

ORIGINAL RESEARCH ARTICLE

How have changes in accessibility and public funding influenced contraceptive use among Norwegian adolescents? A cohort study

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Abstract

Introduction: The Norwegian Government introduced in 2002 a reimbursement scheme for hormonal contraceptives to adolescents at the same time as public health nurses and midwives received authorization to prescribe hormonal contraceptives. This study examines the impact of increased accessibility and public funding on hormonal contraceptive use among adolescents.

Material and Methods: The Norwegian Prescription Database, Statistics Norway, and Norwegian Institute of Public Health served as data sources for this cohort study. The study population comprised 174 653 Norwegian women born 1989–1990, 1994–1995, and 1999–2000. We examined use of hormonal contraceptives through dispensed prescriptions from age 12 through age 19 with duration of first continuous use as primary outcome. The statistical analyses were done in SPSS using chi-squared test, survival analysis, and Joinpoint regression analysis with p -values < 0.05 .

Results: By age 19, ~75% of the cohorts had used at least one hormonal method. The main providers of the first prescription were general practitioners and public health nurses. Starters of progestogen-only pills (POPs) have increased across the cohorts, while starters of combined oral contraceptives (COCs) have decreased. The use of long-acting reversible contraceptives (LARCs) has increased since its inclusion in the reimbursement scheme (2015). Most switchers shifted from COCs or POPs as a start method to implants after LARCs became part of the reimbursement scheme. There has been a significant increase across the cohorts in the number of women who continuously used hormonal contraceptives from start to the end of the calendar year they became 19 years with the same method and after switching methods. We could not correlate changes in decreasing trends for teenage births or induced abortions (Joinpoint analysis) to time for implementation or changes in the reimbursement of hormonal contraceptives from 2002.

Abbreviations: COCs, combined oral contraceptive; DMPA, depot medroxyprogesterone acetate; HCs, hormonal contraceptives; LARCs, long-acting reversible contraceptives; LNG-IUDs, levonorgestrel-releasing intrauterine devices; NoMA, Norwegian Medicines Agency; NorPD, Norwegian Prescription Database; POPs, progestogen-only pill; SARCs, short-acting reversible contraceptives; VR, vaginal ring; VTE, venous thromboembolism.

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Conclusions: Primarily public health nurses and to a lesser extent midwives became soon after they received authorization to prescribe COCs important providers. The expansion of the reimbursement scheme to cover POPs, patches, vaginal ring, and depot medroxyprogesterone acetate in 2006 had minor impact on increasing the proportion of long-term first-time users. However, the inclusion of LARCs in 2015 significantly increased the proportion of long-term first-time hormonal contraceptive users.

KEYWORDS

adolescents, combined oral contraceptives, hormonal contraception, hormonal IUD, implants, induced abortion, long-acting reversible contraception, midwives, progestogen-only pills, public health nurses, short-acting reversible contraception, teenage births, teenagers

1 | INTRODUCTION

In preparation of the Norwegian abortion law on demand in 1978, the government intensified the strategic work of preventing unwanted pregnancies through action plans.¹ Schools became responsible for providing sexual education and knowledge on contraception,² public health nurses and midwives were encouraged to do counseling on sexual and contraceptive matters while physicians were the only profession allowed to prescribe contraception. In contrast, liberalization of the Swedish abortion law in 1975 gave midwives the right to prescribe contraception and insert IUDs.³ At that time, there was hardly a discussion on profession of providers, over the counter sales, and/or cost-free/subsidized provision of contraception in Norway. The proposition suggested better availability of condoms by encouraging health workers that provided contraceptive counseling to distribute condoms free of charge.² This strategy prevailed through the 1980s, and the fear for spread of human immunodeficiency virus/acquired immune deficiency syndrome and other sexually transmitted diseases⁴ strengthened the policy.

Focusing on the positive experiences of prevention of unplanned pregnancies among adolescents, especially induced abortions, from extended access to hormonal contraception (HC) in the Netherlands⁵ and Sweden,⁶ health authorities and politicians in Norway started in the early 1990s a debate on accessibility on HCs.⁷ During those years, Norway had some experience with youth health clinics. The attendance numbers revealed that the youth health clinics reached sexually active female adolescents who needed guidance on contraceptive and sexual issues.

