

Trends in teenage delivery and abortion rates in Estonia over more than two decades: a nationwide register-based study

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Background: In the last 30 years, Estonia has undergone major socio-economic changes, including profound educational and healthcare reforms. The study aimed to analyse trends in teenage delivery and induced abortion rates among younger and older teens, including Estonians and non-Estonians, and to study trends in repeat teenage pregnancies in more detail. **Methods:** The register-based study included data on 29 818 deliveries (1992–2019) and 25 865 (1996–2019) induced abortions among 15–19-year-old girls. Delivery and abortion rates per 1000 girls were calculated by age group, ethnicity and reproductive history. Poisson regression models were applied to estimate average annual percentage changes in delivery and abortion rates over the whole period and in two sub-periods with change points in the trend in 2007. **Results:** The delivery rate decreased by 5.3% per year, from 49.9 in 1992 to 8.4 in 2019; the abortion rate decreased by 6.0% per year, from 42.4 in 1996 to 8.6 in 2019. A faster decline in delivery rates took place among Estonians than non-Estonians, but the opposite trend occurred in abortion rates. Delivery rates for first and repeat pregnancies decreased nearly at the same pace, while abortion rates for repeat pregnancies decreased faster than those for first pregnancies. **Conclusions:** A decreasing trend in teenage births is evident in parallel with society becoming wealthier. A remarkable decline in teenage abortions occurs when young people's rights to safe abortion, contraception, mandatory sexuality education and youth-friendly services are ensured. There always remains a small group of adolescents who repeatedly become pregnant.

Introduction

A recent major global overview of trends in teenage pregnancies from the mid-1990s until 2011 showed that the steepest annual percentage decline (4%) took place in Estonia. The authors stated that the investigation of country-specific trends might serve as a reference to enable decision-makers to find the best strategies for the local prevention of unintended adolescent pregnancies.¹

Different 'enabling' and 'protective' macro- and micro-level factors associated with teenage pregnancies have been analysed in numerous studies.^{1–5} Determinants of teen pregnancies include social and cultural (e.g. distribution of income and power, religiosity, gender roles, sexual morals and values, access to education including sexuality education, and access to services), interpersonal (e.g. family structure and stability, violence, partnership relations, and peers) and individual (e.g. risky health behaviours, substance abuse, chronic illness, knowledge, self-esteem and age at first sexual intercourse) factors.² All these factors are interlinked with each other, which makes research complicated and introduces the possibility of controversial results.⁴

Determinants of teenage childbearing and those of teenage abortions seem to differ from each other.³ Globally, data on births are more complete than similar data on induced abortions and miscarriages, even in countries with liberal abortion laws.¹ Socio-economic factors have been shown to be strongly associated with teenage fertility.^{2–4} In welfare societies, motherhood at a very young age has been seen as equivalent to poverty.^{6,7} On the other hand, prevailing

sexual ideologies in a society determine whether and what kind of sexual health services and information are provided to people,⁸ including education for youth and professionals.

In welfare societies, the majority of teenage deliveries have favourable outcomes for both the mother and the child. However, teenage pregnancy remains a public health issue: similar to research on obesity, cardiovascular disease and diabetes, it requires an intersectional approach. The health sector plays an important role in ensuring maternal care, low-barrier contraceptive services and safe abortion services.⁹ Programmes targeting social deprivation and health education are the major social actors.

After regaining independence in 1991, after almost 50 years of Soviet occupation, Estonia has undergone major socio-economic changes, including profound educational and healthcare reforms. Systems for the collection of health statistics were established, and Estonia joined the European Union and NATO in 2004. According to the World Bank Analytical Classification of countries, Estonia transitioned from an upper lower-income country in the 1990s to a high-income country in 2006.¹⁰ As in many other developed countries, during recent decades in Estonia, the mean age of primiparas has increased substantially, from 22.7 years in 1992 to 28.2 years in 2019.¹¹ The percentage of teenage mothers among all parturients was 17.7 in 1992 and 1.9 in 2019.¹¹

Modern contraceptives arrived in Estonia and have become widely available since the early 1990s. Mandatory (comprehensive) sexuality education lessons were introduced to the school curriculum in 1996, and a network of youth-friendly sexual and reproductive

health services has been developed over the last 25 years, resulting in the establishment of 18 centres by 2019. In Estonia, sexuality education in schools and easy access to services for young people have proven to be cost-effective and have been considered an important determinant of the improvement of sexual health indicators at the public health level.^{12,13} Unfortunately, similar to the trends in the rest of Europe, the Estonian case has also shown that even when favourable policies are in place, ideological pressure to stop them always exist.¹⁴

