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ORIGINAL RESEARCH ARTICLE

Secular trends of socio-demographic and lifestyle characteristics among delivering women in Arctic Russia, 1973-2017

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ABSTRACT

The aim of this study was to describe temporal trends in socio-demographic and lifestyle characteristics among delivering women in two Northern provinces of Russia from 1973 to 2017. Totally 161,730 births were registered in three birth registries. Changes in the distribution of maternal age, education, marital status, smoking during pregnancy were studied using Pearson's chi-squared tests and one-way ANOVA. The logistic regression models were used to assess factors, contributing to the variations in the prevalence of maternal smoking. The mean age of primiparous mothers increased from 22.1 years in 1973–1980 to 25.4 years in 2012–2017 ($p < 0.001$). The proportion of primiparous mothers with higher education increased from 26.2% in 2006 to 38.3% in 2017 ($p < 0.001$). The proportion of cohabiting primiparous women increased from 5.0% to 15.2% over the study period ($p < 0.001$). The proportion of mothers smoking during pregnancy decreased from 18.9% in 2006–2011 to 14.8% in 2012–2017 ($p < 0.001$). Downward in the prevalence of smoking was revealed in 2012–2017 compared to 2006–2011 (OR = 137.76; 95%CI:71.62–264.96, OR = 183.74; 95%CI:95.52–353.41, respectively). Over the past decades, women postpone childbearing until receiving higher education, continue living in cohabitation during pregnancy and smoke less.

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Introduction

Pregnancy complications and adverse birth outcomes linked to social inequalities and unhealthy behaviours are important public health concerns. Maternal age [1–3], occupation [2], marital status [2], education [3], and lifestyle characteristic [4–6] are considered to be the most important social determinants of pregnancy outcomes. Advanced age has been shown to be associated with increased risk of pregnancy complications [7], risk of caesarean section [8,9], stillbirth and adverse neonatal outcomes [10]. Unmarried mothers (single, divorced, widows) and women with lower levels of education also have an increased risk of adverse pregnancy outcomes [11]. Alcohol consumption [6] and smoking [5] are associated with stillbirth, miscarriage, preterm birth, low birth weight, birth defects and foetal alcohol- and tobacco syndromes. Drug exposures during pregnancy are associated with high risk of induced abortion [12], pregnancy complications [12,13], prematurity [13], malformations of the foetus [12], antenatal death of the foetus [13].

Postponing of the first birth has been observed in many parts of Europe since the 1970s. The average age of primiparous women increased from 26.5 years in 1987 to 28 years in 2009 in Western, Southern, Northern Europe and East Asia [1]. In Norway, the mean age of primipara women increased from 23.2 years in 1970 to 30.1 years in 2021 [14]. The corresponding numbers from Finland were 24.4 [15] and 30 [16] years while in Sweden they were 25.9 [15] and 30.1 [17] years, respectively. In Denmark, the average age of primiparous women increased from 24.2 in 1970 to 29.8 in 2021 [18]. The mean age of primiparous mothers in Alaska in 1970 was 21.6 years, in 2000–24.1 [19] years with subsequent increase up to 28.6 years in 2018 [20].

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In Norway, the proportion of married mothers in 1968 was 87%; in 2019 the number of married mothers decreased to 41% with a shift towards cohabiting mothers [21]. In Finland, the marriage frequency was 95.5% in 1970 and decreased to 54,1% in 2018 with increased number of cohabiting mothers up to 33.2% [22]. In Canada, the proportion of married mothers in 1992–1995 was 73.7% against 56.6% in 2002–2005 [23] and 64.8% in 2006 [24].

The data about time trends of maternal health characteristics and maternal pregnancy outcomes in Russia are scarce. A study in Syktyvkar and Vorkuta (Komi Republic, Russia), included 69,000 observations and revealed that the most of the mothers in 1980–1999, was in the age group 20–29 years [25]. The mean age of mothers of 1339 newborns in the city of Severodvinsk (Russia) in 1999 was 24.9 years and 35% of mothers were unmarried [26]. In Monchegorsk (Murmansk County, Russia) in 1973–2002, the proportion of children born to mothers out of wedlock increased from 9.5 to 31% [27]. Retrospective study on 300 indigenous women in the Far North of the Krasnoyarsk Territory versus 150 female newcomers revealed that the highest number of births occurred at the maternal age of 20–24 years [28]. Retrospective study on 168 pregnant women from Khanty-Mansiysk city (Khanty-Mansiysk Autonomous Okrug, Russia) demonstrated the mean age of women 31.2, 29.8 and 33.2 in different studied groups. Women living in the city were mostly married 88.5% and 80.5% in different groups, and only 58.8% of rural women were married. Only 47.1% of rural women were officially employed, while as women from the city 76.9% and 82.9% in different groups [29].