On the initiative from the Norwegian Government, a project started in 1998 where public health nurses and midwives distributed from youth health clinics and schools combined oral contraceptives (COCs) for free to female adolescents 16–19 years of age.⁸ The project reached a large group of young women who to a lesser extent conferred physicians for contraception.⁸ The knowledge of hormonal contraception among clients was independent of provider⁹ and the clients felt well cared for in the project.^{8–10} From June 1998 to December 2000, increased accessibility to COCs led to a relative reduction of 34% in induced abortions and 24% in births among teenagers 17–19 years.⁸ However, the project revealed that public

Key message

Public health nurses have become important providers of hormonal contraception to adolescents. Including long-acting reversible contraceptives in the reimbursement scheme for hormonal contraception have increased the proportion of long-term first-time users. We found no correlation between implementation and refinement of reimbursement of hormonal contraceptives on teenage pregnancy rates.

health nurses and midwives needed further education on counseling skills and basic knowledge about contraception.^{8–10} The results from this project formed the basis for the reimbursement scheme and made through additional education public health nurses and midwives to providers of HCs.

1.1 | The reimbursement scheme for hormonal contraception

The governmental decree with cost-free COCs for adolescents aged 16–19 years came into effect on January 1, 2002. From June 1, 2002, public health nurses and midwives received authorization to prescribe COCs for free to the same age group.¹¹ From March 1, 2006, the reimbursement scheme changed to a fixed 3-month refund rate (100 Norwegian krone [NOK], ~USD 10) for short-acting reversible contraceptives (SARCs including COCs, progestogen-only pills [POPs], vaginal ring [VR], hormonal contraceptive patches, and depot medroxy-progesterone acetate [DMPA] injection) in the age group 16–19 years.¹² From January 1, 2015, the scheme included implants and intrauterine devices prescribed by physicians for the targeted age group, and from January 1, 2016, public health nurses and midwives had the same authorization.¹³ Table 1 provides more details about reimbursement of long-acting reversible contraceptives (LARCs)¹⁴ and age-groups¹⁴ covered by the scheme.

TABLE 1 Overview of reimbursement scheme for hormonal contraception in Norway.

Time for implementation		Contraceptive methods included	Age (years)	Profession	Reimbursement
2002	January 1	Combined oral contraceptive pills containing ethinylestradiol and levonorgestrel	16–19	Medical doctors	Free of charge
	June 1			Public health nurses and midwives	
2006	March 1	Combined oral contraceptive pills as above and expanded to ethinylestradiol/drospirenone and ethinylestradiol/norethisterone containing products. Patch Vaginal ring Progestogen-only pills Medroxyprogesterone acetate injection		Medical doctors, public health nurses and midwives	A fixed reimbursement rate ^a
2015	January 1	As above, and expanded to include hormonal IUDs, Copper IUDs and contraceptive implants		Medical doctors	16–17 years—IUDs and implants free of charge 18–19 years—hormonal IUDs and implants with co-payment. Copper IUDs free of charge For all other methods a fixed reimbursement rate ^a
2016	January 1			Public health nurses and midwives	
2018	January 1	As listed above	16–20	As listed above	As listed above
2019	January 1		16–21		16–19 years—IUDs and implants free of charge. 20–21 years—IUDs and implants with co-payment. For all other methods a fixed reimbursement rate ^a

^aSet to NOK 100 (USD 10) for 3 months of use for any method.

Pharmacies have since the implementation administered the reimbursement scheme.¹⁴ Usually, the consumers take out SARCs for a 3- or 6-month period. For prescriptions on DMPA injection and LARCs, the customers need to go to the pharmacy to redeem the prescription, and then return to the provider's office for injection or insertion of relevant remedy. Cost differences between the actual price and the fixed reimbursement rate for any contraceptive method are paid at the pharmacy. As prescriptions on contraception are valid for 4 years in Norway, it is not necessary to visit a provider before a new pharmacy take-out.

A public health nurse is an authorized nurse with further formal education (2 years) in health promotion and prevention aimed at children, young people, and their families. They usually work in municipal health centers (reaching children 0–5 years), in the school health service (reaching young people 6–20 years), and youth health clinics (reaching young people 16–25 years). Their service is offered with or without an hourly appointment and without a formal referral, and is free of charge. Among many work tasks, public health nurses and midwives promote sexual education, contraceptive counseling and prescribe HCs under delegated responsibility of a physician.

The objective of this study was to examine the impact of increased accessibility and public funding on contraceptive use among Norwegian adolescents.

2 | MATERIAL AND METHODS

2.1 | Data sources and register variables

Data sources were the Norwegian Prescription Database (NorPD), which holds data from 2004, and Statistics Norway. NorPD is a pseudonymous health register. At data entry, the personal ID of both user and provider are replaced with a pseudonymized identifier, which follows user and provider throughout their lives. The user information contains month and year of birth, gender, and residency (municipality), while the prescriber information comprises year of birth, gender, year authorized as health worker, profession, and year authorized/type of medical specialty. Profession includes physicians with no medical specialty (authorized as a physician under subspecialization or a medical student with license), general practitioners, gynecologists, other medical specialists, public health nurses and midwives, and other health workers. NorPD collects also detailed information about the prescription, including date of collection, anatomical therapeutic chemical classification code, package size, and number of packages.

