

GYNECOLOGY

Free-of-charge long-acting reversible contraception: two-year discontinuation, its risk factors, and reasons

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BACKGROUND: Since 2013, the residents of the city of Vantaa, Finland, have been offered their first long-acting reversible contraceptive method (levonorgestrel-releasing intrauterine system, implant, and copper intrauterine device) free of charge.

OBJECTIVE: The primary aim of this study was to assess the 2-year cumulative discontinuation rates of long-acting reversible contraceptive methods when provided free of charge for first-time users in a real-world setting. Additional aims were to describe factors associated with discontinuation and to evaluate the reasons for discontinuation.

STUDY DESIGN: This is a retrospective register-based cohort study of 2026 nonsterilized women aged 15 to 44 years, who initiated a free-of-charge long-acting contraceptive method in 2013–2014 in the city of Vantaa. Removals within 2 years after method initiation and reasons for discontinuation were obtained from electronic health records and from national registers. We calculated the 2-year cumulative incidence rates of discontinuation with 95% confidence intervals for each method. Furthermore, we assessed crude and adjusted incidence rate ratios of discontinuation with 95% confidence interval by Poisson regression models comparing implants and copper intrauterine device with levonorgestrel-releasing intrauterine systems.

RESULTS: During the 2-year follow-up, 514 women discontinued, yielding a cumulative discontinuation rate of 28.3 per 100 women-years (95% confidence interval, 26.2–30.4). Among the 1199 women who initiated the levonorgestrel-releasing intrauterine system, the cumulative discontinuation rate was 24.2 per 100 women-years (95% confidence interval, 21.7–26.9); among the 642 implant users, 33.3 per 100 women-years (95% confidence interval, 29.5–37.4); and among the 185 copper intrauterine device users, 37.8 per 100 women-years (95% confidence interval, 31.0–45.7).

Compared with women aged 30 to 44 years, women aged 15 to 19 years (adjusted incidence rate ratio, 1.58; 95% confidence interval, 1.17–2.14)

and 20 to 29 years (adjusted incidence rate ratio, 1.35; 95% confidence interval, 1.11–1.63) were more likely to discontinue. We observed a higher discontinuation rate in women who had given birth within the previous year (adjusted incidence rate ratio, 1.36; 95% confidence interval, 1.13–1.65), spoke a native language other than Finnish or Swedish (adjusted incidence rate ratio, 1.31; 95% confidence interval, 1.06–1.63), and had a history of a sexually transmitted infection (adjusted incidence rate ratio, 1.62; 95% confidence interval, 1.07–2.46). No association was found in marital status, overall parity, history of induced abortion, socioeconomic status, education level, or smoking status.

The most common reason for discontinuation was bleeding disturbances, reported by 21% of women who discontinued the levonorgestrel-releasing intrauterine system, by 71% who discontinued the implant, and by 41% who discontinued the copper intrauterine device. One in 4 women who discontinued the copper intrauterine device reported heavy menstrual bleeding, whereas only 1% who discontinued the levonorgestrel-releasing intrauterine system and none who discontinued implants reported this reason. Abdominal pain was the reported reason for discontinuation in 20% of both intrauterine device users and in only 2% who discontinued implants.

CONCLUSION: At 2 years, the use of implants and copper intrauterine devices was more likely to be discontinued than that of the levonorgestrel-releasing intrauterine system. Women younger than 30 years and those who gave birth in the preceding year, spoke a native language other than Finnish or Swedish, or had a history of sexually transmitted infections were more likely to discontinue. The levonorgestrel-releasing intrauterine system was least likely to be removed owing to bleeding disturbances.

Key words: adverse effects, contraception, contraceptive implants, copper intrauterine devices, discontinuation, family planning, intrauterine devices, levonorgestrel-releasing intrauterine system

Discontinuation of oral contraception is common, with approximately 45% to 55% of women discontinuing within the first 6 to 12 months.^{1,2} Notably lower discontinuation rates have been reported for long-

acting reversible contraceptive (LARC) methods, that is, the levonorgestrel-releasing intrauterine system (LNG-IUS), implants, and copper intrauterine devices (Cu-IUDs).^{1,3–5} However, previous studies have reported conflicting results on the discontinuation rates of individual LARC methods and on factors associated with discontinuation.^{1,3,5–8}

In the city of Vantaa, in Helsinki's metropolitan area, Finland, women have been offered their first LARC method free of charge since 2013. We have previously reported that uptake of LARC methods increased and rates of induced

abortion declined after the introduction of this public program.⁹

For implementation of programs offering free-of-charge LARC methods, it is essential to evaluate the discontinuation rates of different LARC methods, especially because the results on discontinuation vary and discontinuation is a key determinant of cost efficacy.¹⁰ It is equally important to have data on discontinuation rates to ensure adequate resources to provide easy access to LARC removal and ascertain reproductive autonomy.

The primary aim of this study was to assess the 2-year discontinuation rates of

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AJOG at a Glance

Why was this study conducted?

This study aimed to evaluate the 2-year cumulative discontinuation of long-acting reversible contraceptive (LARC) methods provided free of charge in a real-world setting.

Key findings

The 2-year cumulative discontinuation of free-of-charge LARC methods was 28% (95% confidence interval [CI], 26–30). The levonorgestrel-releasing intrauterine system (LNG-IUS) had the lowest 2-year cumulative discontinuation. The following characteristics were associated with higher rates of discontinuation: age under 30 years, delivery within a year preceding LARC initiation, nonnational native language, and history of a sexually transmitted infection (STI). Implants and copper intrauterine devices (Cu-IUDs) were more likely to be discontinued because of bleeding disturbances than the LNG-IUS.

What does this add to what is known?

We found similar 2-year cumulative discontinuation of LARC methods when offered free of charge as reported previously with mixed-payer settings. Our findings emphasize the importance of an acceptable bleeding profile because bleeding disturbances were the most common reason for discontinuation.

different LARC methods among women initiating their first free-of-charge LARC method in the city of Vantaa in 2013–2014. The secondary aims were to describe factors associated with discontinuation and to evaluate the reasons for discontinuation.

Materials and Methods

In this retrospective register-based cohort study, we studied the discontinuation rate among women who initiated their first free-of-charge LARC method in 2013–2014 in the city of Vantaa, Finland. According to the Finnish Health Care Act, all preventive care visits—including contraceptive services—are offered without charges in public healthcare services.¹¹ The contraceptive methods are not reimbursed. Approximately 210,000 inhabitants in the city of Vantaa are offered contraceptive services in centralized family planning clinics within primary healthcare services. The clinics are frequently visited by 20% of reproductive-aged women using the services annually.⁹ Private healthcare is also available and is partially covered by the National Health Insurance.¹² About 18% of women of all ages in the city of Vantaa visited a private obstetrician-gynecologist in 2013.¹³ There are no data available on

which proportion of these visits were related to contraception.

Since 2013, all women in Vantaa have been offered their first free-of-charge LARC method at public family planning clinics. Available LARC methods in 2013–2014 were the 52-mg LNG-IUS, 13.5-mg LNG-IUS (since 2014), 380-mm² Cu-IUD, and the levonorgestrel- or etonogestrel-releasing implants. At the time of the study, the 52-mg LNG-IUS, levonorgestrel-releasing implants, and Cu-IUD were recommended for 5-year use, and the 13.5-mg LNG-IUS and etonogestrel-releasing implants were advised for 3-year use. In addition to LARC methods, women aged younger than 20 years received a 9-month supply of oral contraceptives or contraceptive rings, and all women received a 3-month supply when initiating or switching a method.