Daily smoking prevalence among pregnant women reduced in Norway [4], Sweden [5] in the last decades. This indicator has also decreased in Russia in time prospective [30]. However, evidence indicates that woman living in Western or Eastern Europe with fewer resources are more likely to smoke before pregnancy and not quit smoking during pregnancy [31]. These high-risk women were mostly unmarried, had lower levels of education, had low health literacy, did not have permanent work, had unplanned pregnancy, and did not use folic acid [31]. Thus, unfavourable socio-demographic characteristics are often associated with destructive health behaviours during pregnancy. Among 648 women of childbearing age recruited in Nizhny Novgorod Region and Saint-Petersburg in 2004–2005, 89% of non-pregnant women reported consuming alcohol and 20% of them reported continued drinking after pregnancy identification [32].

The given number of studies on socio-demographic and lifestyle characteristics of mothers in Russia, their small sample sizes, short observation periods and methodological limitations [25–29,32], necessitate further study on the secular trends of these indicators in Russia. Opposite to given sample studies, population-based research is particular informative. Population-based medical birth registries in Northwest Russia with broad information about maternal characteristics [33–35] gave the opportunity to investigate different factors during pregnancy in historical perspectives in a society in transition including periods of the collapse of the USSR, with a prolonged economic crisis, the destruction of the national economy, a decrease in the income of the majority of the population and an increase in social inequality and their gradually recovering since early 2000s. All these processes were resulted in reproductive health and demographic processes: the crude birth rate was 12 per 1000 population in 1991[35] and dropped down to 8.7 per 1000 population in 1998 [36].

The aim of the study was to investigate changes in socio-demographic and lifestyle characteristics of becoming mothers over time during 1973–2017 using the data from population-based birth registries in the two northernmost regions of European Arctic Russia (the Murmansk and Arkhangelsk Counties). Thus, secular trends for a long, more than 10-years period will be presented for the studied characteristics.

Materials and methods

Design and sample

This is a registry-based historical cohort study. The Kola Birth Registry (KBR), was established in 1998 with the retrospective collection of information about all births from 28 weeks of gestation that occurred in Monchegorsk (one of the biggest cities of the Murmansk County) as of March 1973, later the registration was continued prospectively until 2005 [33]. The Murmansk County Birth Registry (MCBR) and the Arkhangelsk County Birth Registry (ACBR) covered all births in the Murmansk and Arkhangelsk Counties after 22 weeks of gestation. The MCBR was established in 2005, and the prospective registration of pregnancy outcomes began on the 1st of January 2006 [34]. The ACBR was established in 2011 with prospective data collection from the 1st of January 2012 [35]. The territorial birth registry forms were made on the basis of medical birth registry of Norway with the similar information on maternal sociodemographic, lifestyle and behaviour data, evidence on the maternal health before and during the pregnancy, information about the delivery and the newborn's health. All records from the paper-based registration forms were then transferred

to a depersonalised electronic database. The data from the electronic database are provided upon reasonable request for scientific research purposes. Details about the implementation and description of suitability of the registries for epidemiological investigations have been published before [33,35,37].

Data about all deliveries (n = 161,730) during the period 1973–2017 included either in the KBR, the MCBR or the ACBR were obtained. Thereafter, deliveries with missing data on maternal age at delivery, parity, marital status, occupation, smoking during pregnancy, signs of alcohol consumption were excluded from the study. Data on excluded cases are presented in Figure 1. Data on education were presented only in the MCBR and the ACBR, and the number of missing data for education during 2006–2017 was 490.

Variables and statistical analysis

Data from the three registries were merged into one database using the same fields: maternal date of birth; child's birth date; parity; civil status; occupation; education that was presented only in MCBR and ACBR; maternal tobacco smoking during pregnancy; signs of alcohol abuse.

The maternal age was categorised into three groups: < 18 years, 18–34 years, ≥ 35 years. The time periods were divided in accordance with the used registries, political and economic changes in the country into six periods: 1973–80, 1981–89, 1990–97, 1998–05, 2006–11, 2012–17. Maternal education was classified into 5 categories: primary (class 1–9) or none, secondary (class 10–11), vocational, higher education and unknown. Maternal occupation was divided into 2 groups: working or without work, the latter including students. Maternal parity was: primipara (woman pregnant for the first time) and para (woman pregnant for the second or more times). Marital status was: married (officially registered marriage), cohabiting, unmarried (including single, divorced, widows). The smoking habits were registered according to self-reported data from primary documentations and personal interview, while alcohol consumption was estimated according to evidence of alcohol consumption by a doctor at any antenatal visit or at admittance to the delivery department. Mother's smoking before and during pregnancy as well as signs of alcohol consumption were categorised as "yes" or "no".