Membership in a certain ethnic group can be associated with the prevalence of teenage pregnancy through different pathways.^{2,15} Estonia has a population of 1.3 million. In 1940, at the beginning of Soviet occupation, native Estonians made up 97% of the population. During the second half of the 20th century, a wave of immigration from different parts of the former Soviet Union took place; thus, Estonians constituted 61.5% of the population in 1989 and 68.8% in 2017.¹⁶ The largest non-Estonian ethnic group, representing approximately 25% of the population, has been and continues to be Russian.¹⁶

Termination of pregnancy upon women's request up to 12 weeks of pregnancy has been legal in Estonia since 1955, and minors do not need their parents'/guardians' consent (an exception was the period 2009–2015). Pregnancy can be terminated up to 22 weeks of gestation for medical reasons. Estonia is considered to be a country with liberal abortion legislation and complete abortion data.^{1,5} Induced abortion remained the main method of regulating family size until the beginning of the 1990s due to easy access to abortion services and the lack of reliable contraception and relevant sexual health information. It has been calculated that during the 1970s, two out of every three pregnancies ended in termination,¹⁷ and 62% of 18–74-year-old women reported an abortion in a 2000 survey.¹⁸ After the inflow of modern contraception in the beginning of the 1990s and the improvement of services and information distribution, the abortion rate (the number of reported legal abortions per 1000 women aged 15–49 years) decreased over five times, to 69.6 in 1992 and 13.2 in 2019.¹¹ The proportion of adolescents among all women terminating pregnancy was 11.4% in 1992 and 7.0% in 2019.^{11,19}

Several studies have analysed the prevalence and factors associated with repeat teenage pregnancies, both those ending in delivery and those ending in abortion.^{20–26} A recent review and meta-analysis of 26 studies, mainly from the USA, described 47 factors associated with repeat teenage pregnancies.²⁴ The authors of these studies have noted that there is lack of evidence from many parts of the world.

The aim of the study was to analyse trends in teenage pregnancies—both those ending in delivery and those ending in abortion—in Estonia since 1992 (deliveries) and 1996 (abortions) through 2019, to examine delivery and abortion rates among younger and older adolescents, including Estonians and non-Estonians, and to study trends in repeat teenage pregnancies in more detail.

Methods

Single records for teenage (<20 years of age) deliveries and induced abortions (on request or on medical grounds) were obtained from the Estonian Medical Pregnancy Information System, which comprises two separate registers—the Estonian Medical Birth Register (EMBR) and the Estonian Abortion Register (EAR). The EMBR has collected data on all births in Estonia since 1992. Live births are registered regardless of gestational age or birth weight, and the registration criterion for stillbirths is ≥ 22 completed weeks of gestation.²⁷ In addition to the details of the perinatal outcome, each record contains information on the maternal socio-demographic background and reproductive history, with unique personal

identification numbers for the mother and the new-born.^{28,29} The EAR has gathered information on all induced and spontaneous abortions in Estonia since 1996. Each record includes data on the type and method of the abortion with the socio-demographic background and reproductive history of the woman.¹⁹ The personal identification number is incorporated in the records in 1996–1998 and from 2019 onwards.³⁰ Information on previous pregnancies in the EMBR and EAR is based on self-reports. Both registers include data for non-residents of Estonia.

For the time trend analysis, we used the longest period available—deliveries in 1992–2019 (30 010 cases) and induced abortions (26 264 cases) in 1996–2019. Deliveries (110 cases) and abortions (20 cases) among non-residents were excluded. In addition, deliveries and abortions among girls under the age of

Table 1 Characteristics of deliveries (1992–2019) and induced abortions (1996–2019) among adolescents at age 15–19 years in Estonia