We identified 3210 women with at least 1 LARC insertion at the family planning clinics. Only the first LARC was included in the analyses. After applying exclusion criteria (Figure 1), the study cohort included 2026 nonsterilized female residents of Vantaa initiating their first LARC free of charge at the age of 15 to 44 years between 2013 and 2014. Women who purchased LARC themselves were excluded because they were

likely to represent a different group of women than first-time LARC users.

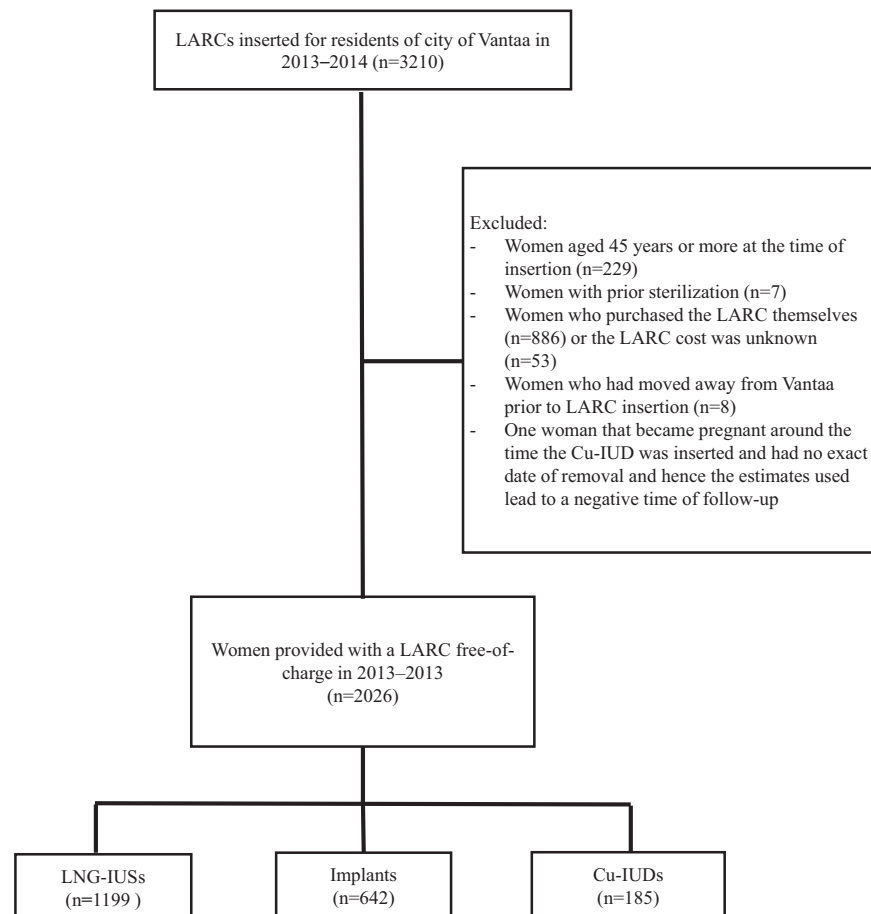
We identified LARC insertions from electronic patient records of family planning clinics based on a code, which is used to compensate general practitioners for LARC insertion. Data were extracted and reviewed by 3 researchers (T.H.S. and F.K.G. and a research nurse) between February 02, 2016, and December 20, 2017. The data included insertion date, whether the method was provided free of charge, brand of the device, date of LARC removal, reasons for removal, and smoking status as entered in the electronic patient records within 2 years before LARC insertion.

In Finland, different registers can be combined using a personal identification number assigned for every citizen since the 1960s. The Finnish Institute of Health and Welfare (THL) registers data on births, induced abortions, sterilizations, sexually transmitted infections (STIs), hospital outpatient visits, and inpatient care episodes. The registers are of high quality and validated.^{14–16} All cases of chlamydia, syphilis, and gonorrhea must be reported to the register on infectious diseases. The register on hospital outpatient visits and inpatient care episodes collects information on the 10th revision of the International Statistical Classification of Diseases and Related Health Problems (ICD-10) and International Classification of Primary Care diagnoses and the medical and surgical procedures according to the Classification of Surgical Procedures of the Nordic Medico-Statistical Committee at all visits.

We obtained data on sterilizations, births, induced abortions, STIs, and outpatient visits and hospital-care episodes in obstetrics and gynecology from the registers maintained by the THL. The Central Population Register of Vantaa provided the data on date of birth, marital status, native language, death, and migration from the city of Vantaa. Because ethnicity or race cannot be registered in Finland, we used data on mother tongue to represent ethnic variation. We obtained data on education and socioeconomic status from Statistics Finland. Educational status was divided

FIGURE 1

Formation of the study cohort of women receiving a free-of-charge long-acting reversible contraceptive method



Cu-IUD, copper intrauterine device; LARC, long-acting reversible contraceptive; LNG-IUS, levonorgestrel-releasing intrauterine system. Saloranta et al. Discontinuation of free-of-charge long-acting reversible contraceptive methods. *Am J Obstet Gynecol* 2020.

into 2 categories, that is, educational attainment above basic education and no educational attainment, and socioeconomic status in 6 categories according to Statistic Finland's standards (Table 1). Age was divided into the following 3 categories: 15 to 19, 20 to 29, and 30 to 44 years. History of induced abortion or delivery, history of STI 2 years before the LARC insertion, marital status, and native language were analyzed as dichotomous variables.

Start of follow-up was defined as the date of the first LARC insertion during the study period. End of follow-up was defined as the first of any of the following censoring events: LARC removal (n=514), migration from Vantaa (n=287), death (n=0), data extraction date (n=17), 2 years of LARC

method use, or on August 6, 2016 (n=269), that is, 21 weeks before the end of 2016. This allowed for all pregnancies to be detected from the data on the universal ultrasound screening program or the abortion registry.

LARC removals were identified from the electronic records or concluded using data from national registers. LARC removal was defined as the first of any of the following events: removal according to the family planning clinic records (n=473), a hospital visit with a procedure code indicating removal of the LARC method (n=22), sterilization (n=3), start of a pregnancy ending in an induced abortion (n=1), or removal estimated from a hospital visit with a pregnancy-related diagnosis or

procedure code (n=15). Of the 473 removals in the family planning clinic records, 21 lacked the date of removal, which was estimated as having occurred halfway between the last notion of the device being in place and the time it was recorded as having been removed. For the removals identified from hospital registers, the reason for removal was classified according to the ICD-10 code at the removal visit.

In Finland, all pregnant women are offered an early pregnancy ultrasound scan between 10 and 13 6/7 weeks' gestation and receive a structural ultrasound scan between 19 and 21 weeks' gestation.¹⁷ These visits are identifiable from the records of outpatient visits. Notably, 8 women without a recorded removal in the electronic patient record presented for early pregnancy ultrasound. We estimated the removal date for these women by calculating the mean time from LARC removal for pregnancy intentions until the date of an ultrasound scan (205 days). We calculated similar estimates for women presenting with visits for early pregnancy-related diagnosis (250 days, n=3) or miscarriage (156 days, n=4).