Data on induced abortions and births for adolescents were retrieved from national data at the Norwegian Institute of Public Health.¹⁵

2.2 | Study population

The study population comprises Norwegian women born 1989–1990 (cohort 1), 1994–1995 (cohort 2), and 1999–2000 (cohort 3) (Statistics Norway). We chose these cohorts to examine how changes in public funding and accessibility had influenced contraceptive use among adolescents aged 12–19 years. The 1989–1990 cohort had access to cost-free COCs the year they became 16 years old, and all SARCs at ages 16–17 through age 19, respectively. The reimbursement scheme covered all SARC methods for the 1994–1995 cohort. In addition to SARCs, LARCs became part of the reimbursement scheme for the 1999–2000 cohort when they turned 16 years of age (Table 1).

We excluded contraceptive prescriptions to men, prescriptions to non-Norwegian citizens, and persons with incomplete personal identification number.

2.3 | Variable definitions and measures

We defined starters as adolescents who collected their first prescription for any hormonal method. Continuous use with the same method was defined as women who collected another prescription for the same hormonal method within 28 days from expiration of the most recent collection, or within 180 days if the method was an implant or levonorgestrel-releasing intrauterine device (LNG-IUD). Continuous use with switched methods were defined as women who started using another HC within 28 days from expiration of the last collected HC or within 180 days if the prescription was an implant or a LNG-IUD. Restarters were defined as women who collected a prescription for either the same or a different hormonal method after a break of at least 28 days, or at least 180 days if the hormonal method was an implant or a LNG-IUD. Consequently, breaks were periods without coverage of any hormonal prescription.

Use duration was estimated in months, from date of first prescription until the date of expiration of the last continuous prescription, or date of expiration of the new contraceptive method after method shift. Users who had prescriptions that expired at age 20 or above were censored on December 31st the year of their 19th birthday, when the study ended.

2.4 | Statistical analyses

The statistical analysis was done in SPSS using chi-squared test and survival analysis with p -values < 0.05 . We applied survival analysis to compare duration of use across cohorts and Joinpoint regression^{16,17} to study breakpoints in trends of induced abortion and births.

3 | RESULTS

The study population comprised all Norwegian-born women in the birth cohorts 1989–1990, 1994–1995, and 1999–2000, in total 174

TABLE 2 Cumulative initiation of hormonal contraception by age and birth cohort.

Age at initiation (years)	Birth cohort		
	1989–90	1994–1995	1999–2000
	N = 58 549	N = 58 495	N = 57 609
	Cumulative percentages		
12		0.1	0.1
13		0.4	0.5
14	1.0	3.0	3.0
15	9.2	13.0	11.8
16	33.0	35.2	33.5
17	54.8	53.9	53.7
18	67.4	66.7	66.2
19	75.3	75.5	74.1

653 women. By age 19, based on 2-year birth cohorts, between 74.1% and 75.5% of the women had used any hormonal method (Table 2). COCs were the most used first hormonal method, despite a decreasing trend, from 91.1% in cohort 1989–1990 to 85.9% and 65.7% in the cohorts 1994–1995 and 1999–2000, respectively (χ^2 -trend; $p < 0.001$) (Table 3, upper panel). A greater proportion of women born in the 1999–2000 cohort used POPs (19.3%) as their first hormonal method than adolescents born in 1994–1995 (10.9%) and in 1989–1990 (5.7%) (χ^2 -trend; $p < 0.001$) cohorts. First use of LARC was also higher in the 1999–2000 cohort (13.7%) compared to cohorts 1 and 2 (between 0.2% and 0.7%) (χ^2 -trend; $p < 0.001$) (Table 3, upper panel), where implants (12.1% vs. 0.1%–0.6%) (χ^2 -trend; $p < 0.001$), over-shadowed LNG-IUDs (1.6% vs. 0.0%–0.1%) (χ^2 -trend; $p < 0.001$).

The main providers of first prescription for all birth cohorts were general practitioners (between 33.1% and 35.8%) and public health nurses (between 35.5% and 37.9%). These differences are statistically significant and considered stable across cohorts (Table 3, lower panel). A larger proportion of cohort 3 received their first prescription from a physician without a specialty (23.4%), compared to 16.0% for women born in 1994–1995 and 10.2% for women born in 1989–1990 (χ^2 -trend; $p < 0.001$) cohorts. The magnitude of prescriptions from MDs with another specialty decreased across birth cohorts. A minor proportion of young women received their first prescription from a gynecologist (decreasing from 3.5% in cohort 1 to 2.9% in cohort 3) (χ^2 -trend; $p < 0.001$) or a midwife (2%–3%) (Table 3, lower panel). All professions prescribed COCs less frequently and POPs more frequently as the first contraceptive method to the 1999–2000 cohort. In this cohort, public health nurses and midwives prescribed implants as the first method more often than the other professions did (data not shown).