Characteristic	Age group (full years)					
	15–17		18–19		15–19	
		%		%		%
Deliveries	7410	100	22 408	100	29 818	100
Year of delivery						
1992–1995	1962	26.5	6690	29.9	8652	29.0
1996–1999	1497	20.2	4381	19.6	5878	19.7
2000–2003	1200	16.2	3552	15.9	4752	15.9
2004–2007	1204	16.2	3290	14.7	4494	15.1
2008–2011	808	10.9	2300	10.3	3108	10.4
2012–2015	469	6.3	1333	5.9	1802	6.0
2016–2019	270	3.6	862	3.8	1132	3.8
Ethnicity						
Estonian	5274	71.2	15 645	69.8	20 919	70.2
Non-Estonian	2131	28.8	6751	30.1	8882	29.8
Unknown	5	0.1	12	0.1	17	0.1
Previous pregnancy						
Yes	997	13.5	5859	26.1	6856	23.0
No	6410	86.5	16 541	73.8	22 951	77.0
Unknown	3	0.0	8	0.0	11	0.0
Previous delivery						
Yes	274	3.7	2258	10.1	2532	8.5
No	7135	96.3	20 149	89.9	27 284	91.5
Unknown	1	0.0	1	0.0	2	0.0
Previous induced abortion						
Yes	599	8.1	3184	14.2	3783	12.7
No	6808	91.9	19 213	85.7	26 021	87.3
Unknown	3	0.0	11	0.0	14	0.0
Induced abortions	9357	100	16 508	100	25 865	100
Year of abortion						
1996–1999	2840	30.4	5120	31.0	7960	30.8
2000–2003	2194	23.4	3879	23.5	6073	23.5
2004–2007	2041	21.8	3307	20.0	5348	20.7
2008–2011	1126	12.0	2179	13.2	3305	12.8
2012–2015	701	7.5	1250	7.6	1951	7.5
2016–2019	455	4.9	773	4.7	1228	4.7
Ethnicity						
Estonian	6570	70.2	10 998	66.6	17 568	67.9
Non-Estonian	2765	29.6	5476	33.2	8241	31.9
Unknown	22	0.2	34	0.2	56	0.2
Previous pregnancy						
Yes	1576	16.8	6252	37.9	7828	30.3
No	7766	83.0	10 215	61.9	17 981	69.5
Unknown	15	0.2	41	0.2	56	0.2
Previous delivery						
Yes	619	6.6	3603	21.8	4222	16.3
No	8722	93.2	12 857	77.9	21 579	83.4
Unknown	16	0.2	48	0.3	64	0.2
Previous induced abortion						
Yes	1022	10.9	3778	22.9	4800	18.6
No	8319	88.9	12 681	76.8	21 000	81.2
Unknown	16	0.2	49	0.3	65	0.3

Table 2 Delivery (1992–2019) and induced abortion (1996–2019) rates with average annual percentage change among adolescents at age 15–19 years in Estonia by age group and reproductive history

Age group/reproductive history	Year/rate per 1000 adolescents			Year/AAPC (95% CI)		
	1992	2007	2019	1992–2007	2007–2019	1992–2019
Deliveries						
Age group (full years)						
15–17	18.2	12.2	3.1	–4.2 (–4.7 to –3.6)	–10.5 (–11.8 to –9.3)	–4.5 (–4.8 to –4.2)
18–19	98.3	41.9	16.5	–6.2 (–6.6 to –5.9)	–7.5 (–8.2 to –6.7)	–5.9 (–6.0 to –5.7)
15–19	49.9	25.0	8.4	–5.6 (–5.9 to –5.3)	–8.9 (–9.5 to –8.2)	–5.3 (–5.5 to –5.2)
Previous pregnancy						
No	39.2	19.8	6.1	–5.4 (–5.7 to –5.1)	–9.3 (–10.0 to –8.5)	–5.3 (–5.5 to –5.2)
Yes	10.8	5.2	2.2	–6.4 (–7.0 to –5.8)	–7.7 (–9.0 to –6.3)	–5.3 (–5.6 to –4.9)
Previous delivery						
No	44.8	23.4	7.2	–5.3 (–5.6 to –5.0)	–9.2 (–9.9 to –8.5)	–5.3 (–5.5 to –5.1)
Yes	5.1	1.6	1.2	–9.2 (–10.2 to –8.2)	–5.9 (–8.0 to –3.9)	–5.5 (–6.1 to –5.0)
Previous induced abortion						
No	45.0	22.0	7.3	–5.7 (–6.0 to –5.4)	–8.9 (–9.5 to –8.2)	–5.3 (–5.5 to –5.1)
Yes	5.0	3.0	1.0	–5.0 (–5.8 to –4.2)	–9.0 (–10.9 to –7.2)	–5.5 (–5.9 to –5.0)
Induced abortions	1996	2007	2019	1996–2007	2007–2019	1996–2019
Age group (full years)						
15–17	23.9	17.9	5.7	–3.7 (–4.4 to –3.0)	–9.1 (–10.1 to –8.1)	–5.6 (–5.9 to –5.3)
18–19	70.6	40.0	13.0	–5.9 (–6.4 to –5.3)	–7.9 (–8.7 to –7.1)	–6.5 (–6.7 to –6.2)
15–19	42.4	27.4	8.6	–4.9 (–5.3 to –4.5)	–8.8 (–9.4 to –8.1)	–6.0 (–6.2 to –5.8)
Previous pregnancy						
No	26.9	19.5	6.8	–3.7 (–4.2 to –3.2)	–8.3 (–9.0 to –7.6)	–5.6 (–5.8 to –5.3)
Yes	15.5	8.0	1.7	–7.5 (–8.2 to –6.7)	–9.8 (–11.0 to –8.7)	–6.9 (–7.3 to –6.6)
Previous delivery						
No	33.8	23.2	7.6	–4.3 (–4.8 to –3.9)	–8.5 (–9.1 to –7.8)	–5.8 (–6.0 to –5.6)
Yes	8.6	4.2	1.0	–7.7 (–8.7 to –6.7)	–10.3 (–11.9 to –8.7)	–6.8 (–7.3 to –6.2)
Previous induced abortion						
No	32.9	22.4	7.5	–4.2 (–4.6 to –3.7)	–8.6 (–9.3 to –8.0)	–5.7 (–5.9 to –5.5)
Yes	9.5	5.1	1.0	–7.8 (–8.8 to –6.9)	–9.3 (–10.8 to –7.8)	–7.2 (–7.7 to –6.7)