We defined women with no registered LARC removal or censoring event as continuers of their method. Because outpatient procedures in private healthcare are not nationally registered, we lacked information on possible LARC removals in private healthcare if a woman had no event indicating removal in public healthcare afterward.

Statistical methods

We calculated the 2-year cumulative discontinuation incidences with 95% confidence intervals (CIs). We plotted cumulative discontinuation incidence curves by LARC method and by factors associated with discontinuation. The differences between cumulative discontinuation incidence curves were assessed using the log-rank test. We used Poisson regression to calculate crude and adjusted incidence rate ratios (IRR) for discontinuation. We selected variables to multivariate model if they were significantly associated ($P < .05$) with discontinuation in univariate analysis and if

TABLE 1

Characteristics of the study subjects initiating a free-of-charge LARC and by initiated method

	Any LARC (n=2026)	LNG-IUS (n=1199)	Implant (n=642)	Cu-IUD (n=185)	P value ^a
Age					<.001
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, y					<.001
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)	<.001
History of delivery	1,304 (64)	953 (79)	225 (35)	126 (68)	<.001
Delivery in the year preceding LARC initiation	774 (38)	557 (46)	147 (23)	70 (38)	<.001
History of induced abortion	479 (24)	309 (26)	120 (19)	50 (27)	.002
Induced abortion in the year preceding LARC initiation	163 (8)	89 (7)	53 (8)	21 (11)	.183
Socioeconomic status ^b					
Upper level employees	224 (11)	166 (14)	34 (5)	24 (13)	176 (12)
Lower level employees or manual workers	1,171 (58)	728 (61)	340 (53)	103 (56)	886 (59)
Entrepreneurs, pensioners, or unknown	206 (10)	120 (10)	69 (11)	17 (9)	147 (10)
Students	287 (14)	105 (9)	157 (24)	25 (14)	210 (14)
Long-term unemployed	128 (6)	74 (6)	39 (6)	15 (8)	85 (6)
Unavailable	10 (0)	6 (1)	3 (0)	1 (1)	8 (1)
Education level					<.001
Basic (9-y mandatory education) or unknown ^c	596 (29)	269 (22)	279 (43)	48 (26)	
Longer (10 y or more)	1,430 (71)	930 (78)	363 (57)	137 (74)	
Only basic education among women aged 25 y or more	255 (13)	165 (14)	54 (8)	36 (19)	<.001
Native language, Finnish or Swedish	1,669 (82)	1,008 (84)	539 (84)	122 (66)	<.001
Sexually transmitted infection ^d	61 (3)	25 (2)	34 (5)	2 (1)	<.001
Smoking ^e					<.001
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)	

Data are expressed as n (%) unless otherwise mentioned.

Cu-IUD, copper intrauterine device; IQR, interquartile range; LARC, long-acting reversible contraceptive; LNG-IUS, levonorgestrel-releasing intrauterine system.

^a Kruskal–Wallis test for continuous variables and χ^2 -test for categorical variables; ^b Socioeconomic status of the youngest age group can be derived from their family's socioeconomic status;

^c Comprises women with only basic education and without education in Finland and those not graduating from elementary school; ^d Chlamydia, gonorrhea, or syphilis 2 years before LARC initiation;

^e As entered in the electronic patient records within 2 years before LARC insertion.

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including them in the model improved it by decreasing the Akaike information criterion and the variable was statistically significant ($P < .05$) in the multivariate model. We calculated frequencies of discontinuation reasons for each method and compared the frequencies using chi-

square analysis. Statistical significance was set at the 5% level. All analyses were conducted using the statistical software R 3.4.3 (R Foundation for Statistical Computing, Vienna, Austria).¹⁸

We performed several sensitivity analyses. In the primary analysis, correlation

among age, basic education, and socioeconomic status precluded the assessment of their effect on LARC discontinuation with the multivariate Poisson regression model. To check whether basic education and socioeconomic status were associated with

discontinuation within age groups, we performed age-stratified analysis using the final Poisson model but excluding age. To inspect whether discontinuation rates were similar among women revisiting the clinics after the initiation, we calculated the 2-year cumulative discontinuation and IRRs for 58% of women with recorded visits in the clinics within 2 years after LARC initiation. To evaluate the influence of age distribution, we also calculated and illustrated the cumulative discontinuation in age groups and repeated the univariate and multivariate Poisson modeling excluding women aged 15 to 19 years.

We received approval from the ethics committee of the Hospital District of Helsinki and Uusimaa. The register-keeping organizations approved the use of the health register data in this study. We followed the Strengthening of Reporting of Observational Studies in Epidemiology guidelines in the manuscript preparation and study design.

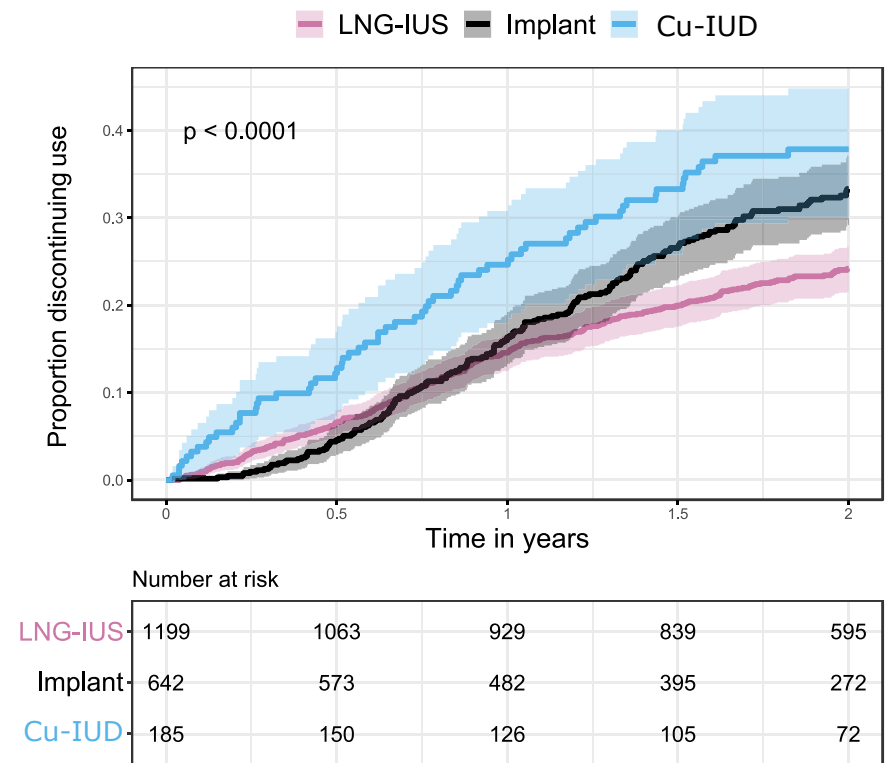
Results

Of all LARC methods initiated free of charge ($n=2026$), 1199 women (59%) chose the LNG-IUS. Because only 124 (10%) women chose the 13.5-mg LNG-IUS and 1075 (90%) chose the 52-mg LNG-IUS, both LNG-IUSs were combined for the analyses. Of the 642 (32%) women initiating an implant, 9 (1%) chose levonorgestrel-containing implants and 633 (99%) chose etonogestrel-containing implants. Implants were also combined for the analyses. The Cu-IUD was selected by 185 (9%) women.

