30.24) than LNG-IUS users.

6 DISCUSSION

6.1 SUMMARY OF MAIN FINDINGS

In this thesis study, we found that young women were more likely to use family planning services and to discontinue free-of-charge LARC methods than women over 30 years of age, as were women with a history of delivery or a history of an STI. Women speaking a native language other than Finnish or Swedish were less likely to use the services, but more likely to discontinue free-of-charge LARC methods.

Free-of-charge LARCs had a reasonably low discontinuation rate, with 28% of women discontinuing within two years of use. Most women discontinued due to problems with the method, and only 16% due to a wish to conceive. The most common problems with all LARC methods were bleeding disturbances. The discontinuation rate of LNG-IUSs was the lowest, with 24% discontinuing within two years, followed by implants (33%) and Cu-IUDs (38%).

Choosing free-of-charge LARCs reduced the need for abortion care by 80% compared to all other contraceptive options, and by 90–95% compared to initiating or switching between SARC methods. Compared to continuing with the familiar SARC method, free-of-charge LARCs halved the need for abortion care.

Women initiating free-of-charge LARCs had a similar need for overall reproductive health services concerning gynaecological problems and method-related issues to women initiating or switching between SARC methods. Women continuing with their familiar SARC method had less need for reproductive health services than women initiating or switching between methods.

6.2 COMPARISON WITH PREVIOUS STUDIES

6.2.1 USERS OF FAMILY PLANNING SERVICES

Prior studies on users of family planning services have been based on aggregated-level data, and knowledge of the associations of parity, previous abortions or STIs with service use is thus scarce. The city of Vantaa offers family planning services differently compared to other Finnish

municipalities and to international settings. Nevertheless, the results regarding the association of age, marital status and nativity with family planning service use are quite similar compared to interview-based National Survey of Family Growth data concerning the use of contraceptive services overall in the US (5). Studies in the UK and the US have similarly revealed that high proportions of service users are young women (5,52,53,242). This is logical, as pregnancy intentions are uncommon among young, and especially teenaged women (49,50).

Being young, parous and having a history of induced abortion or STI all indicate sexual activity and/or fertility and could be expected to associate with the use of family planning services, as was also seen in this study. In contrast, a UK study revealed that nulliparous women used services more than parous women (52). Legislation and service provision are different in the UK, the US, and Finland, which could explain the results to some extent. In Finland, a post-delivery follow-up is required to receive maternity allowances. According to recommendations in the national guidelines and legislation, contraception is required to be discussed at these visits (243). The higher use of services among parous women probably indicates a higher awareness of both fertility and the services.

A recent study in Vantaa found that parous women were more likely to initiate LARC methods than nulliparous women (233). The high use of LARC methods could explain why parous women are less likely to use hormonal contraception (244) but more likely to use family planning services as demonstrated in study I. LARCs require prescriptions only once in three to seven years, and LARC use can, thus, be missed when using prescription data.

Abortion referrals in Vantaa are centralised in family planning clinics, which probably explains the finding that women with a history of induced abortion used the services more across all age groups than women without such a history, as the women with a history of induced abortion were likely to be aware of the services. According to a recent Finnish study using data on redeemed prescriptions, women with a history of induced abortion used all hormonal contraception at lower rates compared to women with no such history (244). This discrepancy could be explained by the fact that especially young women with a history of abortion were more likely to initiate LARC methods in Vantaa (233).

Previous studies have reported that immigrants use health services less than or at most equally to native populations (57). In the US, women with an immigrant background use reproductive health services at lower rates compared to native women (58). Concurring, we found that young women

aged under 30 with a foreign native language used services less compared to native-speaking women of a similar age. The non-native women living in Finland have diverse backgrounds, and possibly differing needs and plans for growing the family compared to native women. In some ethnic groups sexual activity may not be seen as permissible for unmarried young women. Immigrant women may also desire pregnancy at a younger age than native women. These factors can contribute to the lower use of family planning services. Conflicting with previous studies, we found non-native women older than 30 years to use the services similarly or even at higher rates than native women. These women could have received information on the services through maternity care in previous pregnancies or have needs for spacing births.

Women of all ages with lower educational attainments used services more than women with the highest educational level. It is possible that less educated women are less likely to be able to use more expensive private health care or are less likely to have occupational health care offered by their employer. They could also have higher service needs than women with a higher education due to general health issues. Furthermore, it is possible that the plans for childbearing are different among women with different educational levels, as a study from the UK found that women with the highest level of education used contraceptive services the least (52), and a recent study in Finland demonstrated that fecundity is declining among all women except those with the highest educational level (56).

Hormonal contraceptives are often the first-line option for the treatment of excessive or painful menstruation. Thus, women experiencing these symptoms are likely to have higher needs for contraceptive services. Women with mental health disorders may also have increased needs for family planning services (245). On the other hand, as the national registers only contain data on diagnoses in public health care, women with gynaecological or mental health disorder diagnoses in these registers have used public services previously and may be more likely to return to these already familiar services. This could partially explain the higher use of public family planning services among these women.

6.2.2 DISCONTINUING LARC

The overall discontinuation rates of LARC methods provided free of charge were quite similar to previous findings from mixed-payer settings in real life (14,18–20) and in clinical trials (16,62). Similarly to the CHOICE study in

the St. Louis region of the US, we found higher discontinuation rates among implant users than LNG-IUS users (14). The discontinuation rate among implant users could be higher partly due to these users being younger than users of intrauterine contraception, as young women discontinue LARC methods more often than older women (14,18,20,246). Contrary to our results of Cu-IUD users discontinuing more often than LNG-IUS users, the CHOICE study and other previous studies found similar rates of discontinuation among Cu-IUD and LNG-IUS users (14,17,18,20). The age distribution of the users could explain these differences. The women initiating Cu-IUDs in Vantaa were younger than those initiating LNG-IUSs, and in other previous studies, women choosing Cu-IUDs were of the same age or older than women choosing LNG-IUSs (14,18,20). Even so, the differences in discontinuation between methods remained significant when adjusting for age in our study.

Similarly to previous studies, we found no association between education or socioeconomic status and discontinuation (14,20). This is reassuring, as it would be worrisome if women with a lower level of education or financial resources would have less access to method removal.

Previous findings on the association of parity with LARC discontinuation are inconsistent (14,18,20). We found that nulliparous and parous women had similar discontinuation rates, reaffirming that LARC use is also highly acceptable for nulliparous women.

The finding that women with a recent history of an STI are at higher risk of discontinuation is in line with the findings from the CHOICE study (14). Having had an STI may be an indicator of risky behaviour such as non-adherence to contraception. A recurring STI during LARC use could also be an explanation, as previous STI might be a risk factor for a subsequent one (247). STIs such as chlamydia and gonorrhoea commonly cause irregular vaginal bleeding, and troubles with bleeding were the most common reason for discontinuation.

Receiving counselling in a language other than the native language could influence discontinuation, as women speaking foreign native languages discontinued more frequently than women speaking Finnish/Swedish. It is also possible that cultural perceptions affect predispositions, for example, to bleeding profiles. Women often find bleeding control to be an important quality of contraceptive methods (248). As many as 50–80% of LNG-IUS and implant users experience unscheduled bleedings (249). Unlike the bleeding patterns with implants, the unscheduled bleedings with LNG-IUS tend to subside with continuing use (249). These facts and previous studies

are in line with the present results that women had implants removed more often due to bleeding disturbances than LNG-IUSs (250,251).

6.2.3 PROVISION OF FREE-OF-CHARGE LARC AND THE NEED FOR INDUCED ABORTIONS

The 80% lower need for abortion care among LARC users compared to users of all other contraceptive options is in line with the results of the CHOICE study and highlights the superior contraceptive efficacy of LARC methods (21,68). In the CHOICE study, abortion rates among study participants receiving all the contraceptive methods free of charge were less than half of regional and national rates (229). Moreover, providing LARC methods in post-abortion care has been shown to halve the need for repeat abortion (23,252,253).

The proportion of women initiating LARC methods among those using family planning services in Vantaa was substantially lower than the proportion of women initiating LARC methods in the CHOICE study, i.e, 21% vs. 75%. However, in the CHOICE study, all study participants entered the study to initiate contraception, while in Vantaa, many women also attended the family planning clinics for other reasons, such as method follow-up or sexual issues (254).

When comparing the need for abortion care among LARC initiators and SARC initiators or switchers, LARC initiators had a 90–95% lower odds of needing these services. This is in line with previous studies in the US on the provision on free-of-charge LARC and the need for induced abortions, and with the higher efficacy and higher continuation with LARC methods compared to SARC methods (12,21,22,25,68,229). It is noteworthy that SARC continuers had twice as high odds of needing abortion services compared to LARC initiators, but 80% lower odds than SARC initiators or switchers. As continuing users are likely to be satisfied users, this demonstrates the importance of women's satisfaction to method adherence and contraceptive effectiveness.

6.2.4 USE OF REPRODUCTIVE HEALTH SERVICES AMONG USERS OF SHORT- AND LONG-ACTING REVERSIBLE CONTRACEPTIVES

Previous research on the effects of free-of-charge LARC programmes has lacked data on the overall use of reproductive health services. One could speculate that LARC users would need reproductive health services less than SARC users, as LARC methods have a higher continuation rate than SARC methods (14). Contrary to this, we found that free-of-charge LARC initiators used reproductive health services similarly to SARC initiators or switchers for method-related or gynaecological reasons. LARC initiators aged under 30 used reproductive health services even more than the same-aged SARC initiators or switchers. This may be due to young women reacting more to the common side effects of LARC methods. The finding that women continuing with the same SARC method used overall reproductive health services less than women initiating LARC or SARC methods underlines the importance of method continuation and thus user satisfaction with even the resources needed to organize reproductive health services.

When counting the costs for the municipality, the women continuing with the same SARC method used the least financial resources, and the women initiating LARC methods the most. The savings from the abortions averted did not cover the costs of the methods and the other services needed. If SARC methods would also have been paid for by the municipality, the costs would have been more even. Even then, the costs of the SARC continuers would have been the lowest, but the SARC initiators would have surpassed the costs of LARC initiators when assuming a cost of the methods of €40 per year per SARC user.

SARC users attended more routine follow-up visits than LARC initiators. Nevertheless, only 55% of SARC users attended a routine check-up within the two-year follow-up. We speculate that this reflects a low continuation rate among SARC users, as prescriptions expired after a year. Unfortunately, little is known about the real-life continuation rates for SARC methods in Finland. While previous studies have yielded conflicting results when comparing the incidence of STIs between LARC users and women using other methods, we found a similar STI incidence among LARC initiators and SARC users, and likewise among women initiating different LARC methods (255,256). The odds of STIs were increased among LARC initiators in the CHOICE study, but similar odds for LARC users and non-users were found in a study on adolescents in New York (255,256). Annual testing for STIs was offered in both of these studies (255,256). In Vantaa, STI testing was mainly based on the request of the women or on having symptoms related to STIs,

but opportunistic screening was also offered. It is possible that SARC users were more often offered STI testing as they had more frequent check-up visits than LARC users.