AAPC, average annual percentage change; CI, confidence interval.

15 years were omitted from the analysis because of the small number of cases, 82 and 379, respectively. Two induced abortions at age 19 years that were recorded as illegal were included in the analysis.

The terms ‘teenagers’, ‘teens’ and ‘adolescents’ are used to refer to women aged under 20 years.

Statistical analyses

Annual delivery and abortion rates per 1000 adolescents were calculated using corresponding mid-year female population figures from Statistics Estonia.³¹ Rates were calculated for all deliveries and abortions by age (15–17, 18–19 and 15–19 years), ethnicity (Estonian and non-Estonian) and reproductive history (previous pregnancy, previous delivery and previous induced abortion, categorized as no/yes).

Poisson regression models were applied to estimate the average annual percentage changes (AAPC) with 95% confidence intervals (CIs) in delivery and abortion rates over the whole period and in two sub-periods (1992/1996–2007 and 2007–2019) with change points in the trend in 2007. To observe changes in the rate ratios (RRs) of deliveries and abortions by reproductive history (no vs. yes) in the whole study population and in both ethnic groups, the RRs and their AAPCs with 95% CIs were modelled with Poisson regression. Cases with no information about ethnicity or previous pregnancies (table 1) were excluded from the models.

Statistical analyses were performed using Stata 14 (StataCorp LP, College Station, TX, USA).

Ethical approval

Since only anonymized data were used, no ethical consent was needed.

Results

From 1992 to 2019, 29 818 deliveries among 15–19-year-old residents of Estonia took place. The number of induced abortions in the same age group for the shorter period (1996–2019) was 25 865. The distribution of deliveries and abortions by age group, 4-year study periods, ethnicity and reproductive history is shown in table 1.

The delivery rate per 1000 adolescents decreased from 49.9 in 1992 to 8.4 in 2019, with an AAPC of –5.3. The decline accelerated starting in 2007 (AAPC –8.9), especially in the younger subgroup (AAPC –10.5) (table 2, figure 1). An even more rapid decline was evident in the abortion rates—from 42.4 in 1996 to 8.6 in 2019, with an AAPC of –6.0. From 2007 onwards, the decline in the trend was sharper, with an AAPC of –8.8 at age 15–19 and an AAPC of –9.1 in the younger subgroup (table 2, figure 1). Stratified analysis by ethnicity revealed a faster decline in delivery rates among Estonians than among non-Estonians, but the opposite occurred in abortion rates, with a remarkable decrease among non-Estonians starting in 2007 (AAPC –12.7) (table 3, figure 1).