Women choosing implants were younger, more often nulliparous, unmarried, smoked more often, more often had only basic education, and more often had a history of an STI 2 years before LARC initiation than women who chose the LNG-IUS or Cu-IUDs (Table 1). Women who chose Cu-IUDs more often spoke a native language other than Finnish or Swedish than women who chose the LNG-IUS. Characteristics divided according to method and continuation status are presented in Supplemental Table 1.

During the median follow-up of 1.9 years (interquartile range, 1.0–2.0), 514

FIGURE 2
Cumulative 2-year discontinuation of LARC methods



Cu-IUD, copper intrauterine device; LARC, long-acting reversible contraceptive; LNG-IUS, levonorgestrel-releasing intrauterine system. Saloranta et al. Discontinuation of free-of-charge long-acting reversible contraceptive methods. *Am J Obstet Gynecol* 2020.

women discontinued, yielding a 2-year cumulative discontinuation rate in the whole cohort of 28.3 per 100 women-years (95% CI, 26.2–30.4). Of those who discontinued, 263 were LNG-IUS users, 187 were implant users, and 64 were Cu-IUD users. The LNG-IUS had the lowest cumulative discontinuation at 2 years (24.2 per 100 women-years; 95% CI, 21.7–26.9), followed by implants (33.3 per 100 women-years; 95% CI, 29.5–37.4) and Cu-IUDs (37.8 per 100 women-years; 95% CI, 31.0–45.7). The differences between the LNG-IUS and Cu-IUD cumulative discontinuation incidence curves were statistically significant ($P < .001$) (Figure 2).

The crude IRRs for discontinuation during the first 2 years were 1.38 (95% CI 1.15–1.67) for implants and 1.80 (95% CI 1.37–2.37) for Cu-IUDs compared with the LNG-IUS. Univariate analyses (Table 2, Figure 3) indicated a statistically significant difference

($P < .05$) in LARC discontinuation rate according to categorical age, delivery in the year preceding LARC insertion, native language, history of STI 2 years before LARC insertion, socioeconomic status, and having only basic education. Age was strongly associated with socioeconomic status and basic education, and thus, socioeconomic status and basic education were not included in the final multivariate model. Marital status, parity, history of abortion, having only basic education at the age of 25 years or above, and smoking status were not significantly associated ($P < .05$) with discontinuation.

After adjustment, 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 compared with the LNG-IUS. Compared with women at the age of 30 to 44 years, women aged 15 to 19 years (IRR, 1.58; 95% CI, 1.17–2.14) and 20 to 29 years of

TABLE 2

Crude and adjusted Poisson regression estimates of 2-year discontinuation rate ratios with Cu-IUD and implant compared with LNG-IUS, and characteristics associated with discontinuation of all LARC methods (n = 2026)

	Crude rate ratio (95% CI)	Pvalue	Adjusted rate ratio (95% CI) ^a	Pvalue
LARC method				
LNG-IUS	Ref.		Ref.	
Implant	1.38 (1.15–1.67)	<.001	1.29 (1.05–1.58)	.017
Cu-IUD	1.80 (1.37–2.37)	<.001	1.68 (1.27–2.22)	<.001
Aged 30–44 y				
	Ref.		Ref.	
Aged 20–29 y	1.46 (1.21–1.76)	<.001	1.35 (1.11–1.63)	.003
Aged 15–19 y	1.58 (1.20–2.07)	.001	1.58 (1.17–2.14)	.003
Delivery in the year preceding LARC initiation				
No	Ref.		Ref.	
Yes	1.23 (1.05–1.48)	.013	1.36 (1.13–1.65)	.001
Native language, Finnish or Swedish				
Yes	Ref.		Ref.	
No	1.41 (1.15–1.74)	.001	1.31 (1.06–1.63)	.012
Sexually transmitted infection ^b				
No	Ref.		Ref.	
Yes	1.69 (1.12–2.55)	.012	1.62 (1.07–2.46)	.023
Socioeconomic status ^c				
Upper level employees	Ref.			
Lower level employees or manual workers	1.14 (0.84–1.55)	.406		
Entrepreneurs, pensioners, or unknown	1.31 (0.90–1.92)	.163		
Students	1.30 (0.91–1.87)	.153		
Long-term unemployed	1.67 (1.11–2.52)	.015		
Unavailable	1.15 (0.28–4.73)	.846		
Education level				
Longer (10 y or more)	Ref.			
Basic (9-y mandatory education) or unknown ^d	1.34 (1.11–1.60)	.002		
Marital status				
Married	Ref.			
Not married	0.98 (0.82–1.16)	.78		
History of delivery				
No	Ref.			
Yes	1.05 (0.87–1.26)	.631		
History of induced abortion				
No	Ref.			
Yes	0.93 (0.76–1.14)	.475		
Induced abortion in the year preceding LARC initiation				
No	Ref.			
Yes	1.08 (0.80–1.47)	.621		

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(continued)

TABLE 2

Crude and adjusted Poisson regression estimates of 2-year discontinuation rate ratios with Cu-IUD and implant compared with LNG-IUS, and characteristics associated with discontinuation of all LARC methods (n = 2026) (continued)

	Crude rate ratio (95% CI)	Pvalue	Adjusted rate ratio (95% CI) ^a	Pvalue
Only basic education among women aged 25 y or more				
No	Ref.			
Yes	1.20 (0.94–1.54)	.134		
Smoking within the past 2 y ^e				
No	Ref.			
Yes	0.95 (0.76–1.19)	.651		

CI, confidence interval; Cu-IUD, copper intrauterine device; LARC, long-acting reversible contraceptive; LNG-IUS, levonorgestrel-releasing intrauterine system; Ref., reference.

^a Adjusted with categorical age, delivery in the year preceding LARC initiation, mother tongue, and STI 2 years before LARC initiation; ^b Chlamydia, gonorrhea, or syphilis 2 years before LARC initiation; ^c Socioeconomic status of the youngest age group can be derived from their family's socioeconomic status; ^d Comprises women with only basic education and without education in Finland and those not graduating from elementary school; ^e As entered in the electronic patient records within 2 years before LARC insertion.

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age (IRR, 1.35; 95% CI 1.11–1.63) were more likely to discontinue. We observed a higher discontinuation rate for women who had delivered within the previous year (IRR, 1.36; 95% CI, 1.13–1.65), spoke a native language other than Finnish or Swedish (IRR, 1.31; 95% CI 1.06–1.63), and had history of an STI (IRR, 1.62; 95% CI, 1.07–2.46).

The most common reason for discontinuation was bleeding disturbances, reported by 21% of women who discontinued the LNG-IUS, by 71% who discontinued implants, and by 41% who discontinued Cu-IUDs. Among women who discontinued Cu-IUDs, 27% discontinued because of heavy menstrual bleeding, whereas only 1% who discontinued the LNG-IUS and none who discontinued implants reported this reason. Abdominal pain was the reported reason for discontinuation for 20% of both IUD and IUS users compared with 2% of women who discontinued implants (Table 3).