LARC users had more visits with a PID diagnosis than SARC users, and IUD users more than implant users. Clinicians may be more prone to suspecting PIDs among IUD users than the users of other methods especially as pelvic pain is a common adverse effect of IUDs (15,16). Distinguishing pelvic pain clinically from a true PID is challenging (257).

In line with the finding that Cu-IUD users have higher rates of discontinuation due to increased bleeding and cramping, they also attended services more for other reasons than routine checkups compared to LNG-IUS users. Cu-IUD users also needed more services for abortion care than LNG-IUS users, probably due to the higher discontinuation rate, but also due to the lower contraceptive efficacy compared to LNG-IUSs, as also seen in the large prospective EURAS cohort (258).

6.3 STRENGTHS AND LIMITATIONS

6.3.1 DATA SOURCES AND PARTICIPANTS

The data used in this thesis were derived from reliable, comprehensive and validated Finnish national health registers (259–261). These data can be combined using a social security code provided for every Finnish citizen since the 1960s. Although comprehensive, the register data have shortcomings. For example, data on relationship status are incomplete, as cohabitation is not registered in Finland without a specific application to register a partnership. Thus, in this thesis, only being married or not was used to represent being in a relationship. Moreover, ethnicity or race are forbidden to be registered by the Personal Data Act (262). The self-reported native language is registered and was used to describe a potential immigrant status and represent ethnicity. However, preferences for choosing which language to report as a native language can differ among women speaking more than one language.

Furthermore, educational attainments are only registered after the mandatory nine-year basic education has been completed at the age of 16 years. Thus, for immigrant women who migrated to Finland after the age of 16, an educational attainment registered as 'unknown' represents a true unknown. However, for women born in Finland or those who migrated as children, the unknown educational attainment in the registers means completing the basic nine-year schooling. For immigrant women,

reproductive characteristics can also be missing, as the Finnish registers only contain information on pregnancies managed in Finland.

It would have been beneficial to have data on service use in the private sector. Unfortunately, data on use of these services have only recently been added to the registers maintained by the Finnish Institute of Health and Welfare (263). Of the women of all ages in Vantaa, 18% attended a private obstetrician-gynaecologist in 2013 (264). No data exist on the proportion of appointments regarding contraception or on how many women in the study cohorts used private services.

Data in patient registers also have shortcomings. The initiations and removals of LARCs require contact with health services, and are therefore systematically recorded in the medical records. Continuing LARC users, on the other hand, often do not have regular contacts with health care, and thus continuing LARC use is missed in the records. Furthermore, medical records do not contain information on breastfeeding, or pregnancy intentions. This is important, as predisposition towards pregnancy affects contraceptive choice and adherence. Women with a positive attitude towards a possible pregnancy often choose less reliable methods and are less consistent with contraceptive use (149,150,152).

However, combining data from the national registers and local patient registers allowed us to conduct a more detailed evaluation of both discontinuation and service use. This enabled the identification of LARC removals from the local patient registers, from diagnoses and procedure codes from national registers, and using information on the occurrence of pregnancies to detect discontinuation. Using the comprehensive register data allowed us to adjust for many confounders when evaluating discontinuation, the need for induced abortions and the use of reproductive health services.

A major strength of this thesis study is the complete coverage of all women aged 15–44 years in Vantaa in 2013–2014. The study participants represented all non-sterilized women eligible to initiate a free-of-charge LARC and doing so or choosing other contraceptive options at family planning clinics.

6.3.2. METHODOLOGICAL CONSIDERATIONS

Care was taken to select statistical methods that fitted the data when addressing each research question. Poisson regression was used in the discontinuation and abortion analyses, as it fitted the data and the assumptions for a Cox hazards model were not met. In analysing service use during follow-up, negative binomial regression was chosen, as it produced

modelling that fitted the data well, and better than Poisson regression, quasi-Poisson or zero-inflated Poisson, which were also explored. In all statistical analyses, several confounders could be controlled for through adjustment. We carefully selected the confounders for each statistical model. Nevertheless, residual confounding by unknown factors cannot be ruled out.

The Finnish health care system differs from other systems worldwide. This limits the international generalisability of the results. The results regarding discontinuation and service use are only generalizable to settings where the family planning services are equally easily accessible and free of charge, where the staff is experienced in supporting LARC continuation, and the price does not form a barrier to the use of gynaecological services in primary or specialized care.

Although all women in Vantaa using and not using the family planning services were included in the study, satisfied LARC users may have been missed among the service users, as they did not visit the clinics for regular check-ups but were nevertheless within reach of the services. After the initiation of the described, ongoing programme offering all women their first LARC method free of charge in 2013, the use of LARC increased in Vantaa (265). The programme may also have influenced the user profile of family planning services.

In the discontinuation study, we analysed first-time LARC users, as only the first LARC in a woman's lifetime was provided free of charge. Thus, the study presented discontinuation figures from an unselected population of first-time LARC users, without probably satisfied re-initiators.

Regular follow-up appointments are no longer recommended for satisfied LARC users (25,89). This challenges the evaluation of discontinuation rates in real-life settings, as the medical records contain no systematic data on continuing LARC use. If women with no data on continuing LARC were excluded, the discontinuation rates would be overestimated. In this thesis, an assumption was made that a woman continued LARC use if she had no contacts with primary or specialized health care for LARC removal or pregnancy. The follow-up ended when a woman moved away from Vantaa, as she was no longer able to use the city's services. Prior studies on real-life discontinuation rates used similar assumptions (18,266). Based on the Finnish national registers, removal events both in primary and specialized care, as well as pregnancies, could be combined, minimizing the risk of a common bias with non-attenders.

As there were no data on private health service use, neither were data available on LARC removals in private health care. We were able to detect

these removals if the women contacted public health services afterwards, for example by contacting family planning clinics or visiting prenatal care. Women with more financial assets are more likely to use high-cost private health care. Nevertheless, it is likely that most women continue to use the familiar, free-of-charge family planning services. It is noteworthy that the findings regarding women aged under 20 using Cu-IUDs, should be interpreted with caution, as the number of women in this group was low.

The Finnish national registers and the electronic patient registers in Vantaa enabled the evaluation of providing free-of-charge LARCs at the population level. The registers also enabled adjustments for known potential confounders. However, the full adjusted model may be overfitted, as the number of induced abortions among LARC users was low. The crude comparisons were thus repeated between LARC users and the two fully matched cohorts, which did not change the results. Immortal time bias was also considered with sensitivity analyses, and it was not found to influence the results.

Identifying SARC initiators, switchers and continuers from electronic patient registers enabled a more detailed evaluation of the need for induced abortions and overall reproductive services among women initiating free-of-charge LARCs or choosing SARC methods. Data in the patient registers and national registers were used to classify the service use in detail. These comprehensive registers allowed a unique evaluation of the overall use of reproductive health services.

It is to be noted that women switching contraceptive method are likely to have experienced problems with their prior method, which may not resolve by switching. These women are thus likely to have additional service needs. In addition, women initiating LNG-IUSs for therapeutical indications are likely to have further service needs. The service use among LARC users may have been underestimated, as women choosing LARC were older and had a higher socioeconomic status, and therefore had better access to high-cost private services. It would have been very beneficial to also have information on the use of reproductive services in the private sector. Unfortunately, no such information was available in the years of the study.

6.4 SUGGESTIONS FOR FURTHER RESEARCH

More research is needed on women's satisfaction with family planning services. It would be important to modify family planning services to better meet the needs of all women who require these services. More information

on factors associated with discontinuation would be useful to offer more individualized and woman-centred contraceptive counselling. Further evaluation of reproductive health service use among women continuing SARC and LARC methods would provide useful insights into the organization of sufficient services for all women.

6.5 IMPLICATIONS FOR ORGANISING FAMILY PLANNING SERVICES

When organising family planning services, it is important to consider that young women have higher needs for these services. Young, non-native women, on the other hand, can be underrepresented among service users. Efforts are also needed in optimizing family planning services for immigrant women.

More than 80% of the women discontinuing LARCs did so for other reasons than pregnancy intentions. This implies a continuing high need for contraception after discontinuing LARC. These women should be actively counselled to find an effective contraceptive method that suits their preferences to avoid contraceptive failures. Women discontinuing due to adverse effects are unlikely to initiate the same method again (19,267,268). This limits their contraceptive options and can result in the use of less effective methods. Among LNG-IUS users, counselling on expected bleeding patterns has been shown to improve user satisfaction and continuation rates (269). In our study, problems with bleeding were the most common reason for discontinuation, and even more common among implant and Cu-IUD users than LNG-IUS users. It is important to have adequate resources for counselling on the expected bleeding patterns and for troubleshooting these problems when considering and while using LARC methods.

According to our study, offering LARC methods free of charge is an effective way to increase the use of these most efficient contraceptive methods and to reduce the need for abortion care. Initiating a LARC method free of charge reduced the need for abortion care by 80% compared to all users of family planning clinics and population controls, by 90–95% compared to initiating or switching a SARC method and by almost a half compared to continuing the same SARC method.

Our results demonstrate that initiating a new contraceptive method often results in further service use probably due to worries about adverse effects.

This needs to be considered when implementing and designing free-of-charge LARC programmes and resourcing family planning services. A continuing user is likely to be a satisfied user, and user satisfaction with the contraceptive method chosen means less resources are needed to provide reproductive health services. Thus, emphasizing user satisfaction and providing adequate counselling is not only good, woman-centred care, but also financially wise and can save resources elsewhere.

To ensure that all women can take advantage of modern contraception, access to comprehensive family planning services needs to be established. The family planning services must be easily reached not only to initiate the methods, but also to discontinue and especially, to support continuation via troubleshooting while using the method. It is important to resource the services sufficiently so that women have timely access to the services for all these needs, and not just for method initiation. For modern contraception to reach all women who wish to use it, it is important to tackle not only financial barriers, but also barriers from within the service systems such as insufficient access to services or disregarding the wishes of women in contraceptive counselling (270). Only then can all women benefit from modern contraception and have true control over their fertility.

7 CONCLUSIONS

When evaluating the free-of-charge provision of LARC methods in primary care, we found the following:

1. Young, sexually active and fertile women were reached well with the family planning services in Vantaa, but service use was less frequent among young women with a foreign native language.
2. All free-of-charge LARCs had a relatively high continuation rate, with 70% of women continuing the use at two years. The use of LNG-IUSs was more often continued than the use of implants or Cu-IUDs.
3. Women choosing free-of-charge LARCs had an 80% lower need for abortion care when compared to women attending family planning clinics but not choosing free-of-charge LARCs, a 90-95% lower need when compared to women initiating or switching between SARC methods and a 50% lower need when compared to women continuing with the same SARC method.
4. The use of reproductive health services was similar among women initiating LARC or SARC methods. However, women continuing with their familiar SARC method had a lower need for these services.

8 ACKNOWLEDGEMENTS

Back when I was studying medicine, I looked at my fellow students embarking on journeys in research, writing their thesis. I thought they were mad to spend their free time on research. I felt I might take on research as a hobby when I was a pensioner. But here I am, writing these final words of gratitude in a thesis of my own. And I am not a pensioner.