Although we observed a steep decrease in the delivery rates among adolescents, there was almost no change during the whole period in the delivery RRs between the first and repeat pregnancy, regardless of previous delivery or abortion. Delivery rates for first and repeat pregnancies decreased nearly at the same pace (AAPC of –5.5 to –5.3) (table 2, figure 1). However, among Estonians, the delivery rate for repeat deliveries decreased faster than that for first deliveries, but the opposite trend was observed among non-Estonians (table 3).

Induced abortion RRs by previous pregnancies were not stable over the examined period—the abortion rates for repeat pregnancies (AAPC –6.9) decreased faster than those for first pregnancies. Thus, the abortion RRs between first and repeat pregnancies (regardless of previous delivery or abortion) increased by 1–2% per year. Among non-Estonians, there was no change in the RRs of abortions with no previous deliveries, and among those with previous deliveries, both rates decreased at the same pace (AAPC –7.2).

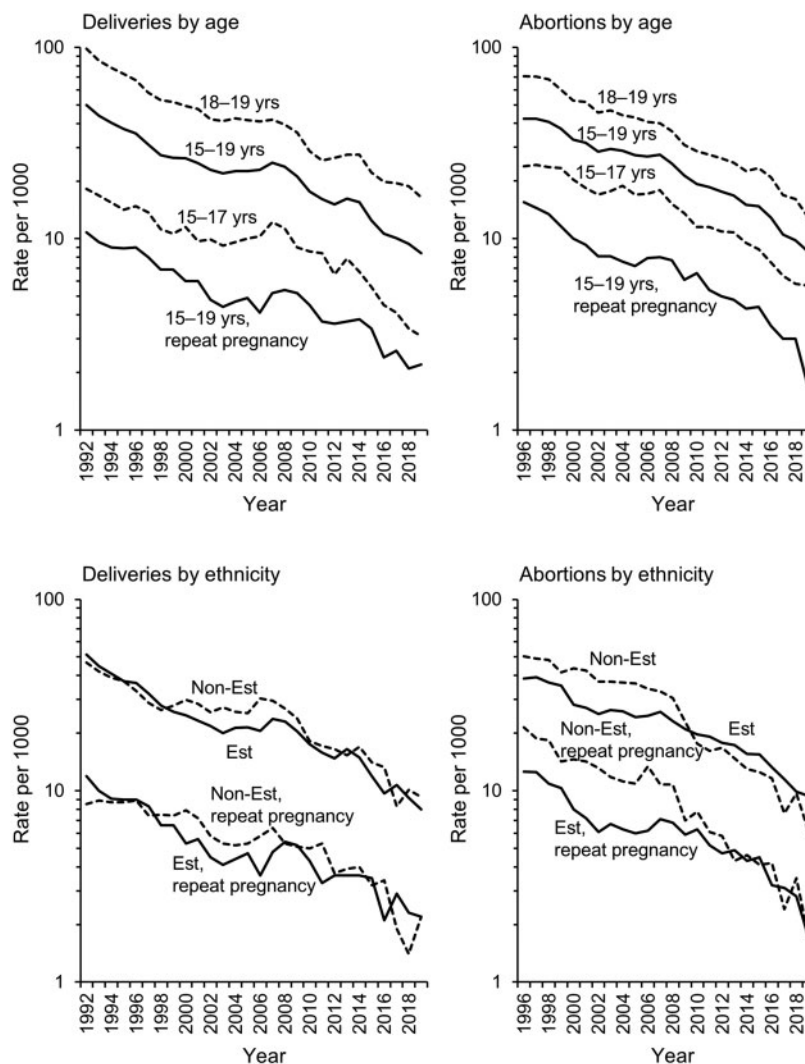


Figure 1 Delivery (1992–2019) and induced abortion (1996–2019) rates among adolescents in Estonia by age and ethnicity. Est, Estonian; Non-Est, Non-Estonian

Discussion

Teenage delivery and abortion rates have decreased dramatically since Estonia reformed its educational and health care systems and restored democratic society. Analysis of the AAPCs of these rates showed that the decline became sharper from 2007 onwards. Delivery rates for first and repeat pregnancies decreased nearly at the same pace, whereas abortion rates for repeat pregnancy decreased faster than those of first pregnancies. Teenage pregnancy rates dropped for both ethnic groups, whereas a faster decline in abortion rates occurred among non-Estonians than among Estonians. The opposite trend was observed in delivery rates.