An increasing proportion of adolescents used the same method from start to study end in cohort 3 compared to the other cohorts (χ^2 -trend; $p < 0.001$), whereas this increase was more than tripled among continuous users who switched methods (16.3%, 4.3%, and 2.9%) (χ^2 -trend; $p < 0.001$) (Table 4). A minor proportion of users stopped using

TABLE 3 First hormonal method used, overall first method use summarized as SARC/LARC methods and provider of first prescription by birth cohort.

	Birth cohort		
	1989–1990	1994–1995	1999–2000
	N = 42 555	N = 44 163	N = 42 668
	%	%	%
First hormonal method used			
COC	91.1	85.9	65.7
Vaginal ring	0.5	0.8	0.3
Patch	1.0	0.9	0.5
POP	5.7	10.9	19.3
DMPA-injection	1.5	0.9	0.6
Implant	0.1	0.6	12.1
LNG-IUD	0.0	0.1	1.6
Overall first method use			
SARC	99.9	99.3	86.3
LARC	0.2	0.7	13.7
Provider first prescription			
General practitioner	33.9	35.8	33.1
Gynecologist	3.5	3.1	2.9
Doctor with another specialty	11.3	7.2	2.7
Doctor without a specialty	10.2	16.0	23.4
Public health nurse	37.9	36.0	35.5
Midwife	2.7	1.9	2.1
Others. no information	0.5	0.2	0.2

Abbreviations: LARC, long-acting reversible contraceptives; SARC, short-acting reversible contraceptives.

HCs after the first method or continuous use when shifting methods before study ended without a restart. The proportion of users with one break and who had a restart (any method) decreased significantly from cohort 1 to cohort 3. The proportion of women with two or more breaks and restarts decreased also significantly by increasing the birth year of the cohorts (Table 4). Different proportions of restarters were using/not using HCs at study end (data not shown).

Approximately, 43% of COC starters switched method in the 1999–2000 cohort, compared to 20%–22% among COC starters in cohorts 1 and 2. There was a remarkable increase in switching from COCs to implants (from 5.3% to 52.4% [χ^2 -trend; $p < 0.001$]) from cohort 1 to cohort 3 (Table 5) followed by major decreases in switching from COCs to POPs and the other methods, except for LNG-IUDs, where we observed a 10% increase in switching from initiators of COCs to LNG-IUDs.

Even though the numbers of POP starters increased across the cohorts, less than 20% of cohort 3 started with POPs. The

proportion of switchers was higher across all cohorts among POP starters and increased from less than 50% in the oldest cohorts to nearly 60% in cohort 3 (Table 5). As among COC starters, most POP switchers continued with implants. The decrease in POP starters that switched to COCs in the oldest cohorts, outweighed the proportional increase in continued implant use among POP starters in the 1999–2000 cohort.

Among implant starters, one-third switched method and most cases continued with COCs, to a lesser extent POPs and LNG-IUDs in the 1999–2000 cohort (Table 5). We observed the lowest number of switchers among LNG-IUD starters (14%) (Table 5). For VR, patch, and DMPA injection initiators, there were too few cases to present meaningful analyses.

Figure 1 displays duration of continuous use of COCs from start to study end for users of same method and for switchers. A significantly higher proportion of women born in cohort 3 used COCs as the first method during the first year, thereafter the differences disappeared. At 3-month follow-up, 74% of cohorts 1 and 2 retained COCs compared to 78.1% (95% CI: 77.6–78.6) ($p < 0.01$, survival analysis) in cohort 3. At 12-month follow-up, respective 42%–43% and 45% in cohort 1 and cohort 3 used COCs. At 24 months, about 21%–22% of COCs starters remained using COCs in all cohorts. The number of switchers increased the proportion of continuous users among adolescents that started with COCs to 75% and 44%–46% at 3- and 12-month follow-up in the oldest cohorts compared to 80.5% (95% CI: 80.0–81.0) and 55.3% (95% CI: 54.7–55.9) (+10.7%, $p < 0.001$, survival analysis) in the 1999–2000 cohort, respectively. The difference in continuation rate among adolescents shifting from COCs to another method seen at 12 months remained at 24 months (10%–12%) between cohort 3 and cohorts 1 and 2, respectively.

Among adolescents who started with POPs (Figure 2), more women stopped using this method during the first 3 months and the first year (Figure 1) compared to starters of COCs. At 3 months, approximately one-third of POP-starters had stopped using HC in cohort 1, and 8% had shifted to another method. In cohort 3, fewer stopped using POPs (24%) and some more adolescents (10%) shifted to other methods compared to the older cohorts. At 12 and 24 months, 20.3%/21.8% and 6.1%/7.7% of initial POP-starters were still using POPs in the oldest cohorts, respective 24.2% and 8.5% in the 1999–2000 cohort (Figure 2).