Life often does not go as planned. I found my research project, or the project found me, when the city of Vantaa started offering long-acting reversible contraceptive methods free-of-charge at the beginning of 2013. At the family planning clinics, we awed the decline in the rates of abortion after the intervention began. Then my dear colleague, Frida Gyllenberg, started researching the effects of this intervention and invited me to join the project. And there I was, beginning a research project leading to a doctoral thesis during my rush years. If doing research while studying medicine seemed busy, doing the same while juggling a demanding full-time job and a family was a task of another sorts. One might think I was mad.

But to my surprise, this journey into the world of research brought joy, new experiences, and a very welcome variation to the never-ending rush and interruptions of the work at the health centre. It has been an absolute joy to be able to concentrate on thinking, coding, statistical modelling, creating tables and illustrations, and most of all writing. And I would have never thought I would say this!

There are so many people I wish to thank for enabling this process. The leaders of the health services in the city of Vantaa are to be thanked for initiating the free-of-charge LARC programme. Thank you, Timo Aronkytö, for the wisdom to make the decision to spend money on free-of-charge contraception as the leader of Vantaa's Health services. Thank you, also for the funding we have received from HUS research grants via the city of Vantaa. My sincere gratitude goes also to the other past and present leaders in city of Vantaa; Piia Niemi-Mustonen, Ella Koivunen, Piia Vuorela and Jarmo Kantonen. The past and present chiefs of health centres in Vantaa, Marja Puurula, Ritva Tauriainen, Merja Kristersson are to be thanked for the opportunity to conduct this research, and the support and leadership of the family planning clinics.

I would not have been able to get this far without my dear, great boss, Laura Laisola. Your support has been invaluable. Repeatedly, I have approached you with a request for a permission to apply for a research grant from HUS to Vantaa. And repeatedly, I have approached you with a

request to use such a grant to work on my thesis studies instead of working at my own job tutoring all the newbies at the health centre. And again repeatedly, you have supported, congratulated, and given the permission to be absent from my job. So, thank you, thank you, thank you!

My other great boss is Elina Rantala, has been just as supportive as Laura. Elina is the person who makes things at the health centre run. She is a master at organising and does it with a good humour. My absences have not made her job easier, but it has not shown as anything else but support. So, thank you Elina, for supporting me, and the whole health centre crew.

I also have another job at the University of Helsinki. I am a part time clinical instructor at the Department of General practice and Primary care, also the “home” of this thesis. I wish to thank the Professor emerita, Kaisu Pitkälä, for accepting my not-so-clearly-formed thesis plan as a doctoral study. Kaisu has also taught me most that I know about basics of scientific research. I had the pleasure of attending a class in primary care research organised by Kaisu. Thank you, Kaisu, for also inviting me to the world of teaching medicine. The current Associate Professors, Merja Laine and Lena Thorn, are also to be thanked for their valuable support. I have been able to be periodically absent from my job as a clinical instructor and concentrate on my thesis. Merja also enlisted me at Kaisu’s class on research basics and made a significant push for my embarkment on this scientific journey.

This project would not have formed or proceeded without my great supervisors Professor Oskari Heikinheimo and Associate professor Merja Laine. Oskari, you have such a profound knowledge in the field of contraception. I have learned tons from you during these years. All the way, you have had a clear vision where to lead this research project. Getting feedback on my writing and on forming the research plans has always been quick, kind and constructive. We have had some enlightening trips to conferences over the years. I can’t thank you enough. And Merja, your support has been as valuable. You have given advice on sticking to the schedules, forming the study questions and even on choosing the dresses for the dissertation. You are a not-very-common role model of a general practitioner doing research and embarking on a career at the university. Your kindness and wisdom enlighten the room you are in.

Thank you, Adjunct professor Eila Suvanto and Associate professor Tuomas Koskela for taking the time and reviewing my thesis. Your comments and insights were very beneficial in improving this book. It was also a pleasure discussing my work with you both.

Then my dear, dear co-writer, co-conspirator, Frida! You are to be thanked for the research coming to life on the free-of-charge LARC programme in

Vantaa. You have materialised the research idea into a comprehensive data set on this cohort of women. Research permits, grants, and hours and hours of sitting in front of the computer going through the electronic patient records. A ton of work that I have had the privilege of doing with you. You are a master at applying for grants, as the money we have been awarded as grants testifies. Embarking with you on this journey with its hurdles, joys and even trips, has been a joy. Thank you, Frida, for everything.

Then my dear co-writer, Anna But. Your expertise on statistical matters and modelling has been invaluable. You have been so patient, provided me with numerous links on possible solutions and coding tips, given me endless advice on model testing, and variable selection. Your insights have been very important in addressing questions from reviewers of our articles. Thank You for all that you have taught me, and for your kindness and compassion! Then last, but definitely not the least co-writer, Mika Gissler. Thank you for your advice on all the registers that you are the expert on. You are always amazingly quick to reply!

I also wish to thank my thesis committee Maria Vuorilehto and Dan Apter for their valuable support, feedback, and advice. Our meetings always helped me to navigate forward.

My warm gratitude goes also to the Academic Health Center at the University of Helsinki. The network has given me support, scientific education, and funding. Thank you Merja Laine and Niko Wasenius for directing the network, for all your organisation and teaching. Thank you, all fellow researchers, for your peer support. The other funders, Suomen yleislääketieteen yhdistys and Suomen Lääketieteen Säätiö, are also to be thanked for their valuable support of my project.

I also wish to thank the great ladies of the family planning clinics of Vantaa. You do an amazing job providing and developing contraceptive services for women in Vantaa. The coffee breaks at the family planning clinics have offered laughs, tears, and a lot of great ideas to improve the services. The greatest lady of the clinics is of course Eija Väänänen. Eija, you are the heart and soul of the clinics. We have worked side by side for many years to develop, organise and maintain the services. Sometimes this has meant keeping the flag up even on holidays or on maternity leave, for the love of the sport. Thank you, Eija, for all your support, wisdom, and advice!

Mia Venhola, the late, former chief physician of the family planning clinics can never be forgotten. Mia's wooden shoes still echo on the hallways of Myyrmäki Health Center. Mia is to be thanked for preserving the family planning services in Vantaa through the recession in the 1990s and for advocating the free-of-charge LARC programme.

I wish to thank all my co-workers at Myyrmäki Health Center for their support, encouragement, and fellowship. Same goes for all co-workers at the Department of General Practice and Primary care at the University of Helsinki. It's a pleasure to work alongside each and every one of you! I also wish to thank all the students and young doctors I have met during the years as a teacher at the university and as a supertutor at the health centre. Your questions always keep me learning.

Thank you, Roy Siddall, for the language review. It is always a pleasure working with you.

Life would be dull without laughs and conversations. I wish to thank my 'seven sisters' from medical school, Helena, Mia, Sari, Noora, Saara and Ande. I can't believe so many years have passed! Thank you all for our continuing friendship! Thank you, Sini, for all your support, gardening tips and conversations. Annina, Riku, Merja, Esa, Jonne and Heidi. Thank you for being a part of my life.

I also wish to thank my ex-husband, Jani. You are the father of my two older boys. We share parenthood and shared a long stretch of our lives. Thank you for the divorce that liberated me to shine as who I am. Sharing parenthood has enabled much of this project, writing in the evenings and conference trips.

Thank you, Ulla-Maija Kerminen for being the best mother-in-law. It is always a joy to spend time at your cottage in Vaasa. Thank you also for your help on checking the language of the abstract.

My sincere gratitude goes to my parents, Erkki and Riitta, for all your love and support. I wish Kajaani was closer so we could spend more time together. I wish to thank my brother Jarkko and his wife Maija for your support, and celebrations together.

My deepest love and gratitude go to my boys and my husband Antti. Matias, you are such a kind, smart boy! You helped with choosing the colours for the figures in this book. Thank you! Niklas, you are a master at asking questions. One of your why-questions helped me to spot missing information on a figure legend. Thank you! Topias, you are an energetic little boy. The maternity leave with you offered me time to finalise and submit the final article – numerous times, and to spend time concentrating on anything but research. Elias, my bonus boy, you are so clever and nice, and keep us all learning new things about ants. It is a true joy to watch all of you boys grow!

Antti, thank you for all your love and support. You fulfil my life with love and joy and offer me a shoulder to fall asleep on while watching tv – a great delight in middle age. This project would have been much more tedious without you - as life in general would be.

Tuire Saloranta

Espoo, October 2022

REFERENCES:

1. Thomas SL, Ellertson C. Nuisance or natural and healthy: should monthly menstruation be optional for women? *Lancet* (London, England). 2000 Mar 11;355(9207):922–4.
2. The World Bank. Fertility rate, total (births per woman) | Data [Internet]. [cited 2022 Feb 10]. Available from: <https://data.worldbank.org/indicator/SP.DYN.TFRT.IN>
3. Butler S, Clayton W. Overview of Family Planning in the United States - A Review of the HHS Family Planning Program - NCBI Bookshelf [Internet]. National Academies Press. 2009 [cited 2019 Nov 3]. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK215219/>
4. Smith R, Ashford L, Gribble J, Clifton D. Family planning saves lives Fourth edition Population Reference Bureau. 2009.
5. Frost JJ. U.S. Women’s Use of Sexual and Reproductive Health Services: Trends, Sources of Care and Factors Associated with Use, 1995–2010. 2013.
6. Zolna MR, Frost JJ. Publicly Funded Family Planning Clinics in 2015: Patterns and Trends in Service Delivery Practices and Protocols Key Points Publicly Funded Family Planning Clinics in 2015: Patterns and Trends in Service Delivery Practices and Protocols. 2016.
7. The Henry J. Kaiser Family Foundation. Private and Public Coverage of Contraceptive Services and Supplies in the United States | The Henry J. Kaiser Family Foundation. 2015;1–7.
8. Frost JJ, Singh S, Finer LB. Factors Associated with Contraceptive Use and Nonuse, United States, 2004. *Perspect Sex Reprod Health*. 2007 Jun;39(2):90–9.
9. Rimpelä M, Saaristo V, Wiss K, Ståhl T. Terveysten edistäminen terveystieteissä 2008. 2009;
10. Stoddard A, McNicholas C, Peipert JF. Efficacy and safety of long-acting reversible contraception. *Drugs*. 2011;71(8):969–80.
11. Trussell J. Contraceptive failure in the United States. *Contraception*.

2004;70(2):89–96.