The statistical analysis was conducted using SPSS version 28.0.1.0, IBM, Armonk, NY, USA. The studied outcomes included mean values for maternal age among primiparous and all women, proportions of age and educational categories, proportions of different occupational and marital status over time. Also, proportions of smoking mothers and women with signs of alcohol consumption during pregnancy over time were studied.

Bivariate comparisons between the study variables across the six time periods were performed by the

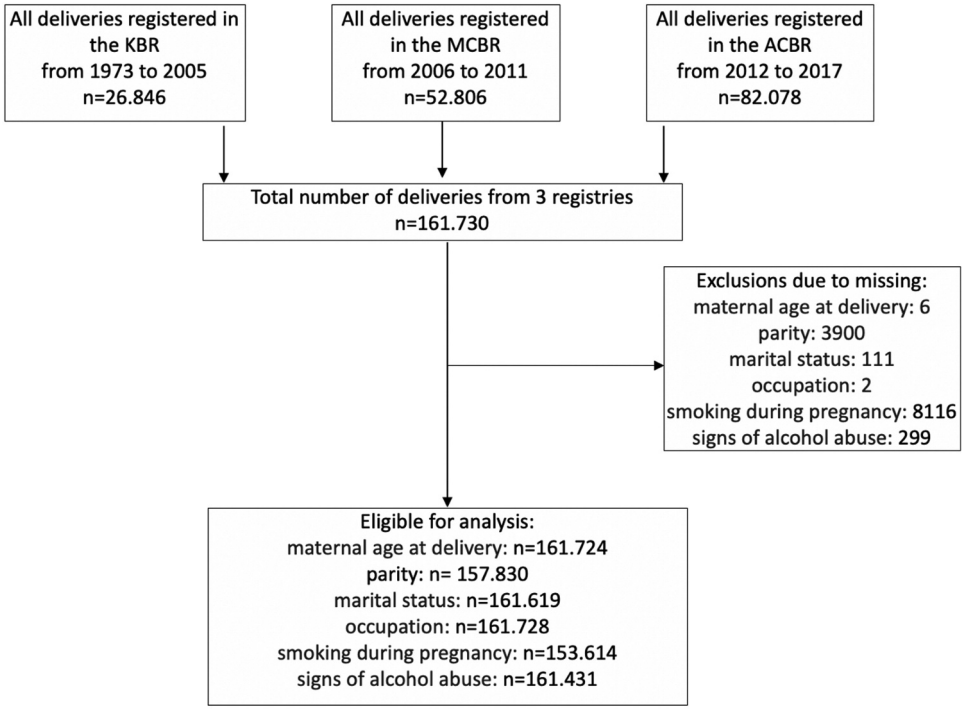

Figure 1. Flow chart of the sampling procedure.

Pearson's chi-square test without standardised adjusted residuals and one-way ANOVA for the categorical and continuous data, respectively. The level of significance was set to 0.05.

To assess factors, contributing to the variations of the prevalence of maternal smoking and signs of alcohol abuse over time, the logistic regression models were used. Time-periods were included as independent categorical variable and maternal smoking or signs of alcohol abuse were included as dichotomous dependent variables. The adjustment also was performed for parity, maternal age and civil status. For the odds ratios 95% confidence intervals (CI) were calculated. The first time-period (1973–1980), maternal age below 18 years, primiparity and married status were used as reference categories.

Results

The mean (SD) of maternal age increased from 24.8 (5.3) years in 1973–1980 to 26.7 (5.3) years in 2006–2011 and 28.4 (5.3) years in 2012–2017 ($p < 0.001$), while mean of maternal age at the first pregnancy increases from 22.1 (3.5) years in 1973–1980 to 23.5 (4.1) years in 2006–2011 and 25.4 (4.8) years in 2012–2017 ($p < 0.001$).

The proportion of mothers with advanced age (35 and more years old) increased from 5.6% in 1973–1980 to 14.4% in 2012–2017 among all women, and was not changed among primiparous till 2011 and highly increased from 1.3% in 2006–2011 to 4.9% in 2012–2017 (Table 1). The proportion of young mothers (<18 years) was the highest in period of 1990–1997 among all women and primiparous, with subsequent 3,5-fold decrease by 2012–2017.