According to the law completing EMBR and EAR cards has always been obligatory for medical institutions, and, there is regular communication between the registries and hospitals. Several scientific studies based on EMBR and EAR databases have been published in relevant scientific journals.^{5,19,28,29} Special statistical studies have not been performed to study the completeness of the databases.

The possible determinants of the rapid decrease in adolescent abortion rates in Estonia have been analysed in previous studies.^{12,32} The abortion rate in 2019—8.4 per 1000 teenagers—is in the same range as that reported in neighbouring Nordic countries: 6.4 in Finland in 2018 and 11.7 in Sweden in 2017. In 2016 and 2017, the average Nordic figures (including Denmark, Finland, Iceland, Norway and Sweden) were 10.3 and 8.9, respectively.³³ Comparison of these rates is of interest because many developments in furthering

sexual and reproductive health and rights in Estonia, which started in 1990s, were inspired by the ideology and approach of Nordic countries, e.g. the youth-friendly services model in Sweden, the sexuality education in Sweden and Finland, and the advanced birth and abortion data collection system in Finland. This raises the question of what figure would be a realistic and desired target for a country to strive for? Extremely low teenage abortion rates have been reported in Switzerland (5 per 1000 in 2011) and Norway (6.3 in 2017).³³

The politically induced change in abortion legislation in 2009–2015 seems to have had no effect on the continuous steady decline in births and abortions among teenagers. No illegally induced abortions have been reported. However, there are reports where parents' decisions about minors' pregnancies caused great confusion in the court and unbearable human suffering.³⁴

It is worth noting that in the analysis of the determinants of teenage pregnancies, the context of Estonia has shown that social and ideological factors may play a major role when the pregnancy rate is high; when motherhood at a young age is a social norm; and when the appropriate services, contraception and education are not easily available. On the other hand, factors at the individual level may be more prominent if the pregnancy rate is low.³ The data for Finland, where, unlike Estonia, there has been a long period of very low teenage pregnancy rates, have shown that teen childbearing has continued to be associated with socio-economic differences in these circumstances. In addition, in Finland, teenage abortions have been

Table 3 Delivery (1992–2019) and induced abortion (1996–2019) rates with average annual percentage change among adolescents at age 15–19 years in Estonia by ethnicity and reproductive history