In the sensitivity analyses, we found no significant association of socioeconomic status or basic education with discontinuation in the age-stratified analysis. The method-specific IRRs calculated for 58% of women who visited the family planning clinics during follow-up were similar to those assessed from the whole study population, but the cumulative discontinuation incidences were much higher (Supplemental Table 2, Supplemental

Figure 1). In age-stratified analysis, the crude cumulative discontinuation rate of the LNG-IUS was lower than that of implants and Cu-IUDs in women aged 20 to 29 years. The differences in other age groups were parallel but not statistically significant (Supplemental Table 3, Supplemental Figure 2). The same variables remained associated with discontinuation in the Poisson model excluding women aged 15 to 19 years (Supplemental Table 4).

Comment Principal findings

We found that the discontinuation rate of the LNG-IUS was lower than that of implants and Cu-IUDs when LARC methods were provided free of charge in a primary care setting. Education and socioeconomic status were not associated with discontinuation; neither were parity nor history of abortion. Age below 30 years, delivery within the year preceding LARC insertion, speaking a native language other than the national languages Finnish and Swedish, and having a history of STI were associated with discontinuation of the LARC method within 2 years of insertion. Bleeding disturbances were the most common reason for discontinuation. Implants and Cu-IUDs were discontinued because of bleeding disturbances 2 to 4 times more often than was the LNG-IUS.

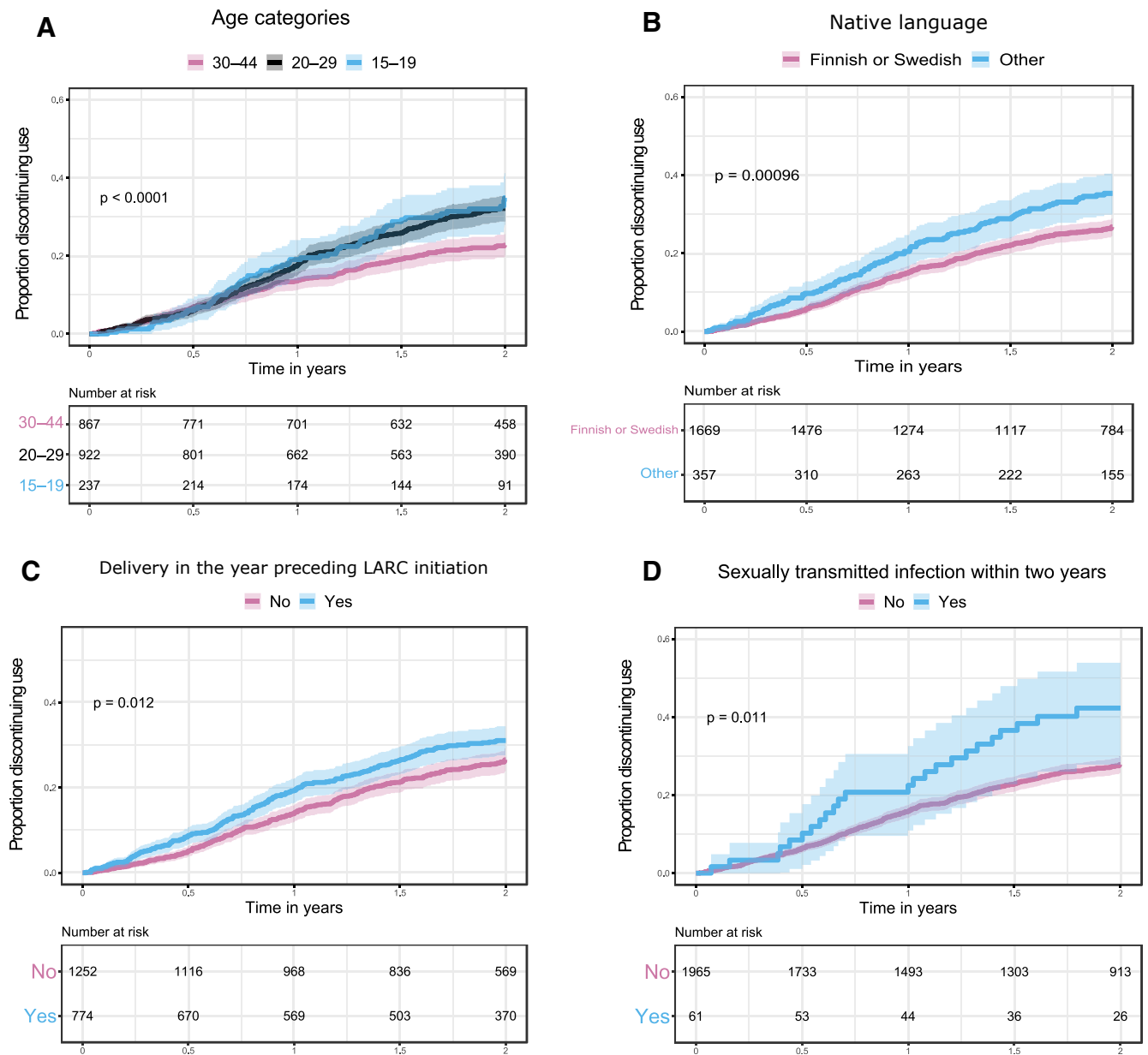
Results

The higher discontinuation rates of implants than of the LNG-IUS are in agreement with the findings from the CHOICE study.³ However, in contrast to our findings, the rates of discontinuation in the CHOICE study were similar for Cu-IUDs and the LNG-IUS.³ These findings can be influenced by age distribution of the users. Because young women more often discontinue and more often choose implants, this can bias implant discontinuation rates so that they are higher than intrauterine methods chosen more often by older women.^{3,6–8} In this study, women who chose Cu-IUDs were younger than women who chose the LNG-IUS, which could have affected the discontinuation rate of Cu-IUDs so that it was higher than in previous studies, in which women who chose Cu-IUDs were in the same age or older than women who chose the LNG-IUS.^{1,3,6,7} However, the differences between methods remained considerable even after adjusting for age in this study.

The finding that education and socioeconomic status were not associated with discontinuation is in line with the results of previous studies and is reassuring because these do not seem to affect a woman's reproductive autonomy.^{3,7} There are conflicting findings concerning the effect of parity on discontinuation of LARC use.^{3,6,7} Reassuringly, parity was

FIGURE 3

Cumulative discontinuation of LARC methods according to A, age, B, delivery within the preceding year, C, mother tongue, and D, history of STI



Cu-IUD, copper intrauterine device; LARC, long-acting reversible contraceptive; LNG-IUS, levonorgestrel-releasing intrauterine system; STI, sexually transmitted infection.

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not associated with discontinuation in this study. Similarly, as in the CHOICE study, we found that women with a recent history of STI were at higher risk for discontinuation.³ Women with a native language other than the national languages had higher rates of discontinuation. Women with nonnational native language in Finland are a heterogenous

group, but they all presumably received counseling in a language other than their native tongue. This could have had an effect leading to higher rates of discontinuation.