As the data for education were presented only for 2006–2017 years, the distribution was tested annually. Among primiparous women, the proportion of mothers with higher education increased from 26.2% in 2006 to 43.2% in 2011 with some decrease to 38.3% in 2017 ($p < 0.001$). The proportion of mothers with vocational education decreased from 33.1% in 2006 to 23.8% in 2011 with subsequent increase up to 47.7% in 2017 ($p < 0.001$). The proportion of mothers with secondary education changed from 35.3% through 27.8% to 8.2% for the same time period ($p < 0.001$) (Figure 2)

Over the last 40 years, civil status of primiparous mothers had markedly changed. In 1973–1980, 89% of mothers were married and only 5% were cohabiting (Figure 3). Subsequently, the proportion of married mother decreased and number of cohabiting mothers increased accounting 65% and 23.9%, respectively, in 1998–2005. At the time of delivery in 2012–2017, 70.3% of primiparous women were married, 14.5% were unmarried and 15.2% were cohabiting ($p < 0.001$). There were the same trends of civil status distribution for all women.

In 1973–1980, 92.9% of primiparous mothers had permanent employment and only 7.1% was unemployed. The proportion of working primiparous mothers gradually decreased till 1998–2005, accounting 58.4% with subsequent increase up to 75.4% in 2012–2017 ($p < 0.001$). The trends in maternal occupation distribution for all women were the similar.

In 1973–1980, only 0.1% of mothers reported about their smoking during pregnancy. Lately, the proportion of smoking during pregnancy mothers was gradually increasing up to 18.9% in 2006–2011 with subsequent decrease to 14.8% in 2012–2017 ($p < 0.001$) (Figure 4). The signs of alcohol consumption were revealed in 0,3% of mothers in 1973–1980. The proportion of mothers with alcohol consumption signs increased in 1981–1998 up to 0.7% and was relatively stable till 1998–2005 with subsequent decrease to 0.3% in 2012–2017 ($p < 0.001$) (Figure 4).

Increase in the prevalence of self-reported smoking was revealed till 2016–2011 compared to 1973–1980 with following downward till 2012–2017 (OR = 183.74; 95% CI: 95.52–353.41, OR = 137.76; 95%CI: 71.62–264.96, respectively) (Table 2). Adjustment for civil

Table 1. Maternal age distribution in 1973–2017, %.

			Total	Years periods						p-value[a]
				1973–80	1981–89	1990–97	1998–05	2006–11	2012–17	
Primiparous	<18 years	N	4207	247	379	391	310	1561	1319	<0.001
		Proportion	8.0	7.6	10.9	19.7	17.6	8.2	5.7	
	18–34	N	47009	2967	3055	1576	1440	17,185	20,786	
		Proportion	89.2	91.6	88.1	79.3	81.8	90.4	89.4	
	35 and more	N	1476	26	33	20	10	254	1133	
		Proportion	2.8	0.8	1.0	1.0	0.6	1.3	4.9	
All women	<18 years	N	5297	268	424	468	367	1950	1820	<0.001
		Proportion	3.3	3.8	4.2	9.2	8.0	3.7	2.2	
	18–34	N	138445	6460	9184	4280	3964	46,087	68,470	
		Proportion	85.6	90.7	90.5	84.3	86.6	87.4	83.4	
	35 and more	N	17982	393	540	327	247	4682	11,791	
		Proportion	11.1	5.6	5.3	6.4	5.4	8.9	14.4	

[a]Calculated by chi-square tests of homogeneity.

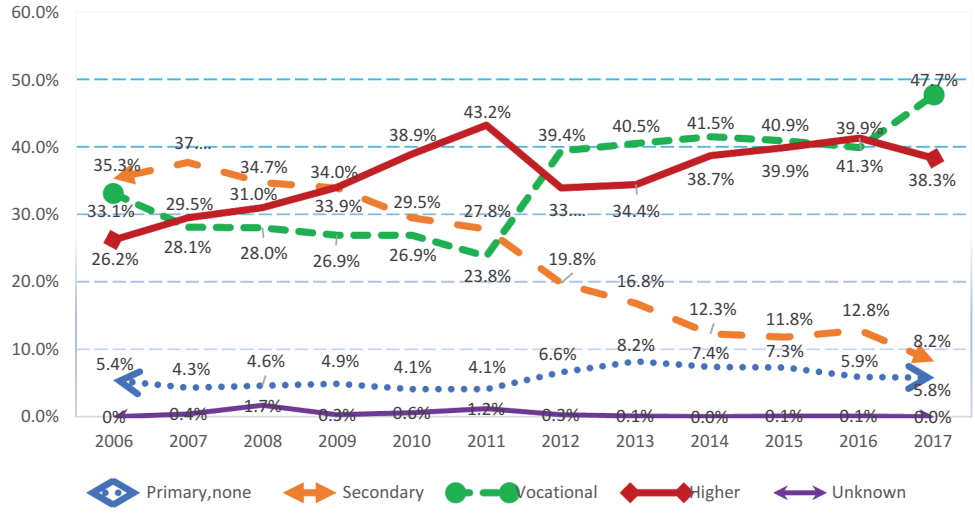

Figure 2. Proportional distribution of primiparous mothers according to education level in 2006–2017.