12. Peipert JF, Zhao Q, Allsworth JE, Petrosky E, Madden T, Eisenberg D, et al. Continuation and Satisfaction of Reversible Contraception LEVEL OF EVIDENCE: II. *Obs Gynecol*. 2011;117:1105–18.
13. Westhoff CL, Heartwell S, Edwards S, Zieman M, Stuart G, Cwiak C, et al. Oral contraceptive discontinuation: do side effects matter? *Am J Obstet Gynecol*. 2007;196(4):412.e1-412.e7.
14. O’Neil-Callahan M, Peipert JF, Zhao Q, Madden T, Secura G. Twenty-Four–Month Continuation of Reversible Contraception. *Obstet Gynecol*. 2013;122(5):1083–91.
15. Sivin I, Mahgoub S El, McCarthy T, Mishell DR, Shoupe D, Alvarez F, et al. Long-term contraception with the levonorgestrel 20 mcg/day (LNg 20) and the Copper T 380Ag intrauterine devices: A five-year randomized study. *Contraception*. 1990 Oct 1;42(4):361–78.
16. Andersson K, Odland V, Rybo G. Levonorgestrel-releasing and copper-releasing (Nova T) IUDs during five years of use: A randomized comparative trial. *Contraception*. 1994 Jan 1;49(1):56–72.
17. Peipert JF, Zhao Q, Allsworth JE, Petrosky E, Madden T, Eisenberg D, et al. Continuation and satisfaction of reversible contraception. *Obstet Gynecol*. 2011 May;117(5):1105–13.
18. Sanders JN, Turok DK, Gawron LM, Law A, Wen L, Lynen R. Two-year continuation of intrauterine devices and contraceptive implants in a mixed-payer setting: a retrospective review. In: *American Journal of Obstetrics and Gynecology*. Elsevier; 2017. p. 590.e1-590.e8.
19. Sznajder KK, Tomaszewski KS, Burke AE, Trent M. Incidence of Discontinuation of Long-Acting Reversible Contraception among Adolescent and Young Adult Women Served by an Urban Primary Care Clinic. *J Pediatr Adolesc Gynecol*. 2017 Feb 1;30(1):53–7.
20. Phillips SJ, Hofler LG, Modest AM, Harvey LFBB, Wu LH, Hacker MR. Continuation of copper and levonorgestrel intrauterine devices: a retrospective cohort study. *Am J Obstet Gynecol*. 2017 Jul 1;217(1):57.e1-57.e6.

21. Winner B, Peipert JF, Zhao Q, Buckel C, Madden T, Allsworth JE, et al. Effectiveness of long-acting reversible contraception. *N Engl J Med*. 2012 May 24;366(21):1998–2007.
22. Ricketts S, Klingler G, Schwalberg R. Game Change in Colorado: Widespread Use Of Long-Acting Reversible Contraceptives and Rapid Decline in Births Among Young, Low-Income Women. *Perspect Sex Reprod Health*. 2014 Sep 1;46(3):125–32.
23. Pohjoranta E, Mentula M, Gissler M, Suhonen S, Heikinheimo O. Provision of intrauterine contraception in association with first trimester induced abortion reduces the need of repeat abortion: first-year results of a randomized controlled trial. *Hum Reprod*. 2015 Nov 1;30(11):2539–46.
24. THL. Raskaudenkeskeytykset 2013. 2014.
25. WHO | Family Planning - A global handbook for providers. WHO. 2018;
26. Photo U, Park K. Family Planning and the 2030 Agenda for Sustainable Development Data Booklet. 2011;
27. Family Planning Can Reduce High Infant Mortality Levels | Guttmacher Institute [Internet]. [cited 2022 Jul 11]. Available from: <https://www.guttmacher.org/report/family-planning-can-reduce-high-infant-mortality-levels#>
28. Division UNP. World contraceptive use 2019. 2019.
29. United Nations. Contraceptive Use by Method 2019. 2019.
30. Gavin L, Pazol K. Update: Providing Quality Family Planning Services — Recommendations from CDC and the U.S. Office of Population Affairs, 2015. *MMWR Morb Mortal Wkly Rep*. 2019 Mar 11;65(9):231–4.
31. Raskauden ehkäisyn Käypä hoito-suositus.
32. THL. Edistä, ehkäise, vaikuta. 2013.
33. FSRH Guidelines & Statements - Faculty of Sexual and Reproductive Healthcare [Internet]. [cited 2022 Apr 20]. Available from:

<https://www.fsrh.org/standards-and-guidance/fsrh-guidelines-and-statements/>

34. Abortion in Ireland: Legal Timeline – Irish Family Planning Association [Internet]. [cited 2022 Jul 11]. Available from: <https://www.ifpa.ie/advocacy/abortion-in-ireland-legal-timeline/>
35. Contraception in the Republic of Ireland - Wikipedia [Internet]. [cited 2022 Jul 11]. Available from: https://en.wikipedia.org/wiki/Contraception_in_the_Republic_of_Ireland
36. European Contraception Policy Atlas - Poland | EPF [Internet]. [cited 2022 Jul 11]. Available from: <https://www.epfweb.org/node/745>
37. Lindh I, Skjeldestad FE, Gemzell-Danielsson K, Heikinheimo O, Hognert H, Milsom I, et al. Contraceptive use in the Nordic countries. *Acta Obstet Gynecol Scand*. 2017 Jan 1;96(1):19–28.
38. Kansanterveyslaki 66/1972 - Ajantasainen lainsäädäntö - FINLEX[®] [Internet]. [cited 2022 Feb 9]. Available from: <https://www.finlex.fi/fi/laki/ajantasa/1972/19720066>
39. FINLEX[®] - Terveystenhoitolaki 1326/2010. Oikeusministeriö, Edita Publishing Oy;
40. FINLEX[®] Laki sosiaali- ja terveydenhuollon asiakasmaksuista 734/1992. Oikeusministeriö, Edita Publishing Oy;
41. Keskitetty ehkäisyneuvonta | Helsingin kaupunki [Internet]. [cited 2022 Jul 18]. Available from: <https://www.hel.fi/sote/toimipisteet-fi/aakkosittain/kalasadaman-thk/ehkaisyneuvonta>
42. Jalanko E, Gyllenberg F, Krstic N, Gissler M, Heikinheimo O. Municipal contraceptive services, socioeconomic status and teenage pregnancy in Finland: a longitudinal study. *BMJ Open*. 2021 Feb 17;11(2).
43. Hemminki E, Sihvo S, Koponen P, Kosunen E. Quality of contraceptive services in Finland. *Qual Saf Heal Care*. 1997;6(2):62–8.
44. Sosiaali- ja terveysministeriö. Maksuttoman ehkäisyn kokeilu. 2021;

45. #EHKÄISYNETTI – tukea sopivan ehkäisymenetelmän pohdintaan [Internet]. [cited 2022 Apr 20]. Available from: <https://www.ehkaisynetti.fi/>
46. Bearak JM, Popinchalk A, Beavin C, Ganatra B, Moller A-B, Tunçalp Ö, et al. Country-specific estimates of unintended pregnancy and abortion incidence: a global comparative analysis of levels in 2015–2019. *BMJ Glob Heal*. 2022 Mar 1;7(3):e007151.
47. World Population Prospects - Population Division - United Nations [Internet]. [cited 2022 May 3]. Available from: <https://population.un.org/wpp/Download/Standard/Fertility/>
48. International | PRB [Internet]. [cited 2022 May 3]. Available from: <https://www.prb.org/international/indicator/fp-total-modern/map/country>
49. Kontula O. FINSEX yhdyntätrendit - Väestöliitto [Internet]. [cited 2020 Jan 23]. Available from: https://www.vaestoliitto.fi/tieto_ja_tutkimus/vaestontutkimuslaitos/seksologinen_tutkimus/suomalaisten-seksuaalisuus-finse/finsex-yhdyntatrendit/
50. Ueffing P, Dasgupta ANZ, Kantorová V. Sexual activity by marital status and age: A comparative perspective. *J Biosoc Sci*. 2019;
51. OECD. OECD Family Database, SF2.3 Age of mothers at childbirth [Internet]. OECD Website. 2021. Available from: <https://www.oecd.org/els/family/database.htm>
52. French RS, Mercer CH, Johnson AM, Fenton KA, Erens B, Wellings K. Use of contraceptive services in Britain: Findings from the second National Survey of Sexual Attitudes and Lifestyles (Natsal-2). *J Fam Plan Reprod Heal Care*. 2009;35(1):9–14.
53. United States Department of Health and Human Services; Office of population affairs. Title X Family Planning Annual Report 2015 National Summary. 2015.
54. Finer LB, Henshaw SK. Disparities in Rates of Unintended Pregnancy In the United States, 1994 and 2001. *Perspect Sex Reprod Health*. 2006 Jun;38(2):90–6.

55. Finer LB, Zolna MR. Declines in Unintended Pregnancy in the United States, 2008–2011. *N Engl J Med*. 2016 Mar 3;374(9):843–52.
56. Jalovaara M, Neyer G, Andersson G, Dahlberg J, Dommermuth L, Fallesen P, et al. Education, Gender, and Cohort Fertility in the Nordic Countries. *Eur J Popul*. 2019 Jul 15;35(3):563–86.
57. Sarría-Santamera A, Hijas-Gómez AI, Carmona R, Gimeno-Feliú LA. A systematic review of the use of health services by immigrants and native populations. Vol. 37, *Public Health Reviews*. BioMed Central Ltd.; 2016.
58. Tapales A, Douglas-Hall A, Whitehead H. The sexual and reproductive health of foreign-born women in the United States. *Contraception*. 2018 Jul 1;98(1):47–51.
59. Castaneda AE, Rask S, Koponen P, Mölsä M, Koskinen S. Maahanmuuttajien terveys ja hyvinvointi - Tutkimus venäläis-, somalialais- ja kurditaustaisista Suomessa. *THL Raportti 2012*; 2012.
60. Ahrendt HJ, Nisand I, Bastianelli C, Gómez MA, Gemzell-Danielsson K, Urdl W, et al. Efficacy, acceptability and tolerability of the combined contraceptive ring, NuvaRing, compared with an oral contraceptive containing 30 µg of ethinyl estradiol and 3 mg of drospirenone. *Contraception*. 2006;74(6):451–7.
61. Oddsson K, Leifels-Fischer B, De Melo NR, Wiel-Masson D, Benedetto C, Verhoeven CHJ, et al. Efficacy and safety of a contraceptive vaginal ring (NuvaRing) compared with a combined oral contraceptive: a 1-year randomized trial. *Contraception*. 2005;71(3):176–82.
62. Sivin I, Alvarez F, Diaz J, Diaz S, Mahgoub S El, Coutinho E, et al. Intrauterine contraception with copper and with levonorgestrel: A randomized study of the TCU 380Ag and levonorgestrel 20 mcg/day devices. *Contraception*. 1984 Nov 1;30(5):443–56.
63. Westfall JM, Main DS, Lynn B. Continuation Rates Among Injectable Contraceptive. *Fam Plan Perspect*. 1996;28:275–7.
64. Kimble T, Burke AE, Barnhart KT, Archer DF, Colli E, Westhoff CL. A 1-year prospective, open-label, single-arm, multicenter, phase 3