For starters of VR, patch, and DMPA-injection, there were minor differences in discontinuation rates across cohorts as between 40%–50% and 70%–80% had stopped using the method after 3- and 12-month follow-up, respectively.

There has been a 95% reduction in teenage births from 1974 to 2022 (Figure 3). Over the first decade after 1974, there was an annual decrease of nearly 8%, thereafter Norway observed an annual decrease of ~3% for the next two decades. Over the years, 2004 to 2009, the teenage birth rate rose but has since then shown a significantly annual decreasing trend. During the mid-1970s, the induced abortion rate for women <20 years of age increased (Figure 4). The nearly linear annual percent decrease of 1.4% in induced abortion

	Birth cohort		
	1989–1990	1994–1995	1999–2000
	N = 42 555	N = 44 163	N = 42 668
Status study end	%	%	%
Continuous use from start to study end, same method ^a	20.4	23.6	27.1
Continuous use from start to study end, switched methods ^a	2.9	4.3	16.3
No use at study end, continuous use of same method before first break, no restart ^a	2.9	4.3	4.5
No use at study end, continuous use of switched methods before first break, no restart ^a	0.5	0.4	2.3
Continuous use of same method before first break, restarted ^b	25.6	23.7	13.6
Continuous use of switched methods before first break, restarted ^b	6.4	7.4	14.9
Two breaks, restarted ^b	21.7	18.7	13.0
Three or more breaks, restarted ^c	19.7	17.4	8.3

^aAt end of calendar year turning 19 years of age.

^bMaybe using or not using HCs at study end.

^cMay stop after the third break or continue to a fourth break, etc. with use/no use of HCs at study end.

TABLE 4 Status of use of hormonal contraception from start to study end.

TABLE 5 Number of starters, proportion switchers, new method at first switch by start method (COCs, POPs, implants, and LNG-IUDs) and birth cohort.

Starting method	COCs			POPs			Implants			LNG-IUD
	Cohorts			Cohorts			Cohorts			Cohort
	1989–1990	1994–1995	1999–2000	1989–1990	1994–1995	1999–2000	1989–1990	1994–1995	1999–2000	1999–2000
No. starters (n)	38 772	37 938	28 027	2444	4806	8233	62	244	5143	662
Prop. switchers (%)	20.1	22.3	43.3	49.1	47.2	59.2	-	31.1	34.7	13.9
No. switchers (n)	8119	8444	12 123	1199	2268	4871		76	1783	92
Switching to	%	%	%	%	%	%		%	%	
COCs				84.7	76.5	44.9		51.3	74.0	42.4
POPs	49.3	50.3	29.4					17.1	11.6	29.3
VR	12.2	12.9	1.8	3.3	3.9	0.7		7.9	1.0	4.3
Patch	14.3	12.0	2.7	3.1	2.6	0.9		7.9	1.5	
Implant	5.3	11.6	52.4	3.3	9.4	45.0				21.7
DMPA-injection	17.2	11.5	2.3	4.7	6.6	1.6		13.2	2.0	2.2
Hormonal IUD	1.7	1.5	11.4	1.4	1.0	7.0		2.6	10.1	

rate from 1978 to 2008 has been followed by a larger annual percent decrease over the recent years.

4 | DISCUSSION

This study examined how changes in public funding and accessibility have influenced contraceptive use among Norwegian adolescents.

We find a stable overall use of HC among adolescents after the introduction of the reimbursement scheme at the time when public health nurses and midwives became providers. There has been an increase in the first use of LARC after LARCs became part of the reimbursement scheme in 2015, due to a higher first use of implants. First use of POP has increased. Public health nurses have become important prescribers of the first prescription after they were entitled to prescribe COCs in 2002, and later, including all SARC and

FIGURE 1 Cumulative proportion of users among starters of combined oral contraceptives (solid line), switchers included (dotted line) by cohort.