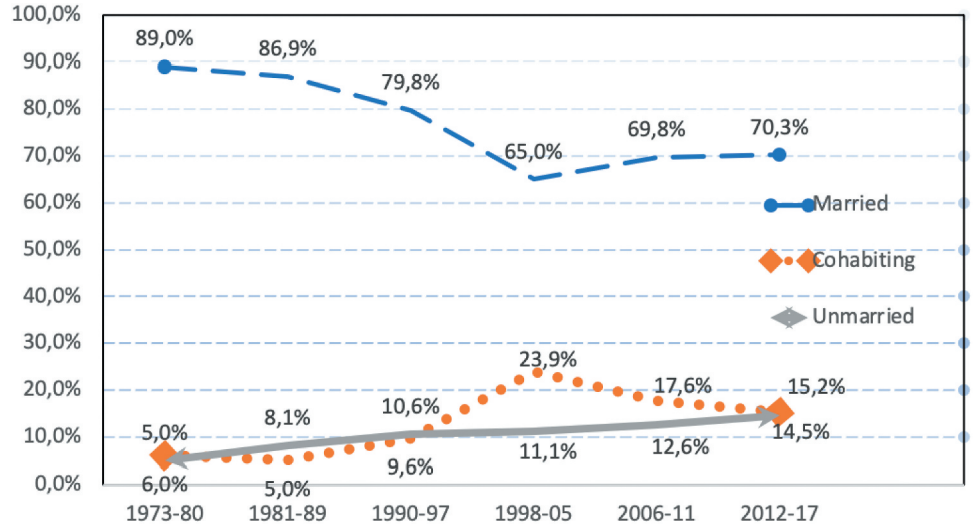

Figure 3. Civil status distribution among primiparous mothers in 1973–2017.

status contributed the strongest variation of the prevalence of self-reported smoking over time. 2.2-fold increase in the prevalence of alcohol abuse signs in 1981–1998 compared to 1973–1980 was revealed (OR = 2.21; 95%CI: 1.35–3.60) (Table 2). The following downward in prevalence of alcohol abuse signs till 2012–2017 did not reach statistical significance. Adjustment for civil status contributed the strongest variation in the prevalence of alcohol abuse signs over time, compared to parity and maternal age.

Discussion

The most important finding of the study is that we documented changes in socio-demographic and lifestyle characteristics of mothers in two Northern provinces of Russia since the 1970s. The mean age of primiparous mothers increased from 22.1 years in 1973–1980 to 25.4 years in 2012–2017. The proportion of primiparous mothers with advanced age highly increased from 0.8% in 1973–1980 to 4.9% in 2012–2017. The proportion of primiparous mothers with higher education increased from 26.2% in 2006 to 38.3% in 2017. The proportion of cohabiting primiparous women increased from 5.0% to 15.2% over the study period. The proportion of smoking during pregnancy mothers decreased from 18.9% in 2006–2011 to 14.8% in 2012–2017.

Over the past 40 years, fertility rates in Russia and USSR have undergone significant changes. In the 1970s, the total fertility rate in the USSR was 2.02 [38],

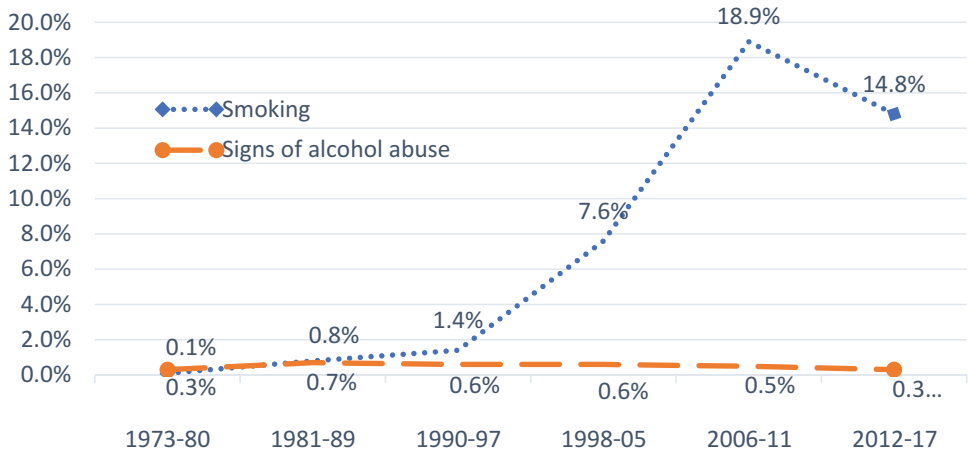

Figure 4. Maternal self-reported smoking during pregnancy and signs of alcohol consumption distribution among all women in 1973–2017.