Up to 52 (78%) LNG-IUS and implant users experience unscheduled bleeding, but unlike with implants, the unfavorable bleeding patterns of the LNG-IUS tend to

subside when continuing their use.¹⁹ In line with previous studies, we also found that implant discontinuation for bleeding disturbances was more likely than discontinuation of the LNG-IUS.^{20,21}

Clinical implications

Counseling women on expected bleeding patterns associated with LNG-IUS use is

TABLE 3

Reasons for discontinuation of all free-of-charge LARC methods and by method type within 2 years after LARC initiation, with frequencies among those who discontinued

	Any LARC	LNG-IUS	Implant	Cu-IUD	<i>P</i> value for differences between methods ^a
No. of discontinuations	514	263	187	64	
Wished to conceive	84 (16)	60 (23)	13 (7)	11 (17)	.004
Bleeding disturbances ^b	214 (42)	55 (21)	133 (71)	26 (41)	<.001
Heavy menstrual bleeding	21 (4)	3 (0)	1 (1)	17 (27)	<.001
Abdominal pain or cramping	69 (13)	52 (20)	4 (2)	13 (20)	<.001
Infection, including vaginal infections and PID	16 (3)	13 (5)	1 (1)	2 (3)	.09
Mood	27 (5)	14 (5)	12 (6)	1 (2)	.281
Skin problems (eg, acne)	37 (7)	24 (9)	12 (6)	1 (2)	.383
Weight gain	25 (5)	14 (5)	11 (6)	0 (0)	.168
Expulsion or partial expulsion	49 (10)	42 (16)	0 (0)	7 (11)	<.001
Problems with libido	17 (6)	12 (5)	5 (3)	0 (0)	.373
Other or unknown reasons ^c	52 (20)	29 (11)	17 (9)	6 (9)	.794

Data are expressed as n (%) unless otherwise mentioned.

Cu-IUD, copper intrauterine device; *LARC*, long-acting reversible contraceptive; *LNG-IUS*, levonorgestrel-releasing intrauterine system; *PID*, pelvic inflammatory disease.

^a *P* value obtained by chi-squared test; ^b Including irregular bleeding, heavy bleeding, and amenorrhea; ^c Unknown (n=26).

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important and improves continuation rates.²² In our data, bleeding disturbances were the most common reason for discontinuation with the LNG-IUS and even more common with implants and Cu-IUDs. Only 16% of women discontinued because of pregnancy intentions, which implies a continuing need for contraception after discontinuation of LARC. Although the overall discontinuation of LARC methods is low, women who discontinue their first device because of adverse effects are unlikely to reinitiate the same method,^{10,23,24} which limits their future contraceptive options and may lead to the use of less effective methods. This emphasizes the importance of adequate resources to provide for counseling on the expected bleeding patterns during the use of LARC methods.

Research implications

Additional comparative data on discontinuation rates among LARC methods are needed to better understand continuation and cost efficacy in different settings. Further studies are needed to assess factors associated with discontinuation to

provide means for more individualized and woman-centered contraceptive care.

Strengths and limitations

Evaluating the discontinuation rates in a real-life setting is challenging because regular follow-up visits are no longer recommended for satisfied LARC users.^{25,26} Continuing LARC use is not systematically recorded in the general medical patient records. Hence, excluding women with no data on continuing LARC use would overestimate the discontinuation rates. Thus, we assumed that women still living in Vantaa and without contacts to primary or specialized healthcare organizations for method removal or pregnancy continued LARC use. This assumption is in line with previous studies that estimated real-life continuation rates.^{6,23} Using the Finnish national registers, we minimized the risk of bias with non-attenders common with all real-world studies, because we combined removal events based on records both in primary and specialized care and identified occurring pregnancies.

Another strength of the study is that we analyzed first-time users of LARCs, because only a woman's first method was provided free of charge. Without mostly satisfied reinitiators, this study presents discontinuation figures from an unselected population of first-time LARC users.

There are limitations to this study. Data on LARC removals in private healthcare were unavailable, unless women used public health services after placement. Women with more financial assets have better access to private healthcare. However, adherence to family planning clinics is high and it is likely that most women continue to use the family planning services offered free of charge. In addition, the public family planning clinics in Vantaa are easily accessible as part of primary care services. The staff is experienced and supports the continuation of LARC use. The results are generalizable only to settings with similar types of services. Our findings on women aged below 20 years should be interpreted with caution because the number of women

using Cu-IUDs in this age group was small.

Conclusion

The discontinuation rates of LARC methods provided free of charge were similar to those of previous findings from mixed-payer settings. The LNG-IUS had the lowest rate of discontinuation compared with that of implants and Cu-IUDs. At the end of 2 years, only 22% of women had discontinued LNG-IUS use. Young women and women with a native language other than Finnish or Swedish had higher rates of LARC discontinuation. This may represent a gap in counseling and knowledge of adverse effects and attributes of the methods. The reason for discontinuation was most often bleeding disturbances, of which the LNG-IUS had the lowest rate. This emphasizes the importance of an acceptable bleeding profile in women and the importance of addressing the expected bleeding profiles in contraceptive counseling. The present removal rates should be acknowledged when designing contraceptive services providing free-of-charge LARC methods. ■

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This study was approved by the Ethics Committee of the Hospital District of Helsinki and Uusimaa (304/13/03/03/2015).

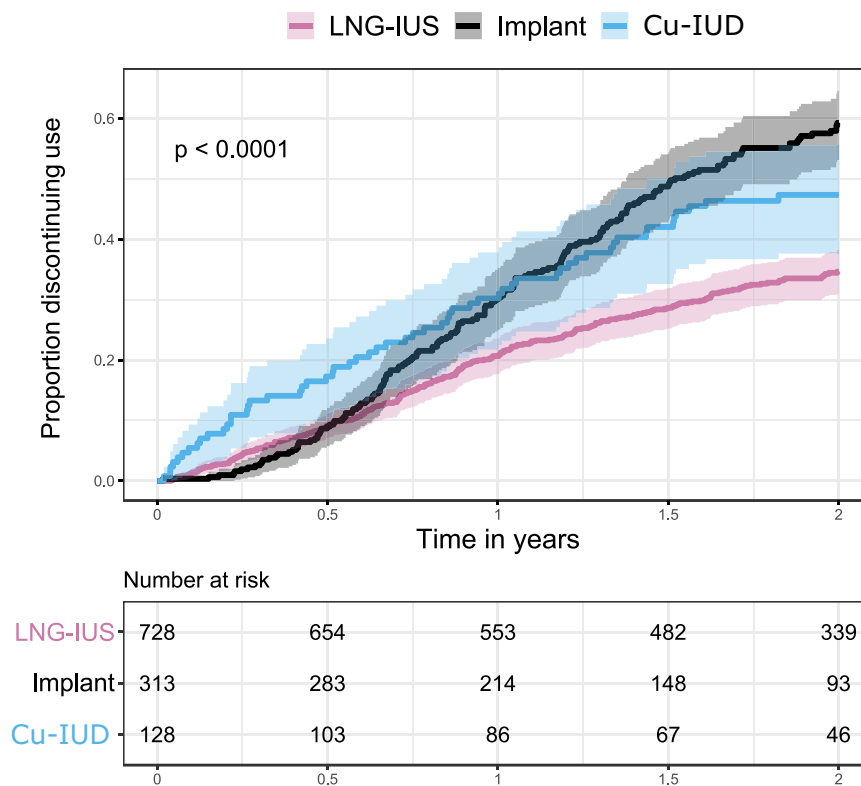
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SUPPLEMENTAL FIGURE 1