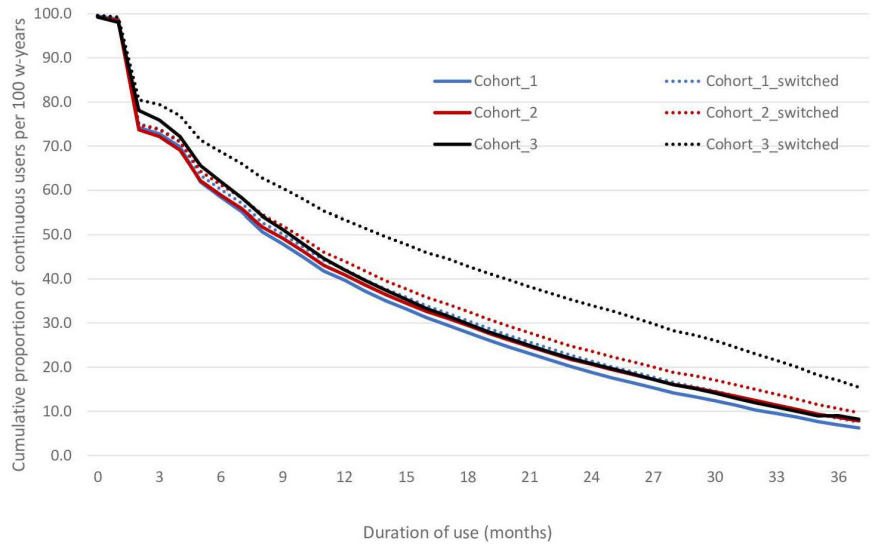


FIGURE 2 Cumulative proportion of users among starters of progestogen-only pills (solid line), switchers included (dotted line) by cohort.

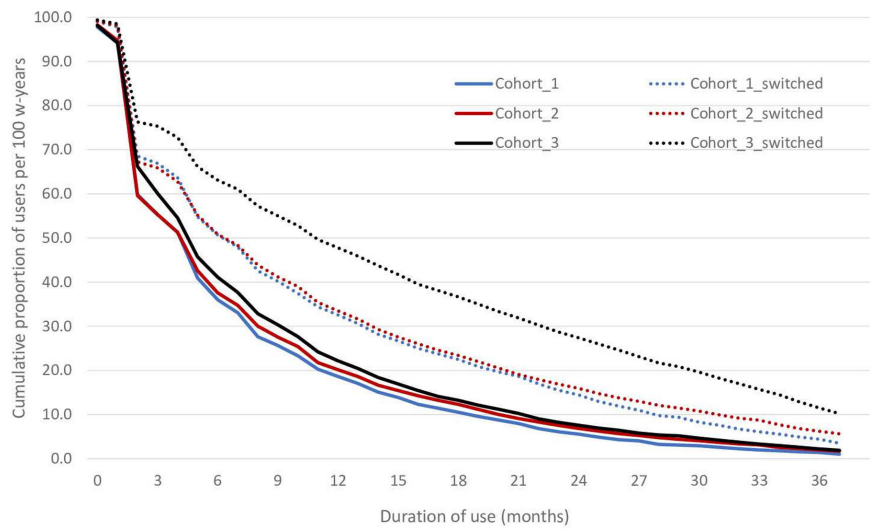
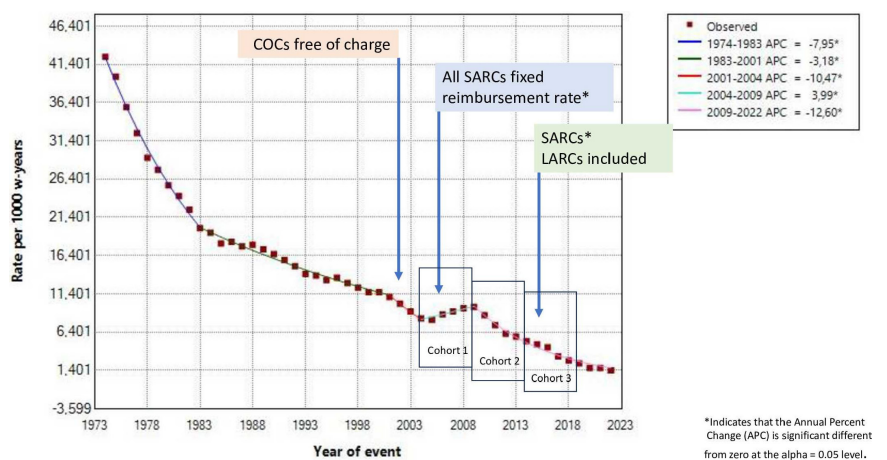


FIGURE 3 Trends and annual percent change (APC) in teenage births, Norway, 1974–2022. Joinpoint regression analysis with break points.



LARC methods. Furthermore, public health nurses have been the main prescriber of implant as the first hormonal method after 2015. After LARC became part of the reimbursement scheme, continuous first-time use of HCs increased.