- trial of the contraceptive efficacy and safety of the oral progestin-only pill drospirenone 4 mg using a 24/4-day regimen. *Contracept X*. 2020 Jan 1;2:100020.
65. Ali M, Cleland J, Iqbal S. Causes and consequences of contraceptive discontinuation : evidence from 60 Demographic and Health Surveys. 2012.
 66. Berglund Scherwitzl E, Lundberg O, Kopp Kallner H, Gemzell Danielsson K, Trussell J, Scherwitzl R. Perfect-use and typical-use Pearl Index of a contraceptive mobile app. *Contraception*. 2017 Dec 1;96(6):420–5.
 67. Mansour D, Inki P, Gemzell-Danielsson K. Efficacy of contraceptive methods: A review of the literature. *Eur J Contracept Reprod Heal Care*. 2010 Feb 8;15(1):4–16.
 68. Trussell J. Contraceptive failure in the United States. *Contraception*. 2011 May;83(5):397–404.
 69. Hopkins J. Family Planning A GLOBAL HANDBOOK FOR PROVIDERS Evidence-based guidance developed through worldwide collaboration A WHO Family Planning Cornerstone United States Agency for International Development Bureau for Global Health Office of Population and Reproductive Health.
 70. Pharmaca Fennica [Internet]. [cited 2022 May 3]. Available from: <https://pharmacafennica.fi/>
 71. Cover J, Ba M, Drake JK, NDiaye MD. Continuation of self-injected versus provider-administered contraception in Senegal: a nonrandomized, prospective cohort study. *Contraception*. 2019 Feb 1;99(2):137–41.
 72. Hubacher D, Goco N, Gonzalez B, Taylor D. Factors affecting continuation rates of DMPA. *Contraception*. 1999 Dec 1;60(6):345–51.
 73. Rosenberg MJ, Waugh MS. Oral contraceptive discontinuation: A prospective evaluation of frequency and reasons. *Am J Obstet Gynecol*. 1998 Sep 1;179(3):577–82.
 74. Agostini A, Godard C, Laurendeau C, Benmahmoud Zoubir A,

Lafuma A, Lévy-Bachelot L, et al. Two year continuation rates of contraceptive methods in France: a cohort study from the French national health insurance database.

<https://doi.org/101080/1362518720181535653>. 2018 Nov 2;23(6):421–6.

75. Stuart JE, Secura GM, Zhao Q, Pittman ME, Peipert JF. Factors associated with 12-month discontinuation among contraceptive pill, patch, and ring users. *Obstet Gynecol*. 2013 Feb;121(2 PART 1):330–6.
76. Higgins JA, Smith NK. The sexual acceptability of contraception: Reviewing the literature and building a new concept. *J Sex Res*. 2016 May 3;53(4–5):417–56.
77. Killick SR, Leary C, Trussell J, Guthrie KA. Sperm content of pre-ejaculatory fluid. *Hum Fertil (Camb)*. 2011 Mar;14(1):48–52.
78. Berglund Scherwitzl E, Gemzell Danielsson K, Sellberg JA, Scherwitzl R. Fertility awareness-based mobile application for contraception. *Eur J Contracept Reprod Heal Care*. 2016 May 3;21(3):234–41.
79. Wilcox AJ, Dunson D, Baird DD. The timing of the “fertile window” in the menstrual cycle: day specific estimates from a prospective study. *BMJ*. 2000 Nov 18;321(7271):1259–62.
80. Wilcox AJ, Weinberg CR, Baird DD. Timing of Sexual Intercourse in Relation to Ovulation — Effects on the Probability of Conception, Survival of the Pregnancy, and Sex of the Baby. *N Engl J Med*. 1995 Dec 7;333(23):1517–21.
81. Daniels K, Daugherty J, Jones J. NCHS Data Brief, Number 173, December 2014. 2011;
82. Whittum M, Schickler R, Fanarjian N, Rapkin R, Nguyen BT. The History of Female Surgical Sterilization. *J Gynecol Surg*. 2021 Dec 1;37(6):459–64.
83. Leavesley JH. Brief history of vasectomy. *Fam Plann Inf Serv*. 1980 Dec;1(5):2–3.
84. Mahdy H, Shaeffer AD, McNabb DM. *Condoms*. StatPearls Publishing, Treasure Island (FL); 2021.

85. Harvey SM, Bird ST, Branch MR. A New Look at an Old Method: The Diaphragm. *Perspect Sex Reprod Health*. 2003 Sep;35(05):270–3.
86. Evolutionary Voyage of Modern Birth Control Methods. *Hong Kong J Gynaecol Obstet Midwifery*. 2005;5(1).
87. Birgisson NE, Zhao Q, Secura GM, Madden T, Peipert JF. Preventing Unintended Pregnancy: The Contraceptive CHOICE Project in Review. *J Women’s Heal*. 2015;
88. The American College of Obstetrician and Gynecologists. Long-Acting Reversible Contraception (LARC): IUD and Implant. *Acog*. 2016;1–4.
89. NICE. Long-acting reversible contraception | Clinical guideline [Internet]. NICE; 2014 [cited 2019 Mar 22]. Available from: <https://www.nice.org.uk/guidance/cg30/chapter/1-Recommendations>
90. Walsh-Buhi ER, Helmy HL. Trends in long-acting reversible contraceptive (LARC) use, LARC use predictors, and dual-method use among a national sample of college women. <https://doi.org/101080/0744848120171399397>. 2018 May 19;66(4):225–36.
91. World Health Organization. Family Planning - A global handbook for providers 2018.
92. Andrade ATL, Edelman DA, Ji G, Grimes DA, Hagenfeldt K, Johannisson E, et al. Mechanism of action, safety and efficacy of intrauterine devices. *World Health Organization - Technical Report Series*. 1987. p. 7–91.
93. Ortiz ME, Croxatto HB, Bardin CW. Mechanisms of action of intrauterine devices. *Obstet Gynecol Surv*. 1996 Dec;51(12 Suppl):S42-51.
94. Roepke CL, Schaff EA. Long Tail Strings: Impact of the Dalkon Shield 40 Years Later. *Open J Obstet Gynecol*. 2014 Nov 27;04(16):996–1005.
95. The Dalkon Shield. *FDA Consum*. 1975 Feb;9(1):21.

96. Daling JR, Weiss NS, Metch BJ, Chow WH, Soderstrom RM, Moore DE, et al. Primary Tubal Infertility in Relation to the Use of an Intrauterine Device. *N Engl J Med*. 1985;312(15):937–41.
97. Cramer DW, Schiff I, Schoenbaum SC, Gibson M, Belisle S, Albrecht B, et al. Tubal Infertility and the Intrauterine Device. *N Engl J Med*. 1985;312(15):941–7.
98. Tatum HJ, Schmidt FH, Phillips D, McCarty M, O'leary WM. The Dalkon Shield Controversy: Structural and Bacteriological Studies of IUD Tails. *JAMA*. 1975 Feb 17;231(7):711–7.
99. Ory HW. A review of the association between intrauterine devices and acute pelvic inflammatory disease. *J Reprod Med Obstet Gynecol*. 1978 Apr;20(4):200–4.
100. Farley TMM, Rowe PJ, Meirik O, Rosenberg MJ, Chen JH, Rowe PJ, et al. Intrauterine devices and pelvic inflammatory disease: an international perspective. *Lancet*. 1992 Mar 28;339(8796):785–8.
101. Skjeldestad FE. The impact of intrauterine devices on subsequent fertility. *Curr Opin Obstet Gynecol*. 2008 Jun;20(3):275–80.
102. Hubacher D, Lara-Ricalde R, Taylor DJ, Guerra-Infante F, Guzmán-Rodríguez R. Use of Copper Intrauterine Devices and the Risk of Tubal Infertility among Nulligravid Women. *N Engl J Med*. 2001 Aug 23;345(8):561–7.
103. Ortiz ME, Croxatto HB. Copper-T intrauterine device and levonorgestrel intrauterine system: biological bases of their mechanism of action. *Contraception*. 2007 Jun 1;75(6):S16–30.
104. Faculty of Sexual & Reproductive Healthcare (FSRH). *Buku Clinical Guidance Intrauterine Contraception*. *Fac Sex Reprod Healthc*. 2015;2015(April 2015):19.
105. Hubacher D, Chen PL, Park S. Side effects from the copper IUD: do they decrease over time? *Contraception*. 2009 May;79(5):356.
106. Kivijärvi A, Timonen H, Rajamäki A, Grönroos M. Iron deficiency in women using modern copper intrauterine devices. *Obstet Gynecol*. 1986 Jan;67(1):95–8.

107. Gemzell-Danielsson K, Kubba A, Caetano C, Faustmann T, Lukkari-Lax E, Heikinheimo O. Thirty years of mirena: A story of innovation and change in women's healthcare. *Acta Obstet Gynecol Scand*. 2021 Apr 1;100(4):614.
108. Nilsson CG. Comparative quantitation of menstrual blood loss with a d-norgestrel-releasing IUD and a Nova-T-copper device. *Contraception*. 1977 Apr 1;15(4):379–87.
109. MIRENA depotlääkevalmiste, kohtuun 20 mikrog/24 h - Pharmaca Fennica [Internet]. [cited 2022 Feb 16]. Available from: <https://pharmacafennica.fi/spc/2025731>
110. Gustaf Nilsson C, A Lahteenmaki PL, Tapani Luukkainen Md. Ovarian function in amenorrheic and menstruating users of a levonorgestrel-releasing intrauterine device*. *Fertil Steril*. 1984;41(1).
111. Critchley HOD, Wang H, Jones RL, Kelly RW, Drudy TA, Gebbie AE, et al. Morphological and functional features of endometrial decidualization following long-term intrauterine levonorgestrel delivery. *Hum Reprod*. 1998;13(5):1218–24.
112. Rose S, Chaudhari A, Peterson CM. Mirena® (Levonorgestrel intrauterine system): A successful novel drug delivery option in contraception. *Adv Drug Deliv Rev*. 2009 Aug 10;61(10):808–12.
113. Bednarek PH, Jensen JT. Safety, efficacy and patient acceptability of the contraceptive and non-contraceptive uses of the LNG-IUS. *Int J Womens Health*. 2009;1(1):45.
114. Luukkainen T, Allonen H, Haukkamaa M, Lähtenmäki P, Nilsson CG, Toivonen J. Five years' experience with levonorgestrel-releasing IUDs. *Contraception*. 1986 Feb 1;33(2):139–48.
115. FSRH Clinical Guideline: Intrauterine Contraception (April 2015, amended September 2019) - Faculty of Sexual and Reproductive Healthcare [Internet]. [cited 2022 Feb 7]. Available from: <https://www.fsrh.org/standards-and-guidance/documents/ceuguidanceintrauterinecontraception/>
116. JAYDESS depotlääkevalmiste, kohtuun 13,5 mg - Pharmaca Fennica

- [Internet]. [cited 2022 Feb 16]. Available from: <https://pharmacafennica.fi/spc/2027220>
117. KYLEENA depotlääkevalmiste, kohtuun 19,5 mg - Pharmaca Fennica [Internet]. [cited 2022 Feb 16]. Available from: <https://pharmacafennica.fi/spc/4668481>
 118. Runsaat kuukautisvuodot [Internet]. [cited 2022 Feb 18]. Available from: <https://www.kaypahoito.fi/hoi50033>
 119. Overview | Heavy menstrual bleeding: assessment and management | Guidance | NICE [Internet]. [cited 2022 May 20]. Available from: <https://www.nice.org.uk/guidance/ng88>
 120. Sivin I, Nash HA, Waldman SN. Jadelle® levonorgestrel rod implants: A summary of scientific data and lessons learned from programmatic experience.
 121. Darney P, Patel A, Rosen K, Shapiro LS, Kaunitz AM. Safety and efficacy of a single-rod etonogestrel implant (Implanon): results from 11 international clinical trials. *Fertil Steril*. 2009 May 1;91(5):1646–53.
 122. Contraceptive Implants | KFF [Internet]. [cited 2022 Feb 21]. Available from: <https://www.kff.org/womens-health-policy/fact-sheet/contraceptive-implants/>
 123. Faundes A, Brache V, Tejada AS, Cochon L, Alvarez-Sanchez F. Ovulatory dysfunction during continuous administration of low-dose levonorgestrel by subdermal implants. *Fertil Steril*. 1991 Jul 1;56(1):27–31.
 124. Brache V, Alvarez-Sanchez F, Faundes A, Tejada A, Cochon L. Ovarian endocrine function through five years of continuous treatment with NORPLANT subdermal contraceptive implants. *Contraception*. 1990;41(2):169–77.
 125. Croxatto HB, Díaz S, Salvatierra AM, Morales P, Ebensperger C, Brandeis A. Treatment with NORPLANTR subdermal implants inhibits sperm penetration through cervical mucus in vitro. *Contraception*. 1987 Aug 1;36(2):193–201.
 126. Mäkäräinen L, Van Beek A, Tuomivaara L, Asplund B, Bennink HC.