Ethnicity/reproductive history	Year/rate per 1000 adolescents			Year/AAPC (95% CI)		
	1992	2007	2019	1992–2007	2007–2019	1992–2019
Deliveries						
Estonian	51.4	23.7	8.0	−6.4 (−6.7 to −6.1)	−8.7 (−9.4 to −7.9)	−5.6 (−5.8 to −5.4)
Previous pregnancy						
No	39.5	18.8	5.8	−6.1 (−6.4 to −5.7)	−9.2 (−10.0 to −8.3)	−5.6 (−5.8 to −5.4)
Yes	11.9	4.8	2.2	−7.5 (−8.3 to −6.8)	−7.1 (−8.7 to −5.6)	−5.6 (−6.0 to −5.2)
Previous delivery						
No	45.1	22.1	6.8	−5.9 (−6.3 to −5.6)	−9.0 (−9.8 to −8.2)	−5.5 (−5.7 to −5.3)
Yes	6.3	1.6	1.2	−11.2 (−12.4 to −10.1)	−6.0 (−8.4 to −3.6)	−6.7 (−7.3 to −6.1)
Previous induced abortion						
No	46.3	21.0	7.0	−6.5 (−6.8 to −6.1)	−8.8 (−9.6 to −8.0)	−5.6 (−5.8 to −5.4)
Yes	5.1	2.6	1.0	−5.7 (−6.7 to −4.7)	−7.9 (−10.0 to −5.7)	−5.3 (−5.8 to −4.7)
Non-Estonian	46.8	29.5	9.3	−3.7 (−4.2 to −3.2)	−9.7 (−11.0 to −8.4)	−4.5 (−4.8 to −4.2)
Previous pregnancy						
No	38.3	23.2	7.1	−3.7 (−4.3 to −3.1)	−9.8 (−11.2 to −8.3)	−4.6 (−4.9 to −4.2)
Yes	8.5	6.4	2.2	−3.6 (−4.7 to −2.5)	−9.4 (−12.1 to −6.7)	−4.5 (−5.1 to −3.8)
Previous delivery						
No	44.1	27.8	8.2	−3.7 (−4.2 to −3.2)	−10.1 (−11.4 to −8.8)	−4.7 (−5.0 to −4.4)
Yes	2.7	1.7	1.1	−2.9 (−5.1 to −0.7)	−5.6 (−9.9 to −1.3)	−2.2 (−3.3 to −1.1)
Previous induced abortion						
No	42.1	25.2	8.3	−3.8 (−4.3 to −3.2)	−9.3 (−10.6 to −7.9)	−4.4 (−4.7 to −4.1)
Yes	4.7	4.3	1.0	−3.1 (−4.4 to −1.8)	−12.7 (−16.5 to −8.9)	−5.4 (−6.2 to −4.6)
Induced abortions	1996	2007	2019	1996–2007	2007–2019	1996–2019
Estonian	38.5	25.8	9.4	−4.8 (−5.3 to −4.3)	−7.6 (−8.3 to −6.9)	−5.2 (−5.4 to −4.9)
Previous pregnancy						
No	25.9	18.6	7.7	−3.9 (−4.5 to −3.3)	−7.1 (−7.9 to −6.3)	−4.9 (−5.2 to −4.7)
Yes	12.6	7.1	1.7	−7.4 (−8.4 to −6.4)	−8.8 (−10.2 to −7.5)	−5.9 (−6.4 to −5.5)
Previous delivery						
No	31.0	21.8	8.4	−4.3 (−4.9 to −3.8)	−7.2 (−8.0 to −6.5)	−5.1 (−5.3 to −4.8)
Yes	7.5	3.9	1.0	−7.9 (−9.2 to −6.5)	−9.6 (−11.5 to −7.8)	−6.0 (−6.6 to −5.4)
Previous induced abortion						
No	31.0	21.3	8.4	−4.3 (−4.8 to −3.7)	−7.5 (−8.3 to −6.7)	−5.1 (−5.3 to −4.8)
Yes	7.5	4.3	1.0	−7.8 (−9.1 to −6.6)	−8.0 (−9.7 to −6.3)	−5.9 (−6.5 to −5.3)
Non-Estonian	50.5	33.0	6.1	−4.0 (−4.7 to −3.3)	−12.7 (−14.0 to −11.4)	−7.2 (−7.6 to −6.8)
Previous pregnancy						
No	29.1	22.2	4.4	−2.7 (−3.6 to −1.8)	−12.6 (−14.3 to −11.0)	−6.8 (−7.2 to −6.3)
Yes	21.5	10.8	1.7	−6.2 (−3.9 to −3.8)	−12.8 (−15.1 to −10.5)	−8.0 (−8.6 to −7.3)
Previous delivery						
No	39.4	27.9	5.2	−3.4 (−4.2 to −2.6)	−12.8 (−14.3 to −11.3)	−7.2 (−7.6 to −6.7)
Yes	11.1	5.1	0.9	−6.0 (−7.7 to −4.4)	−12.2 (−15.1 to −9.3)	−7.2 (−8.0 to −6.3)
Previous induced abortion						
No	36.9	25.5	5.0	−3.2 (−4.0 to −2.4)	−12.5 (−14.0 to −11.1)	−6.8 (−7.2 to −6.3)
Yes	13.6	7.5	1.1	−6.3 (−7.8 to −4.8)	−13.3 (−16.3 to −10.3)	−8.7 (−9.5 to −7.8)

AAPC, average annual percentage change; CI, confidence interval.

associated with being in foster care; having psychiatric problems; and being the daughter of teenage mother, of a mother with a history of induced abortions, or a mother who smoked during pregnancy.³ Individual-level factors such as a lack of sexual health knowledge, a dislike of school and alcohol abuse in the family were associated with the risk of unwanted pregnancies in Estonia at the beginning of this century.³⁵ Alcohol abuse in the family was accompanied by violence in the family in this study.

In the comparison of adolescent pregnancies across different settings, it is important to consider how many teenagers have been ‘exposed’ to pregnancy and at what age. The mean age at first sexual intercourse slightly decreased during the study period, from 18.0 years at the beginning of the 1990s to 17.5 years in 2015.^{12,36} This figure was similar for boys and girls, and it has not changed in this century. According to a study from 2015, two-thirds of 18-year-olds in Estonia reported having had sexual intercourse.³⁶ According to the same study, 36% and 28% of 14- to 18-year-old Estonians and non-Estonians, respectively, had engaged in sexual intercourse.³⁶ The proportion of 15-year-olds and younger teens who reported sexual intercourse was previously reported to be approximately 20–22% by similar study reports

starting in 2003; the last survey, from 2015, showed that this proportion had decreased to 15%.³⁶