For several political reasons, Norway chose a stepwise introduction of reimbursement of HCs and authorizing public health nurses/midwives as prescribers. This differential approach gave no more ever users of HCs among Norwegian adolescents. Few other studies

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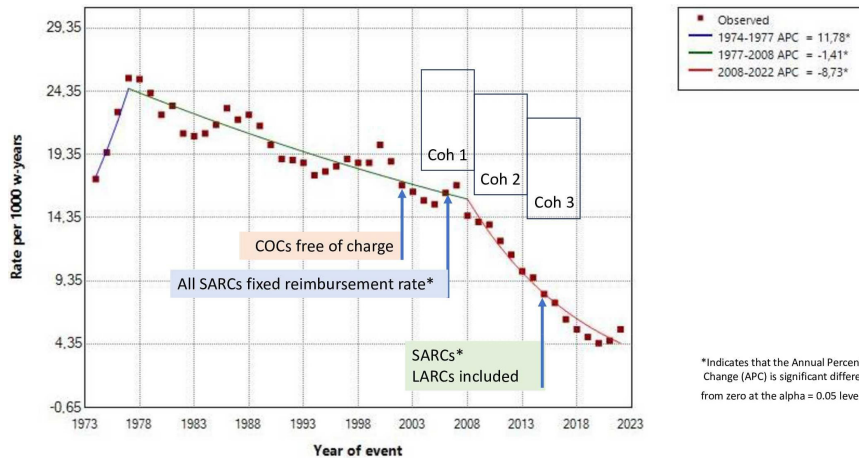


FIGURE 4 Trends and annual percent change (APC) in teenage induced abortions, Norway, 1974–2022. Joinpoint regression analysis with break points.

have explored the trends in initiation of HC among adolescents. A Danish study from 2014 stated that 85% of the female population had been prescribed HCs at the age of 20 years.¹⁸ Between 60% and 64% of US teenagers born 1989–1997 had used any hormonal method by the age of 19.¹⁹

When public health nurses became prescribers of HCs, they were working in places familiar to the adolescents with convenient opening hours, evening and drop-in service, and an option of scheduling visits at short notice. This may explain why it took only a few years from implementation of the reimbursement scheme before public health nurses reached that high volume of prescriptions to starters, and thereafter remained the leading prescribing profession.

Along with the changes in the reimbursement scheme, other changes in recommendations for first use of HCs have taken place over the last decades. In 2009, the Norwegian Medicines Agency (NoMA) published an alert on differential risks for venous thromboembolism (VTE) among COC users by progestogen component and recommended that initiators of COCs used a levonorgestrel-containing pill, or started first HC use with POPs.²⁰ By the time NoMA posted a summary of the recommendations²¹ from the Pharmacovigilance Risk Assessment Committee, European Medical Agency,²² to all prescribers of HCs in Norway in April 2014, more than 80% of starters used a levonorgestrel-containing pills.²³ In 2016, public health nurses and midwives prescribed levonorgestrel-containing COCs to 96% of starters younger than 20 years, while the different medical specialists prescribed levonorgestrel-containing pills to significant lower proportions of starters.²³

Our findings revealed more than a threefold increase in first use of POPs across the birth cohorts while uptake of the other SARC methods (COC excluded) has been stable at a low usage rate since they became part of the reimbursement scheme in 2006. This suggests that the changes in national recommendations with increased focus on VTE associated with COC use from 2009 contributed to an increase in first use of POPs, and concurrently, a decrease in first use of COCs. However, we have no published data that assess the changes in VTE incidence among young women due to changes in prescription patterns over the recent years. These studies are warranted.

The observed increase in the proportion of POP starters in cohort 3 may also be attributed to the fact that some women having had periods of bothersome moodiness or depression, irregular bleeding, acne, or breast tenderness may benefit from a trial of POPs over a 2–3-month period to avoid an unnecessary implant insertion. If the symptoms felt bothersome or worsened over this trial period, they were not candidates for implant use.

At the same time, as LARCs became part of the reimbursement scheme in 2015, NoMA recommended LARCs as the first choice among starters of HCs.²⁴ The immediate effect of this recommendation led to a 20-fold increase in first use of implants, and a similar increase in first use of LNG-IUDs, though at a much lower usage rate than implants. Public health nurses were most compliant to these recommendations as they prescribed implants to a higher proportion of starters than the other professions did.

To understand the impact of the reimbursement scheme, we need data over a longer period than the implementation period. The incidence of birth among adolescents declined by 50% from 1974 to 1983, and continued to decline until 2004 (Figure 3) at times when medical doctors were the only profession to prescribe HCs at no refund. During the first years of reimbursement the birth rate among adolescents increased again, and has since 2009 significantly declined. Related to cohorts 1 and 2 that covered the period to 2015, there are few changes in duration of first HC use or duration of switched continuous use that can explain the breakpoints of trends in adolescent births in 2004 and 2009.