- Ovarian Function During the Use of a Single Contraceptive Implant: Implanon Compared with Norplant 1. *Fertil Steril*. 1998 Apr 1;69(4):714–21.
127. Croxatto HB, Mäkäräinen L. The pharmacodynamics and efficacy of Implanon® 1: An overview of the data. *Contraception*. 1998 Dec 1;58(6):915-97S.
 128. Ali M, Akin A, Bahamondes L, Brache V, Habib N, Landoulsi S, et al. Extended use up to 5 years of the etonogestrel-releasing subdermal contraceptive implant: comparison to levonorgestrel-releasing subdermal implant. *Hum Reprod*. 2016 Nov 1;31(11):2491.
 129. McNicholas C, Swor E, Wan L, Peipert JF. Prolonged Use of the Etonogestrel Implant and Levonorgestrel Intrauterine Device - Two Years Beyond FDA-Approved Duration. *Am J Obstet Gynecol*. 2017 Jun 1;216(6):586.e1.
 130. Mornar S, Chan LN, Mistretta S, Neustadt A, Martins S, Gilliam M. Pharmacokinetics of the etonogestrel contraceptive implant in obese women. *Am J Obstet Gynecol*. 2012;207(2):110.e1-110.e6.
 131. Rivera R, Yacobson I, Grimes D. The mechanism of action of hormonal contraceptives and intrauterine contraceptive devices. *Am J Obstet Gynecol*. 1999 Nov 1;181(5 I):1263–9.
 132. De Leo V, Musacchio MC, Cappelli V, Piomboni P, Morgante G. Hormonal contraceptives: Pharmacology tailored to women's health. *Hum Reprod Update*. 2016;22(5):634–46.
 133. Stanczyk FZ, Archer DF, Bhavnani BR. Ethinyl estradiol and 17 β -estradiol in combined oral contraceptives: Pharmacokinetics, pharmacodynamics and risk assessment. *Contraception*. 2013;87(6):706–27.
 134. CERAZETTE tabletti, kalvopäällysteinen 75 mikrog - Pharmaca Fennica [Internet]. [cited 2022 Feb 17]. Available from: <https://pharmacafennica.fi/spc/2083116>
 135. Palacios S, Regidor PA, Colli E, Skouby SO, Apter D, Roemer T, et al. Oestrogen-free oral contraception with a 4 mg drospirenone-only pill: new data and a review of the literature. *Eur J Contracept*

Reprod Heal Care. 2020 May 3;25(3):221–7.

136. Wren LM. Depo Provera: still controversial. *Int Heal news*. 1988 Feb;9(2):2-3,8.
137. FDA gives final approval to Depo amid concerns over safety, cost and coercion. *Wash Memo Alan Guttmacher Inst*. 1992 Nov;(17):2–3.
138. Injectable Contraceptives [Internet]. [cited 2022 Feb 23]. Available from: <https://www.fhi360.org/sites/default/files/webpages/Modules/INJ/s2pg15.htm>
139. Fimea. Myönnetyt ja perutut myyntiluvat. 2018.
140. THL. Steriloinnit 2016. 2017;
141. Steriloimislaki 283/1970 - Ajantasainen lainsäädäntö - FINLEX® [Internet]. [cited 2022 Feb 17]. Available from: <https://finlex.fi/fi/laki/ajantasa/1970/19700283>
142. Heino A, Gissler M. Steriloinnit 2020 Sterilointien määrä laski. 2022;1–5.
143. Sterilisations 2020 - THL [Internet]. [cited 2022 Feb 21]. Available from: <https://thl.fi/en/web/thlfi-en/statistics-and-data/statistics-by-topic/sexual-and-reproductive-health/sterilisations>
144. Higgins JA, Smith NK, Sanders SA, Schick V, Herbenick D, Reece M, et al. Dual method use at last sexual encounter: a nationally representative, episode-level analysis of US men and women: Prepared for resubmission to *Contraception*. *Contraception*. 2014;90:399–406.
145. Higgins JA, Smith NK. The Sexual Acceptability of Contraception: Reviewing the Literature and Building a New Concept. *J Sex Res*. 2016 May 3;53(4–5):417–56.
146. Larsson M, Aneblom G, Odling V, Tydén T. Reasons for pregnancy termination, contraceptive habits and contraceptive failure among Swedish women requesting an early pregnancy termination. *Acta Obstet Gynecol Scand*. 2002 Jan 1;81(1):64–71.

147. Heino A, Gissler M. Tilastoraportti 48/2021 Raskaudenkeskeytykset 2020. 2021.
148. Santelli JS, Morrow B, Anderson JE, Lindberg LD. Contraceptive Use and Pregnancy Risk Among U.S. High School Students, 1991-2003. *Perspect Sex Reprod Health*. 2006 Feb 1;38(02):106–11.
149. Higgins JA, Popkin RA, Santelli JS. Pregnancy Ambivalence and Contraceptive Use Among Young Adults in the United States. *Perspect Sex Reprod Health*. 2012 Dec;44(4):236–43.
150. Higgins JA. Pregnancy Ambivalence and Long-Acting Reversible Contraceptive (LARC) Use Among Young Adult Women: A Qualitative Study. *Perspect Sex Reprod Health*. 2017 Sep;49(3):149.
151. Black KI. Why do women experience untimed pregnancies? A review of contraceptive failure rates. *Best Pract Res Clin Obstet Gynaecol*. 2010;24:443–55.
152. Frost JJ, Darroch JE. Factors Associated with Contraceptive Choice and Inconsistent Method Use, United States, 2004. *Perspect Sex Reprod Health*. 2008 Jun 1;40(2):94–104.
153. Sundaram A, Vaughan B, Kost K, Bankole A, Finer L, Singh S, et al. Contraceptive Failure in the United States: Estimates from the 2006–2010 National Survey of Family Growth. *Perspect Sex Reprod Health*. 2017 Mar;49(1):7.
154. Menken J, Trussell J, Larsen U. Age and infertility. *Science* (80-). 1986;233(4771):1389–94.
155. Kühnert B, Nieschlag E. Reproductive functions of the ageing male. *Hum Reprod Update*. 2004 Jul 1;10(4):327–39.
156. Bradley SEK, Polis CB, Bankole A, Croft T. Global Contraceptive Failure Rates: Who Is Most at Risk? *Stud Fam Plann*. 2019 Mar 1;50(1):3–24.
157. Trussell J. Understanding contraceptive failure. *Best Pract Res Clin Obstet Gynaecol*. 2009 Apr;23(2):199.
158. FINSEX: Yhdyntätrendit - Väestöliitto.fi [Internet]. [cited 2022 Mar 2]. Available from: <https://www.vaestoliitto.fi/artikkelit/finsex->

yhdyntatrendit/

159. Black KI, Gupta S, Rassi A, Kubba A. Why do women experience untimed pregnancies? A review of contraceptive failure rates. *Best Pract Res Clin Obstet Gynaecol*. 2010 Aug 1;24(4):443–55.
160. Polis CB, Bradley SEK, Bankole A, Onda T, Croft T, Singh S. Typical-use contraceptive failure rates in 43 countries with Demographic and Health Survey data: Summary of a detailed report. *Contraception*. 2016 Jul 1;94(1):11–7.
161. Holt VL, Scholes D, Wicklund KG, Cushing-Haugen KL, Daling JR. Body mass index, weight, and oral contraceptive failure risk. *Obstet Gynecol*. 2005 Jan;105(1):46–52.
162. Dinger J, Do Minh T, Buttman N, Bardenheuer K. Effectiveness of oral contraceptive pills in a large U.S. cohort comparing progestogen and regimen. *Obstet Gynecol*. 2011 Jan;117(1):33–40.
163. Lopez LM, Bernholc A, Chen M, Grey TW, Otterness C, Westhoff C, et al. Hormonal contraceptives for contraception in overweight or obese women. *Cochrane Database Syst Rev*. 2016 Aug 18;2016(8).
164. Martin J, Kane S V., Feagins LA. Fertility and Contraception in Women With Inflammatory Bowel Disease. *Gastroenterol Hepatol (N Y)*. 2016 Feb 1;12(2):101.
165. Madden T, McNicholas C, Zhao Q, Secura GM, Eisenberg DL, Peipert JF. Association of age and parity with intrauterine device expulsion. *Obstet Gynecol*. 2014 Oct 10;124(4).
166. Hubacher D. Copper intrauterine device use by nulliparous women: review of side effects. *Contraception*. 2007 Jun 1;75(6 SUPPL.):S8–11.
167. Kaislasuo J, Heikinheimo O, Lähteenmäki P, Suhonen S. Menstrual characteristics and ultrasonographic uterine cavity measurements predict bleeding and pain in nulligravid women using intrauterine contraception. *Hum Reprod*. 2015 Feb 2;30(7):1580–8.
168. Behringer T, Reeves MF, Rossiter B, Chen BA, Schwarz EB. Duration of use of a levonorgestrel IUS amongst nulliparous and adolescent women. *Contraception*. 2011;84(5):e5.