In Estonia, the Russian-speaking minority lives mainly in the north-eastern part of the country and in the capital city of Tallinn. Despite attempts at integration, there are still Russian-speaking and Estonian-speaking schools in Estonia. It has been shown that sexual cultures, attitudes and values have traditionally been different in these two communities.¹⁸ Sexuality education has been more difficult to introduce in Russian-speaking schools. Our results showing similar trends in adolescent delivery and abortion rates and a faster decline in abortion rates among non-Estonians than among Estonians are somewhat surprising and worth further analysis. The steeper decline in delivery rates among Estonians supports the finding that teenage motherhood is closely linked with social deprivation—compared to native Estonians, non-Estonians have been and continue to be socio-economically disadvantaged.³⁷ Teenage motherhood should not be stigmatized and targeted social support systems are required to help young mothers and their children. It has been shown that when these strategies are widespread and well established, teenage childbearing is a sign rather than a cause of deprivation.³⁸

The phenomenon of repeat teenage pregnancies deserves closer examination in future studies. With the database used, it was not possible to determine how the subjects overlapped. The multipara group might have differed from the group with multiple abortions and the group with unwanted pregnancies after delivery. The last two groups were analysed in a study from the UK, where the authors showed a steady increase in adolescent repeat pregnancies from 1991 to 2007.²⁰ However, the proportion of abortion patients with repeat pregnancies was lower in the UK in 2007 than in our study. In 2017, an overview of evidence of measures to prevent teenage repeat pregnancies including 14 studies was published.²⁵ The studies came from the developing world, the UK and the USA and stressed the importance of enhancing contraception usage. Research to understand the non-use of contraception in contexts such as in Estonia, where services and contraception are easily accessible, must be more nuanced. Little is known about the sexual acceptability of different contraception methods,³⁹ the reasons and rates of discontinuation of different methods, fear of hormones in the era of environmental awareness movements and the role of the partner. It has been found in Scotland, UK, for example that in addition to social deprivation, repeat pregnancy terminations after 2–5 years were associated with the use of implant and Depo injectable contraception after the first termination.²² However, the concept of repeat abortions itself has been questioned; it might have little scientific merit, and every woman and girl deserves individualized approach and support.⁴⁰

The strength of our study is that the teenage delivery and abortion data can be considered complete and cover almost three decades in a country where the social and economic background and ‘official’ sexual morals have changed very rapidly. This is rarely the case in countries that underwent major societal changes in the beginning of the 1990s in Central and Eastern Europe. For example, in nearby Latvia and Lithuania, the (teenage) abortion data are still considered incomplete.^{1,5} Since 1996, it has been possible to analyse separately legally induced and spontaneous abortions and different ethnic groups in Estonia. There were very few cases where data about previous pregnancies were absent.

The major limitation of the study is that due to the prohibition of the usage of the personal identification code in abortion cards (for political reasons) in 1998, the data on previous pregnancies in abortion patients are based on information given by the woman rather than on the linkage of databases. Hopefully, linkage analysis will be possible in the future, as legal regulation has recently become favourable in this respect. In some studies, the timing of conception instead of the time of delivery or abortion has been used to analyse teen pregnancies.²⁶ This was not possible in our study, which was why we did not calculate pregnancy rates (including spontaneous abortions, ‘other abortions’, induced abortions and deliveries). Additionally, the registration of spontaneous abortions might be less complete since the majority of them do not need medical aid and do not involve a hospital visit.

The calculations of rates in the current study might slightly differ from that of earlier publications due to the updated number of girls in the 15–19-year-old age group according to recent censuses. Another reason is that the methodology of the calculation of the girl’s age on the day of delivery or abortion might have been different in previous studies than in the current study.

Data availability

The data underlying this article will be shared on reasonable request to the Estonian Medical Pregnancy Information System.

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Key points

- Although we did not investigate causality, we noticed that trends in teenage births decrease as society becomes wealthier.
- A substantial decrease in teenage abortion rates occurs in the context of legal and safe abortion, liberal legislation, easy access to contraception, youth-friendly services and mandatory holistic sexuality education lessons in schools.
- There always remains a small group of adolescents who repeatedly become pregnant; these adolescents need individualized approaches and support and should not be stigmatized.
- Differences in teenage pregnancy rates in ethnic groups with divergent sexual cultures can change over time.

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