Cumulative 2-year discontinuation of LARC methods with those 1169 (58%) women who visited the family planning clinics within the 2-year follow-up



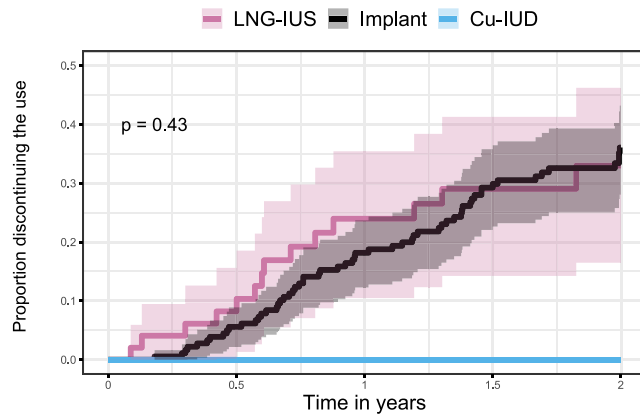
Cu-IUD, copper intrauterine device; LARC, long-acting reversible contraceptive; LNG-IUS, levonorgestrel-releasing intrauterine system.
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SUPPLEMENTAL FIGURE 2

Cumulative 2-year discontinuation of LARC methods in different age groups

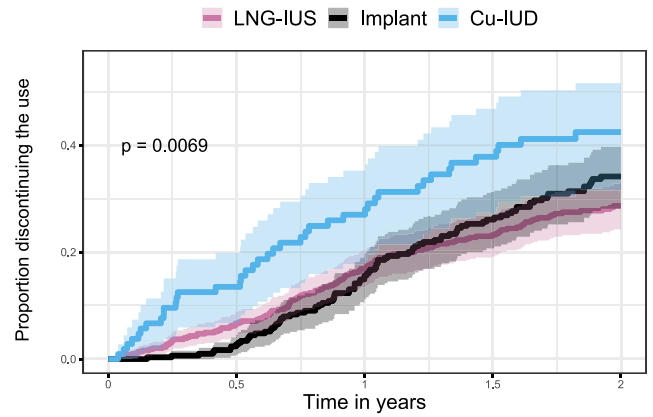
Women aged 15-19

Women aged 20-29



Number at risk

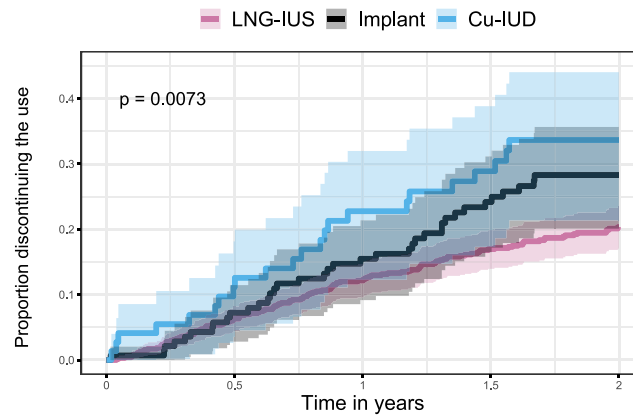
	0	0.5	1	1.5	2
LNG-IUS	49	43	30	27	16
Implant	183	167	140	113	72
Cu-IUD	5	4	4	4	3



Number at risk

	0	0.5	1	1.5	2
LNG-IUS	502	436	362	319	223
Implant	314	281	231	188	130
Cu-IUD	106	84	69	56	37

Women aged 30-44



Number at risk

	0	0.5	1	1.5	2
LNG-IUS	648	584	537	493	356
Implant	145	125	111	94	70
Cu-IUD	74	62	53	45	32

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

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SUPPLEMENTAL TABLE 1

Characteristics of the study subjects divided according to LARC method and continuation status

Characteristic	All LARC users		LNG-IUS users		Implant users		Cu-IUD users	
	Continued (n=1512)	Discontinued (n=514)	Continued (n=936)	Discontinued (n=263)	Continued (n=455)	Discontinued (n=187)	Continued (n=121)	Discontinued (n=64)
n=2026								
Age at LARC initiation, y								
Median (IQR)	28.8 (23.5–34.0)	27.4 (22.0–32.0)	31.1 (26.0–35.3)	29.6 (25.0–33.5)	23.5 (19.8–29.4)	22.8 (19.1–29.0)	28.6 (25.0–33.4)	27.8 (25.0–31.0)
Age categories, y								
15–19	164 (11)	73 (14)	35 (4)	14 (5)	124 (27)	59 (32)	5 (4)	0 (0)
20–29	664 (44)	258 (50)	376 (40)	126 (48)	223 (49)	91 (49)	65 (54)	41 (64)
30–44	684 (45)	183 (36)	525 (56)	123 (47)	108 (24)	37 (20)	51 (42)	23 (36)
Married	592 (39)	210 (41)	438 (47)	125 (48)	101 (22)	54 (29)	53 (44)	31 (48)
History of delivery	961 (64)	343 (67)	738 (79)	215 (82)	144 (32)	81 (43)	79 (65)	47 (73)
Delivery in the year preceding LARC initiation	553 (37)	221 (43)	417 (45)	140 (53)	92 (20)	55 (29)	44 (36)	26 (41)
History of induced abortion	361 (24)	118 (23)	239 (26)	70 (27)	85 (19)	35 (19)	37 (31)	13 (20)
Induced abortion in the year preceding LARC initiation	118 (8)	45 (9)	69 (7)	20 (8)	35 (8)	18 (10)	14 (12)	7 (11)
Socioeconomic status ^a								
Upper level employees	176 (12)	48 (9)	137 (15)	29 (11)	22 (5)	12 (6)	17 (14)	7 (11)
Lower level employees or manual workers	886 (59)	285 (55)	574 (61)	154 (59)	243 (53)	97 (52)	69 (57)	34 (53)
Entrepreneurs, pensioners, or unknown	147 (10)	59 (11)	92 (10)	28 (11)	47 (10)	22 (12)	8 (7)	9 (14)
Students	210 (14)	77 (15)	78 (8)	27 (10)	116 (25)	41 (22)	16 (13)	9 (14)
Long-term unemployed	85 (6)	43 (8)	51 (5)	23 (9)	24 (5)	15 (8)	10 (8)	5 (8)
Unavailable	8 (1)	2 (0)	4 (0)	2 (1)	3 (1)	0 (0)	1 (1)	0 (0)
Education level								
Basic or unknown ^b	414 (27)	182 (35)	192 (21)	77 (29)	189 (42)	90 (48)	33 (27)	15 (23)
Longer (10 y or more)	1098 (73)	332 (65)	744 (79)	186 (71)	266 (58)	97 (52)	88 (73)	49 (77)
Basic education among women aged 25 y or more	179 (12)	76 (15)	117 (12)	48 (18)	37 (8)	17 (9)	25 (21)	11 (17)
Native language Finnish or Swedish	1271 (84)	398 (77)	797 (85)	211 (80)	394 (87)	145 (78)	80 (66)	42 (66)
Sexually transmitted infection ^c	37 (2)	24 (5)	15 (2)	10 (4)	22 (5)	12 (6)	0 (0)	2 (3)

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(continued)

SUPPLEMENTAL TABLE 1

Characteristics of the study subjects divided according to LARC method and continuation status (continued)

Characteristic	All LARC users		LNG-IUS users		Implant users		Cu-IUD users	
	Continued (n=1512)	Discontinued (n=514)	Continued (n=936)	Discontinued (n=263)	Continued (n=455)	Discontinued (n=187)	Continued (n=121)	Discontinued (n=64)
n=2026								
Smoking ^d								
Yes	321 (21)	101 (20)	159 (17)	45 (17)	140 (31)	47 (25)	22 (18)	9 (14)
No	897 (59)	289 (56)	569 (61)	149 (57)	259 (57)	108 (58)	69 (57)	32 (50)
Unknown	294 (19)	124 (24)	208 (22)	69 (26)	56 (12)	32 (17)	30 (25)	23 (36)

Data are expressed as n (%) unless otherwise mentioned.