169. van Eijk AM, Zulaika G, Lenchner M, Mason L, Sivakami M, Nyothach E, et al. Menstrual cup use, leakage, acceptability, safety, and availability: a systematic review and meta-analysis. *Lancet Public Heal*. 2019 Aug 1;4(8):e376–93.
170. Schnyer AN, Jensen JT, Edelman A, Han L. Do menstrual cups increase risk of IUD expulsion? A survey of self-reported IUD and menstrual hygiene product use in the United States. <https://doi.org/10.1080/1362518720191643836>. 2019 Sep 3;24(5):368–72.
171. Harrison-Woolrych M, Hill R. Unintended pregnancies with the etonogestrel implant (Implanon): A case series from postmarketing experience in Australia. *Contraception*. 2005 Apr 1;71(4):306–8.
172. Duerr A, Gallo MF, Warner L, Jamieson DJ, Kulczycki A, MacAluso M. Assessing male condom failure and incorrect use. *Sex Transm Dis*. 2011 Jul;38(7):580–6.
173. Gomez AM, Fuentes L, Allina A. Women or LARC First? Reproductive Autonomy and the Promotion of Long-Acting Reversible Contraceptive Methods. *Perspect Sex Reprod Health*. 2014 Sep;46(3):171.
174. Brunner Huber LR, Hogue CJ, Stein AD, Drews C, Zieman M, King J, et al. Contraceptive use and discontinuation: Findings from the contraceptive history, initiation, and choice study. *Am J Obstet Gynecol*. 2006 May 1;194(5):1290–5.
175. Blumenthal PD, Shah NM, Jain K, Saunders A, Clemente C, Lucas B, et al. Revitalizing long-Acting reversible contraceptives in settings with high unmet need: A multicountry experience matching demand creation and service delivery. *Contraception*. 2013;87(2):170–5.
176. Fraser IS. Non-contraceptive health benefits of intrauterine hormonal systems. *Contraception*. 2010 Nov;82(5):396–403.
177. Schindler AE. Non-contraceptive benefits of oral hormonal contraceptives. *Int J Endocrinol Metab*. 2013;11(1).
178. Sivin I. Risks and Benefits, Advantages and Disadvantages of

- Levonorgestrel-Releasing Contraceptive Implants. *Drug Saf* 2003 26(5):303–35.
179. Gray RH. Reduced risk of pelvic inflammatory disease with injectable contraceptives. *Lancet* (London, England). 1985 May 4;1(8436):1046.
180. Weiderpass E, Adami HO, Baron JA, Magnusson C, Lindgren A, Persson I. Use of oral contraceptives and endometrial cancer risk (Sweden). *Cancer Causes Control*. 1999;10(4):277–84.
181. Group on Epidemiological Studies on Endometrial Cancer C. Endometrial cancer and oral contraceptives: An individual participant meta-analysis of 27 276 women with endometrial cancer from 36 epidemiological studies. *Lancet Oncol*. 2015 Sep 1;16(9):1061–70.
182. Faber MT, Jensen A, Frederiksen K, Glud E, Høgdall E, Høgdall C, et al. Oral contraceptive use and impact of cumulative intake of estrogen and progestin on risk of ovarian cancer. *Cancer Causes Control*. 2013 Dec 1;24(12):2197–206.
183. Robakis T, Williams KE, Nutkiewicz L, Rasgon NL. Hormonal Contraceptives and Mood: Review of the Literature and Implications for Future Research. *Curr Psychiatry Reports* 2019 217. 2019 Jun 6;21(7):1–9.
184. Both S, Lew-Starowicz M, Luria M, Sartorius G, Maseroli E, Tripodi F, et al. Hormonal Contraception and Female Sexuality: Position Statements from the European Society of Sexual Medicine (ESSM). *J Sex Med*. 2019 Nov 1;16(11):1681–95.
185. Buchan H, Villard-Macintosh L, Vessey M, Yeates D, McPherson K. Epidemiology of pelvic inflammatory disease in parous women with special reference to intrauterine device use. *Br J Obstet Gynaecol*. 1990;97(9):780–8.
186. Birgisson NE, Zhao Q, Secura GM, Madden T, Peipert JF. Positive Testing for *Neisseria gonorrhoeae* and *Chlamydia trachomatis* and the Risk of Pelvic Inflammatory Disease in IUD Users. *J Women's Heal*. 2015 May 1;24(5):354.

187. Madden T, Allsworth JE, Hladky KJ, Secura GM, Peipert JF. Intrauterine contraception in Saint Louis: a survey of obstetrician and gynecologists' knowledge and attitudes. *Contraception*. 2010 Feb 1;81(2):112–6.
188. Bohm MK, Newman L, Satterwhite CL, Tao G, Weinstock HS. Pelvic inflammatory disease among privately insured women, United States, 2001-2005. *Sex Transm Dis*. 2010 Mar;37(3):131–6.
189. Toiconen J, Luukkainen T, Allonen H. Protective Effect of Intrauterine Release of Levonorgestrel on Pelvic Infection: Three Years' Comparative Experience of Levonorgestrel- and Copper-Releasing Intrauterine Devices. *Obstet Gynecol*. 1991;77(2).
190. Watkins ES. The Comeback of the IUD in Twenty-First Century USA. *J Hist Med Allied Sci*. 2021 Apr 8;76(2):191–216.
191. The intrauterine device. *Int J Gynecol Obstet*. 1993 May 1;41(2):189–93.
192. Piccinino LJ, Mosher WD, Piccinino BLJ, Mosher WD. Trends in Contraceptive Use in the United States : 1982-1995 All use subject to <http://about.jstor.org/terms> ARTI ([[S Trends in Contraceptive Use In the United States : 1982-1995. 2016;30(1):4–10.
193. ACOG practice bulletin. Clinical management guidelines for obstetrician-gynecologists. Number 59, January 2005. Intrauterine device. *Obstet Gynecol*. 2005 Jan;105(1):223.
194. National Collaborating Centre for Women's and Children's Health (UK). Long-acting Reversible Contraception: The Effective and Appropriate Use of Long-Acting Reversible Contraception. London; 2005.
195. ACOG Committee Opinion No. 392, December 2007. Intrauterine device and adolescents. *Obstet Gynecol*. 2007 Dec;110(6):1493–5.
196. Klein JD, Barratt MS, Blythe MJ, Braverman PK, Diaz A, Rosen DS, et al. Contraception and adolescents. *Pediatrics*. 2007 Nov;120(5):1135–48.
197. ACOG Committee Opinion no. 450: Increasing use of contraceptive implants and intrauterine devices to reduce unintended pregnancy.

- Obstet Gynecol. 2009 Dec;114(6):1434–8.
198. ACOG Practice Bulletin No. 121: Long-acting reversible contraception: Implants and intrauterine devices. *Obstet Gynecol.* 2011 Jul;118(1):184–96.
 199. Committee on adolescence. Contraception for adolescents. *Pediatrics.* 2014;134(4):e1244–56.
 200. Oddens BJ, Visser AP, Vemer HM, Everaerd WTAM, Lehert P. Contraceptive use and attitudes in Great Britain. *Contraception.* 1994;49(1):73–86.
 201. Makkonen K, Hemminki E, Tuimala R. Contraception in Finland — with a focus on IUDs. *Eur J Public Health.* 1993 Jan 1;3(4):249–53.
 202. Gray RH. Manual for the provision of intrauterine devices (IUDs). 1980.
 203. World Health Organization. Intrauterine devices: technical and managerial guidelines for services TT - Intrauterine devices: technical and managerial guidelines for services. 1997. p. 175.
 204. World Health Organization. Reproductive Health and Research, World Health Organization. Medical eligibility criteria for contraceptive use, 4th ed. 2009. 268 p.
 205. WHO. Medical eligibility criteria for contraceptive use, Fifth edition [Internet]. 2015 [cited 2018 Mar 18]. Available from: http://apps.who.int/iris/bitstream/10665/181468/1/9789241549158_eng.pdf
 206. World Health Organization D if C and AHe and D. Contraception Issues in Adolescent Health and Development. Nursing standard (Royal College of Nursing (Great Britain) : 1987). 2004.
 207. Berenson AB, Tan A, Hirth JM, Wilkinson GS. Complications and continuation of intrauterine device use among commercially insured teenagers. *Obstet Gynecol.* 2013 May;121(5):951–8.
 208. Bahamondes MV, Hidalgo MM, Bahamondes L, Monteiro I. Ease of insertion and clinical performance of the levonorgestrel-releasing intrauterine system in nulligravidas. *Contraception.* 2011 Nov

1;84(5):e11–6.

209. Suhonen S, Haukkamaa M, Jakobsson T, Rauramo I. Clinical performance of a levonorgestrel-releasing intrauterine system and oral contraceptives in young nulliparous women: a comparative study. *Contraception*. 2004 May 1;69(5):407–12.
210. French RS, Gibson L, Geary R, Glasier A, Wellings K. Changes in the prevalence and profile of users of contraception in Britain 2000–2010: evidence from two National Surveys of Sexual Attitudes and Lifestyles. *BMJ Sex Reprod Heal*. 2020 Jul 1;46(3):200–9.
211. Lindberg LD, Santelli JS, Desai S. Changing Patterns of Contraceptive Use and the Decline in Rates of Pregnancy and Birth Among U.S. Adolescents, 2007–2014. *J Adolesc Heal*. 2018 Aug 1;63(2):253–6.
212. Daniels K, Daugherty J, Jones J, Mosher W. Current contraceptive use and variation by selected characteristics among women aged 15–44: United States, 2011–2013. *Natl Health Stat Report*. 2015 Nov 10;2015(86).
213. Hognert H, Skjeldestad FE, Gemzell-Danielsson K, Heikinheimo O, Milsom I, Lidegaard Ø, et al. Ecological study on the use of hormonal contraception, abortions and births among teenagers in the Nordic countries. *BMJ Open*. 2018;8(10):1–9.
214. NOVA T 380 kohdunsisäinen ehkäisin - Pharmaca Fennica [Internet]. [cited 2022 Mar 16]. Available from: <https://pharmacafennica.fi/spc/3515563>
215. Sanders JN, Adkins DE, Kaur S, Storck K, Gawron LM. Bleeding, cramping, and satisfaction among new copper IUD users: A prospective study. *PLoS One*. 2018 Nov 1;13(11).
216. Long-Acting Reversible Contraception: Implants and Intrauterine Devices | ACOG [Internet]. [cited 2022 May 3]. Available from: <https://www.acog.org/clinical/clinical-guidance/practice-bulletin/articles/2017/11/long-acting-reversible-contraception-implants-and-intrauterine-devices>
217. WHO. Medical eligibility criteria for contraceptive use, Fourth edition. 2009.