Table 2. Assessment of factors contributing to the variations of the prevalence of maternal smoking and signs of alcohol abuse over time.

Maternal smoking during pregnancy	Crude OR (95% CI)	Adjusted OR[1] (95% CI)	Adjusted OR[2] (95% CI)	Adjusted OR[3] (95% CI)
1973–1980	1.0	1.0	1.0	1.0
1981–1989	6.44 (3.23–12.82)	6.11 (3.07–12.18)	6.39 (3.21–12.73)	6.27 (3.14–12.49)
1990–1997	11.38 (5.68–22.78)	11.05 (5.5–22.13)	10.39 (5.19–20.80)	9.52 (4.75–19.07)
1998–2005	64.68 (33.33–125.52)	62.69 (32.30–121.66)	61.03 (31.44–118.45)	46.50 (23.95–90.29)
2006–2011	183.74 (95.52–353.41)	194.77 (101.24–374.72)	212.19 (110.30–408.21)	178.91 (92.98–344.23)
2012–2017	137.76 (71.62–264.96)	141.33 (73.47–271.87)	158.95 (82.63–305.77)	132.33 (68.78–254.61)
Signs of alcohol abuse	Crude OR (95% CI)	Adjusted OR[1] (95% CI)	Adjusted OR[2] (95% CI)	Adjusted OR[3] (95% CI)
1973–1980	1.0	1.0	1.0	1.0
1981–1989	2.38 (1.46–3.88)	2.38 (1.46–3.88)	2.38 (1.46–3.88)	2.21 (1.35–3.60)
1990–1997	1.60 (0.89–2.89)	1.60 (0.89–2.88)	1.55 (0.86–2.80)	1.23 (0.68–2.23)
1998–2005	2.09 (1.19–3.70)	2.10 (1.19–3.71)	2.06 (1.17–3.64)	1.25 (0.70–2.22)
2006–2011	1.67 (1.07–2.61)	2.07 (1.32–3.25)	1.99 (1.27–3.13)	1.31 (0.83–2.06)
2012–2017	1.07 (0.69–1.68)	1.24 (0.79–1.94)	1.16 (0.74–1.82)	0.76 (0.48–1.19)

[1]- Adjusted for parity
[2]- Adjusted for parity, maternal age
[3]- Adjusted for parity, maternal age, civil status

providing natural population growth. By 1980s, the total fertility rate was 1.86 [35] as a result of the small number of children born in the 1940s due to the Great Patriotic War, as well as an increase in the number of divorces and abortions, increase in male mortality, leading to a demographic crisis [39]. By 1987, the total fertility rate had increased to 2.23 [38]. In the 1990s, the total fertility rate dropped to 1.89, and the largest drop in this indicator occurred in 2000–1.19 38], as a result of the collapse of the Soviet Union and the associated economic and social crises. Further, there was a gradual increase in this indicator, amounting 1.56 in 2010, that could be partly explained by the introduction of the so-called «maternal capital» for delivery of the second and subsequent child since 2007, that contributed to a decrease in the number of abortions and an increase in the total fertility rate [38]. The programme provides financial support for such families that can be spent for real-estate purchase, education or maternal pension insurance [38]. In 2015, after the reunification of Crimea with Russia, the indicator had increased to 1.78 [39] with subsequent decrease to 1.57 in 2018 and 1.50 in 2020 [40]. In 2018, the programme «maternal capital» was expanded with the payments for the first, second and third child. The total fertility rate in Murmansk and Arkhangelsk Counties in 2015 was 1.71 and 1.81, respectively, even lower than in whole Russia. In 2018 that was 1.51 and 1.55 for Murmansk and Arkhangelsk Counties, in 2020–1.44 and 1.39, respectively [40].

Socially significant diseases influence on perinatal outcomes. The incidence of tuberculosis in women of childbearing age (18–34 years) in Russia, was 76.6 cases per 100 thousand people in 2010, and 29.4-in 2020 [41]. There are different complications of tuberculosis in pregnancy: pre-eclampsia, preterm birth, postpartum haemorrhage, low birth weight, increased neonatal mortality [42]. Prevalence of gestational diabetes mellitus (GDM) was 0.4% in 2010 in Russia and increased up to 7.8% in 2020 [43], that is partly explained by the

change in diagnostic criteria for GDM over time. GDM is associated with different long- and short-term adverse outcomes for the mother (pre-eclampsia, shoulder dystocia, risk of caesarean section, type 2 diabetes mellitus after pregnancy, cardiovascular disease and metabolic syndrome) and for the child (macrosomia, birth trauma, neonatal hypoglycaemia, metabolic syndrome and cardiovascular disease) [44, 45].

Maternal health status and lifestyle factors have an important impact on maternal morbidity and perinatal outcomes and should be better monitored and improved for higher fertility rate and better perinatal outcomes.