Cu-IUD, copper intrauterine device; *IQR*, interquartile range; *LARC*, long-acting reversible contraceptive; *LNG-IUS*, levonorgestrel-releasing intrauterine system.

^a Socioeconomic status of the youngest age group can be derived from their family's socioeconomic status; ^b Comprises women with only basic education (9-year mandatory education) and without education in Finland and those not graduating from elementary school; ^c Chlamydia, gonorrhea, or syphilis 2 years before LARC initiation; ^d As entered in the electronic patient records within 2 years before LARC insertion.

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SUPPLEMENTAL TABLE 2

Crude and adjusted Poisson regression estimates of 2-year discontinuation rate ratios with Cu-IUD and implant compared with LNG-IUS, and characteristics associated with discontinuation of all LARC methods for 1169 (58%) women in the study cohort who visited the family planning clinics within 2 years after LARC initiation

LARC method	Crude rate ratio (95% CI)	Pvalue	Adjusted rate ratio (95% CI) ^a	Pvalue
LNG-IUS	Ref.		Ref.	
Implant	1.92 (1.58–2.33)	<.001	1.85 (1.49–2.31)	<.001
Cu-IUD	1.59 (1.19–2.12)	.002	1.52 (1.14–2.05)	.005
Aged 30–44 y	Ref.		Ref.	
Aged 20–29 y	1.32 (1.08–1.61)	.007	1.16 (0.94–1.42)	.161
Aged 15–19 y	1.60 (1.21–2.13)	.001	1.26 (0.91–1.74)	.162
Delivery in the year preceding LARC initiation				
No	Ref.		Ref.	
Yes	1.10 (0.92–1.32)	.291	1.27 (1.04–1.55)	.017
Native language Finnish or Swedish				
Yes	Ref.		Ref.	
No	1.36 (1.10–1.68)	.005	1.30 (1.04–1.62)	.020
Sexually transmitted infection ^b				
No	Ref.		Ref.	
Yes	1.59 (1.05–2.42)	.030	1.36 (0.88–2.09)	.169

CI, confidence interval; Cu-IUD, copper intrauterine device; LARC, long-acting reversible contraceptive; LNG-IUS, levonorgestrel-releasing intrauterine system; Ref., reference.

^a Adjusted with categorical age, giving birth within the year preceding LARC initiation, mother tongue, and STI 2 years before LARC initiation; ^b Chlamydia, gonorrhea, or syphilis 2 years before LARC initiation.

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SUPPLEMENTAL TABLE 3

Cumulative discontinuation rate per 100 women-years of LARC methods in different age groups

Age	LNG-IUS	Implant	Cu-IUD
15–19 y	33.0 (20.6, 50.0)	36.1 (29.1, 44.1)	-
20–29 y	28.7 (24.6, 33.2)	34.1 (28.7, 40.3)	42.4 (33.2, 53.0)
30–44 y	20.3 (17.3, 23.8)	28.3 (21.4, 36.9)	33.7 (23.7, 46.3)
All age groups	24.2 (21.7, 26.9),	33.3 (29.5, 37.4)	37.8 (31.0, 45.7)

Data are presented as mean (95% confidence intervals).

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

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SUPPLEMENTAL TABLE 4

Crude and adjusted Poisson regression estimates of 2-year discontinuation rate ratios with Cu-IUD and implant compared with LNG-IUS and characteristics associated with discontinuation

	Crude rate ratio (95% CI)	Pvalue	Adjusted rate ratio (95% CI) ^a	Pvalue
LARC method				
LNG-IUS	Ref.		Ref.	
Implant	1.36 (1.10–1.68)	.005	1.29 (1.04–1.62)	.023
Cu-IUD	1.90 (1.44–2.49)	<.001	1.76 (1.32–2.33)	<.001
Aged 30–44 y				
Aged 20–29 y	1.46 (1.21–1.76)	<.001	1.34 (1.10–1.63)	.005
Delivery in the year preceding LARC initiation				
No	Ref.		Ref.	
Yes	1.33 (1.10–1.60)	.003	1.37 (1.13–1.67)	.001
Native language, Finnish or Swedish				
Yes	Ref.		Ref.	
No	1.47 (1.19–1.83)	<.001	1.33 (1.06–1.66)	.014
Sexually transmitted infection ^b				
No	Ref.		Ref.	
Yes	1.77 (1.13–2.77)	.013	1.73 (1.09–2.73)	.020
Socioeconomic status				
Upper level employees	Ref.			
Lower level employees or manual workers	1.11 (0.81–1.52)	.503		
Entrepreneurs, pensioners, or unknown	1.29 (0.87–1.92)	.212		
Students	1.36 (0.91–2.05)	.138		
Long-term unemployed	1.62 (1.05–2.49)	.028		
Unavailable	1.40 (0.34–5.78)	.640		
Education level				
Longer (10 y or more)	Ref.			
Basic (9-y mandatory education) or unknown	1.29 (1.04–1.59)	.019		
Marital status				
Married	Ref.			
Not married	0.95 (0.78–1.14)	.564		
History of delivery				
No	Ref.			
Yes	1.14 (0.92–1.42)	.225		
History of induced abortion				
No	Ref.			
Yes	0.91 (0.74–1.14)	.421		
Induced abortion in the year preceding LARC initiation				
No	Ref.			
Yes	1.02 (0.72–1.43)	.919		

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(continued)

SUPPLEMENTAL TABLE 4

Crude and adjusted Poisson regression estimates of 2-year discontinuation rate ratios with Cu-IUD and implant compared with LNG-IUS and characteristics associated with discontinuation (continued)

	Crude rate ratio (95% CI)	Pvalue	Adjusted rate ratio (95% CI) ^a	Pvalue
Only basic education among women aged 25 y or more				
No	Ref.			
Yes	1.26 (0.98–1.61)	.070		
Smoking within the past 2 y				
No	Ref.			
Yes	0.91 (0.70–1.17)	.455		

Only women aged 20 to 44 years are included (n=1789).

CI, confidence interval; Cu-IUD, copper intrauterine device; LARC, long-acting reversible contraceptive; LNG-IUS, levonorgestrel-releasing intrauterine system; Ref., reference.

^a Adjusted with categorical age, delivery in the year preceding LARC initiation, mother tongue, and STI 2 years before LARC initiation; ^b Chlamydia, gonorrhea, or syphilis 2 years before LARC initiation.

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