There has been a decreasing trend in induced abortion among adolescents from the late 1970s to 2007. From 2008, induced abortion among adolescents has further declined (Figure 4). As there are minor differences in age at start (Table 1), use and duration of first use, duration of continuous use with switched methods between cohorts 1 and 2, there are major differences in trends of induced abortions (Figure 4). In cohort 3, the duration of use for switched methods to implants among COC and POP starters, in addition to a large significant increase in the proportion of implant and IUD starters, and that the number of pauses in use are significantly lower in cohort 3 than 2, the trends of induced abortion are the same across cohorts. We could expect that all these elements in cohort 3 relative

cohort 2 may have contributed to prevention of more unplanned pregnancies.

There has been a decline in adolescents' abortions over recent years in the other Nordic countries²⁵ as well as UK,²⁶ US,²⁷ and New Zealand.²⁸ The breakpoint for a higher decline in induced abortions started in 2008 both in Norway (Figure 4), Sweden, and Denmark with an annual percent change through 2022 of -8.7%, -8.0%, and -6.4%, respectively.²⁵ In Denmark, only medical doctors prescribe HCs and there is no reimbursement.²⁹ In Sweden, midwives have been the major prescribers over years, and there is no national reimbursement scheme, but some countries practice different ordinances.²⁹ In Iceland and Finland, induced abortions among teenagers have been on a decline since the millennium shift, with a more substantial decrease after 2011 in Finland, and 2017 in Iceland.²⁵

As we have no clear indication that confirm a change in use of HCs at time for breakpoints of a sharper decline in both induced abortions or births among teenagers, and the trends are the same in many countries where only medical doctors are prescribers, and where reimbursement of HCs on national scale is limited or absent, we cannot confirm a correlation between expanding prescription rights to public health nurses and midwives, nor the different reimbursement schemes, have had any impact on prevention of teenage pregnancies. Also, a Swedish study questioned the impact of reimbursement schemes on incidence of adolescents' abortions in Swedish countries with different reimbursement schemes for HCs over the years 2002–2010.³⁰

We measure adolescents' births and induced abortions per 1000 women-years; and in 2018, these events were rare: 2.7 and 5.5 per 1000 women-years, respectively. In 2018, over 600 per 1000 18–19 years old adolescents of the entire cohort 3 (data not shown) used a HC method. This means that we must advise a considerable proportion of female adolescents to continue use of HCs in periods with infrequent or no sexual activity to prevent unplanned pregnancies in a future male sexual encounter as most adolescents' pregnancies arise during periods of no use of HCs.

One strength of this study is that it is a population-based registry study. All pharmacies do electronic reporting to the NorPD. It is not necessarily the case that women who collect a prescription for contraception use it. On the other hand, registry-based studies rule out recall bias. A previous study demonstrated that measuring prescription-based contraceptive use is more reliable than self-reported use, as women tend to overestimate their contraceptive use.³¹ It is reassuring for actual use that over 92% of starters renewed their first prescription, and that nearly 75% of starters had five or more prescription take outs through the age of 19 years. Our study did not assess the use of copper IUDs and coitus-dependent methods. Furthermore, some women use HCs exclusively for medical reasons, not contraception. NorPD does not contain this information, which means that excluding this group from the study is not possible. However, this group of teenagers will be well prepared to avoid pregnancy when they face a male sexual encounter. Another limitation is that the cohorts represent a little less than one-third of all adolescents that are part of the time window that each cohort

represented. However, we do not believe that these adolescents differ in user pattern of HCs than the participating birth cohorts did.

5 | CONCLUSION

The overall use of hormonal contraception has been stable since the implementation of the reimbursement scheme (2002). Public health nurses have become important prescribers of the first prescription of HCs since authorization (2002). The use of LARC has increased since its inclusion in the reimbursement scheme (2015), and at the time when public health nurses and midwives started to prescribe LARCs (2016). Our findings indicate that increased LARCs use led to an increase in continuous use among starters of HCs. There has been a steep decline in induced abortions and births among Norwegian adolescents in recent years; however, our data do not support that this decline can be attributed to expanding prescription rights on HCs to public health nurses and midwives, nor the implementation and further refinements in the reimbursement scheme of HCs.

AUTHOR CONTRIBUTIONS

Sunniva Sæbø: Investigation, writing—original draft, review and editing. Finn Egil Skjeldestad: Conceptualization, project administration, investigation, methodology, data curation, formal analysis, writing—review and editing, visualization.

CONFLICT OF INTEREST STATEMENT

None.

ETHICS STATEMENT

The legal aspects of utilization of registry data were performed in accordance with national and European legislation (General Data Protection Regulation), the Regional Committee for Medical and Health Research Ethics North (Institutional Review Board number; IRB00001874 REK North, case no. 9997, approved April 25, 2019), The Norwegian Center for Research Data (project no. 808142, approved August 30, 2019), and the National Institute of Public Health (project no. PDB 2778, approved February 2, 2020) and Statistics Norway (project no. 21/0336, approved February 23, 2021).

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