Maternal age, education and occupation

Our findings are in line with data from Norway [14], Denmark [18], Finland [22], showing the increase of the mean maternal age at the first pregnancy and number of primiparous mothers with advanced age (35 and more years old). The results of our study correspond to the data of the official statistics of Russia: the mean age of primiparous mothers in Russia (until 1991 – the USSR) in 1970 was 23.6 years with later increase to 26.1 years in 2018 [38], the mean age of all mothers in 1970 was 27 years, with a subsequent decrease to 25.6 years in 1980 and later annual increase to 28.7 years in 2018 [39].

The United Nations declared about decrease of the number of births per 1000 girls aged 15–19 in Russia from 51.8 to 20.7 in 1990–1995 and 2015–2020, respectively, but still the level of adolescent fertility far exceeded this indicator in Norway and Sweden (5.1 births per 1000 girls aged 15–19), Finland (5.8) and Denmark (4,1) respectively [44]. There is the same trend for young mothers in our study.

Pregnancies in adolescents, as well as in mothers of advanced age, have serious health consequences for the mothers and their babies. Young mothers aged 15–19 years have higher risks of eclampsia, postpartum endometritis and systemic infections in comparison with women aged 20–24 years [46].

In 1980–1983, 68% of primiparous mothers in Russia aged 15–49 years had secondary education, and 23% of mothers had higher and vocational education. By 2000–2003, the proportion of mothers with higher than secondary education rose up to 33% [47]. In Norway, from 1967 to 2004, the level of high education increased from 21.2% to 45.8%, with a significant decrease in the low level of education from 22.1% to 4.2% [48]. Mothers of Finland are also more educated. The total fertility rate of women with tertiary-level education in 2006 was 2.0 and with basic education – 1.6. From 2010 to 2018 there was the decrease in the total fertility rate in the whole country in all women's educational groups. In 2020, the total fertility rate of highly educated women has increased to 1.5 and among women with basic education total fertility rate is still decreasing to 1.1 [49]. According to our data, the mothers are becoming more educated nowadays, and the number of mothers with vocational education exceeded the number with higher education in 2017, 47.7% and 38.3% respectively.

From 1973 to 2002 in Monchegorsk (Murmansk County), there was 3-fold decrease in the proportion of mothers employed as "skilled workers using machines". At the same time, the proportion of student mothers increased from 1.4% to 17.3% [27]. In Finland, the proportion of mothers with high skilled work increased from 14.3% in 1991–1993 to 19.1% in 2003–2006, while the proportion of mothers with unskilled work decreased from 19.1% to 13.3%, and the number of students increased from 5 to 10.4% [50].

Nowadays, women prioritise higher education, well-paid work and stable financial situation, postponing childbearing.

Marital status

The proportion of married mothers in 1970 in the USSR counted 89.4%, and in Russia in 2018 there were 78.2% of married mothers [39]. The frequency of cohabitation in the Russia among primiparous women doubled from 1980 to 2003 [47]. In Norway in 1968–1991, the level of married primiparous women amounted 87–85.5% [51]. From 2002 to 2019, there was a decrease in the proportion of primiparous married mothers from 35.4% to 31.4% and an increase in the proportion of cohabitating mothers from 45.6% to 55% [21]. In Finland, 80% of the mothers were married in 1987 with gradual decrease up to 57.8% in 2010 and 54.1% in 2018 [22].

The results of our study are consistent with literature data and we had revealed the maximum proportion of cohabitating mothers and lowest proportion of married mothers in 1998–2005, in the period of economic crises with low fertility rate.

Lifestyle characteristics

Increased proportion of smoking during pregnancy from 1995–2005 to 2006–2011 in our study could be associated with better collection of data and implementation of birth registries. Later, there was a decrease in the proportion of smoking mothers that corresponds to the world data [4,5,52]. According to the results of the study on the basis of the MCBR in 2006–2011, 25.2% of the mothers smoked before pregnancy and 18.9% continued smoking during pregnancy [30]. Also, cessation of smoking during pregnancy was associated with

marital status, education and parity but not with maternal age [31]. According to our data, civil status contributed the strongest variation of the prevalence of self-reported smoking over time.

Data on consuming alcohol during pregnancy in Europe are difficult to compare due to different methodologies used for information collection [53]. Recently, that was reported about the highest proportion of alcohol consumption during pregnancy in the UK (28.5%), Russia (26.5%), and Switzerland (20.9%) and the lowest in Sweden (7.2%) and Norway (4.1%) [53]. In our study, we found relatively low proportion of alcohol consumption signs, possibly due to misclassifications, presented in limitations, and the prevalence of alcohol abuse signs were mostly influenced by civil status, compared to parity and maternal age.