218. Bearak J, Popinchalk A, Alkema L, Sedgh G. Global, regional, and subregional trends in unintended pregnancy and its outcomes from 1990 to 2014: estimates from a Bayesian hierarchical model. *Lancet Glob Heal*. 2018 Apr 1;6(4):e380–9.
219. Bearak J, Popinchalk A, Ganatra B, Moller AB, Tunçalp Ö, Beavin C, et al. Unintended pregnancy and abortion by income, region, and the legal status of abortion: estimates from a comprehensive model for 1990–2019. *Lancet Glob Heal*. 2020 Sep 1;8(9):e1152–61.
220. Roe overturned: What you need to know about the Supreme Court abortion decision [Internet]. [cited 2022 Jul 11]. Available from: <https://theconversation.com/roe-overturned-what-you-need-to-know-about-the-supreme-court-abortion-decision-184692>
221. Cleland J. The complex relationship between contraception and abortion. *Best Pract Res Clin Obstet Gynaecol*. 2020 Jan 1;62:90–100.
222. United Nations. Abortion Policies and Reproductive Health around the World. *Economic & Social Affairs*. 2014. 1–49 p.
223. The World’s Abortion Laws - Center for Reproductive Rights [Internet]. [cited 2022 May 2]. Available from: <https://reproductiverights.org/maps/worlds-abortion-laws/>
224. EUROPEAN DATA – ABORT report [Internet]. [cited 2022 Mar 24]. Available from: <https://abort-report.eu/europe/>
225. Laki raskauden keskeyttämisestä 239/1970 - Ajantasainen lainsäädäntö - FINLEX[®] [Internet]. [cited 2022 Apr 25]. Available from: <https://www.finlex.fi/fi/laki/ajantasa/1970/19700239>
226. Sveriges Kommuner och Landsting. Rekommendation om gemensam enhetlig modell för preventivmedelssubvention. 2013.
227. Sydsjö A, Sydsjö G, Bladh M, Josefsson A. Reimbursement of hormonal contraceptives and the frequency of induced abortion among teenagers in Sweden. *BMC Public Health*. 2014 May 29;14(1):1–7.
228. Birth Control and the Contraceptive Pill on the NHS – People’s History of the NHS [Internet]. [cited 2022 Mar 24]. Available from:

<https://peopleshistorynhs.org/encyclopaedia/birth-control-on-the-nhs/>

229. Peipert JF, Madden T, Allsworth JE, Secura GM. Preventing unintended pregnancies by providing no-cost contraception. *Obstet Gynecol.* 2012 Dec;120(6):1291–7.
230. Secura GM, Allsworth JE, Madden T, Mullersman JL, Peipert JF. The Contraceptive CHOICE Project: reducing barriers to long-acting reversible contraception. *Am J Obs Gynecol.* 2010 Aug;203(2):115.e7.
231. Birth Control Methods & Options | Types of Birth Control [Internet]. [cited 2022 May 16]. Available from: <https://www.plannedparenthood.org/learn/birth-control>
232. R Core Team. R: A language and environment for statistical computing. R Foundation for Statistical Computing [Internet]. 2020. Available from: <https://www.r-project.org/>.
233. Gyllenberg F, Saloranta T, But A, Gissler M, Heikinheimo O. Predictors of choosing long-acting reversible contraceptive methods when provided free-of-charge – A prospective cohort study in Finland. *Contraception.* 2020;101(6):370–5.
234. Eeckhaut MCW, Sweeney MM, Gipson JD. Who Is Using Long-Acting Reversible Contraceptive Methods? Findings from Nine Low-Fertility Countries. *Perspect Sex Reprod Health.* 2014 Sep;46(3):149–55.
235. Kavanaugh ML, Jerman J, Finer LB. Changes in Use of Long-Acting Reversible Contraceptive Methods Among U.S. Women, 2009–2012. *Obstet Gynecol.* 2015 Oct 20;126(5):917–27.
236. Kavanaugh ML, Jerman J, Hubacher D, Kost K, Finer LB. Characteristics of women in the United States who use long-acting reversible contraceptive methods. *Obstet Gynecol.* 2011 Jun;117(6):1349–57.
237. Garbers S, Correa N, Tobier N, Blust S, Chiasson MA. Association between symptoms of depression and contraceptive method choices among low-income women at urban reproductive health

- centers. *Matern Child Health J.* 2010 Jan;14(1):102–9.
238. Francis J, Presser L, Malbon K, Braun-Courville D, Linares LO. An exploratory analysis of contraceptive method choice and symptoms of depression in adolescent females initiating prescription contraception. *Contraception.* 2015 Apr 1;91(4):336–43.
239. Frontpage - Sotkanet.fi Statistics and Indicator Bank [Internet]. [cited 2021 Jan 29]. Available from: <https://sotkanet.fi/sotkanet/en/index?>
240. Terveyden- ja sosiaalihuollon yksikkökustannukset Suomessa vuonna 2017 [Internet]. [cited 2022 Jul 18]. Available from: <https://www.julkari.fi/handle/10024/142882>
241. HUS. Palveluhinnasto 2022 Osa 1 Tuoteperusteiset sairaanhoidolliset palvelut. 2022;
242. NHS Contraceptive Services: England, Community Contraceptive Clinics Statistics for 2013-14. 2014.
243. Klemetti R, Hakulinen-Viitanen T. Kansallinen äitiyshuollon asiantuntijaryhmä, Äitiysneuvolaopas suosituksia äitiysneuvolatoimintaan. THL; 2013.
244. Toffol E, But A, Heikinheimo O, Latvala A, Partonen T, Haukka J. Associations between hormonal contraception use, sociodemographic factors and mental health: A nationwide, register-based, matched case-control study. *BMJ Open.* 2020 Oct 15;10(10).
245. Hall KS, Steinberg JR, Cwiak CA, Allen RH, Marcus SM. Contraception and Mental Health: A Commentary on the Evidence and Principles for Practice. *Am J Obstet Gynecol.* 2015 Jun 1;212(6):740.
246. Aoun J, Dines VA, Stovall DW, Mete M, Nelson CB, Gomez-Lobo V. Effects of age, parity, and device type on complications and discontinuation of intrauterine devices. *Obstet Gynecol.* 2014 Mar;123(3):585–92.
247. Velic I, Ploner A, Sparén P, Marions L, Herrmann B, Kühlmann-Berenzon S. Sexual and testing behaviour associated with Chlamydia trachomatis infection: a cohort study in an STI clinic in

Sweden.

248. Den Tonkelaar I, Oddens BJ. Preferred frequency and characteristics of menstrual bleeding in relation to reproductive status, oral contraceptive use, and hormone replacement therapy use. *Contraception*. 1999 Jun 1;59(6):357–62.
249. Zigler RE, McNicholas C. Unscheduled vaginal bleeding with progestin-only contraceptive use. *Am J Obstet Gynecol*. 2017 May 1;216(5):443–50.
250. Weisberg E, Bateson D, McGeechan K, Mohapatra L. A three-year comparative study of continuation rates, bleeding patterns and satisfaction in Australian women using a subdermal contraceptive implant or progestogen releasing-intrauterine system. *Eur J Contracept Reprod Heal Care*. 2014 Feb 14;19(1):5–14.
251. Grunloh DS, Casner T, Secura GM, Peipert JF, Madden T. Characteristics Associated With Discontinuation of Long-Acting Reversible Contraception Within the First 6 Months of Use. *Obstet Gynecol*. 2013;122(6):1214–21.
252. Rodrigues-Martins D, Lebre A, Santos J, Braga J. Association between contraceptive method chosen after induced abortion and incidence of repeat abortion in Northern Portugal. <https://doi.org/10.1080/1362518720201764527>. 2020 Jul 3;25(4):259–63.
253. Kilander H, Alehagen S, Svedlund L, Westlund K, Thor J, Brynhildsen J. Likelihood of repeat abortion in a Swedish cohort according to the choice of post-abortion contraception: A longitudinal study. *Acta Obstet Gynecol Scand*. 2016 May 1;95(5):565–71.
254. McNicholas C, Madden T, Secura G, Peipert JF. The Contraceptive CHOICE Project Round Up: what we did and what we learned. *Clin Obstet Gynecol*. 2014;57(4):635.
255. McNicholas CP, Klugman JB, Zhao Q, Peipert JF. Condom use and incident sexually transmitted infection after initiation of long-acting reversible contraception. *Am J Obstet Gynecol*. 2017 Dec 1;217(6):672.e1-672.e6.

256. Mendoza RM, Garbers S, Lin S, Stockwell MS, Warren M, Gold MA. Chlamydia Infection Among Adolescent Long-Acting Reversible Contraceptive and Shorter-Acting Hormonal Contraceptive Users Receiving Services at New York City School-Based Health Centers. *J Pediatr Adolesc Gynecol*. 2020 Feb 1;33(1):53–7.
257. Bhavsar AK, Gelner EJ, Shorma T. Common Questions About the Evaluation of Acute Pelvic Pain. Vol. 93, *American Family Physician*. 2016 Jan.
258. Heinemann K, Reed S, Moehner S, Minh T Do. Comparative contraceptive effectiveness of levonorgestrel-releasing and copper intrauterine devices: the European Active Surveillance Study for Intrauterine Devices. *Contraception*. 2015 Apr 1;91(4):280–3.
259. Heino A, Niinimäki M, Mentula M, Gissler M. How reliable are health registers? Registration of induced abortions and sterilizations in Finland. *Informatics Heal Soc Care*. 2018 Jul 3;43(3):310–9.
260. Gissler M, Haukka J. Finnish health and social welfare registers in epidemiological research. *Nor Epidemiol*. 2004 Oct 14;14(1):113–20.
261. Sund R. Quality of the Finnish Hospital Discharge Register: A systematic review. *Scand J Public Health*. 2012;40(6):505–15.
262. Henkilötietolaki 523/1999 - Säädökset alkuperäisinä - FINLEX[®] [Internet]. [cited 2022 Apr 8]. Available from: <https://www.finlex.fi/fi/laki/alkup/1999/19990523>
263. National Health Insurance - kela.fi [Internet]. [cited 2020 Apr 3]. Available from: <https://www.kela.fi/web/en/national-health-insurance>
264. Kelasto - Sairaanhoitokorvausten saajat/ Erikoislääkärit 2013 - 2015 [Internet]. [cited 2020 Apr 3]. Available from: http://raportit.kela.fi/ibi_apps/WFServlet?IBIF_ex=NIT129BL
265. Gyllenberg F., Juselius M., Gissler M. HO, Gyllenberg F, Juselius M, Gissler M, Heikinheimo O. Long-Acting Reversible Contraception Free of Charge, Method Initiation, and Abortion Rates in Finland. *Am J Public Health*. 2018 Apr;In Press(4):538–43.

266. Sznajder KK, Tomaszewski KS, Burke AE, Trent M. Incidence of Discontinuation of Long-Acting Reversible Contraception among Adolescent and Young Adult Women Served by an Urban Primary Care Clinic. *J Pediatr Adolesc Gynecol*. 2017 Feb 1;30(1):53–7.
267. Mavranouzouli I. The cost-effectiveness of long-acting reversible contraceptive methods in the UK: analysis based on a decision-analytic model developed for a National Institute for Health and Clinical Excellence (NICE) clinical practice guideline. *Hum Reprod*. 2008 Jun 11;23(6):1338–45.
268. Hubacher D, Spector H, Monteith C, Chen P-LL, Hart C. Long-acting reversible contraceptive acceptability and unintended pregnancy among women presenting for short-acting methods: a randomized patient preference trial. *Am J Obstet Gynecol*. 2017 Feb;216(2):101–9.
269. Backman T, Huhtala S, Luoto R, Tuominen J, Rauramo I, Koskenvuo M. Advance information improves user satisfaction with the levonorgestrel intrauterine system. *Obstet Gynecol*. 2002 Apr 1;99(4):608–13.
270. Leeman L. Medical Barriers to Effective Contraception. *Obstet Gynecol Clin North Am*. 2007 Mar;34(1):19–29.