Strengths and limitations

An important strength of this study is that the data represent almost the total population of pregnant women in Monchegorsk, Murmansk and Arkhangelsk Counties during the defined time periods. The KBR, MCBR, ACBR are reliable and systematically validated sources of information [33,34,36], that allowed to estimate the social status of pregnant women over a 40-years period in Russia. The advantage of above-mentioned registries includes information on socio-demographic and lifestyle characteristics that are not totally collected by the official statistics. The KBR contained records of more than 98% of all deliveries [36], the coverage of births by the MCBR was 98.9% [33], and by the ACBR- 99,6% of all births [34], resulting in a small chance for selection bias.

One of the limitations in our study is that women from the three different populations were included. Thus, The KBR includes mothers only from city of Monchegorsk, while the MCBR and the ACBR include mothers from entire Murmansk and Arkhangelsk regions, ie both urban and rural citizens. The KBR was the retrospective collection of information and for the MCBR and the ACBR information was collected mostly prospectively with some information collected retrospectively. Another limitation is that the smoking information was based on self-reported data, that may have led to an underestimation of smoking rates, and thus could constitute informational bias and resulted in misclassification. The data on signs of alcohol consumption are of questionable quality. That is still difficult to get faithful answers on this question in our society and we can assume that abusing women do not always visit the doctor in a state of intoxication so that the doctor could record this state, resulting in misclassification on exposure. Also, all births were included in the registry, thus the same woman with different deliveries could be included in the study.

Conclusions

Over the past decades, women of Russia increasingly postpone childbearing until receiving higher education and a permanent job, and being pregnant, continue to live in cohabitation. But nowadays, mothers are more often to be non-smokers and less likely to consume alcohol. Civil status contributed the strongest variation in the prevalence of self-reported smoking and alcohol abuse signs in mothers. Further measures for young families support and strengthening the institution of the family are needed to increase the birth rate in Russia and improvement of birth outcomes. The prevention of smoking and alcohol consumption during pregnancy still should be a priority for health workers.

Ethics approval and informed consent

The KBR, ACBR and MCBR were promulgated by regional Ministries of health's orders, their registration forms do not contain personal identifiers, meaning that the health information is confidential and therefore no personal consent was needed. All registries were approved by local ethical committees. The current study was granted ethical approval by the Ethical Committee of the Northern State Medical University (Arkhangelsk, Russia) (Protocol 04/10-19) and the Norwegian Regional Committee for Medical and Health Research Ethics (2020/120,598 REK Midt).

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No potential conflict of interest was reported by the author(s).

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References

[1] Mills M, Rindfuss RR, McDonald P, et al. Why do people postpone parenthood? Reasons and social policy incentives. Hum Reprod Update. 2011;17(6):848–860.

[2] Kingsbury AM, Gibbons K, McIntyre D, et al. How have the lives of pregnant women changed in the last 30 years? Women Birth. 2017;30(4):342–349.

[3] Kana MA, Peleteiro B, Correia S, et al. Trends in sociodemographic and health care factors in portuguese and non-portuguese mothers giving birth in Portugal, 1995-2014. Paediatr Perinat Epidemiol. 2019;33(4):249–259.

[4] Kvalvik LG, Skjaerven R, Haug K. Smoking during pregnancy from 1999 to 2004: a study from the medical birth registry of Norway. Acta Obstet Gynecol Scand. 2008;87 (3):280–285.

[5] Cnattingius S, Lambe M. Trends in smoking and overweight during pregnancy: prevalence, risks of pregnancy complications, and adverse pregnancy outcomes. Semin Perinatol. 2002;26(4):286–295.

[6] Iversen ML, Sørensen NO, Broberg L, et al. Alcohol consumption and binge drinking in early pregnancy. A cross-sectional study with data from the copenhagen pregnancy cohort. BMC Pregnancy Childbirth. 2015;15 (1):327.

[7] Laopaiboon M, Lumbiganon P, Intarut N, et al. Advanced maternal age and pregnancy outcomes: a multicountry assessment. Bjog. 2014;121 Suppl 1:49–56.

[8] Rydahl E, Declercq E, Juhl M, et al. Cesarean section on a rise-Does advanced maternal age explain the increase? A population register-based study. PLoS One. 2019;14(1): e0210655.

[9] Bayrampour H, Heaman M. Advanced maternal age and the risk of cesarean birth: a systematic review. Birth. 2010;37(3):219–226.

[10] Blomberg M, Birch Tyrberg R, Kjølhede P. Impact of maternal age on obstetric and neonatal outcome with emphasis on primiparous adolescents and older women: a swedish medical birth register study. BMJ Open. 2014;4 (11):e005840.

[11] Grjibovski A, Bygren LO, Svartbo B. Socio-demographic determinants of poor infant outcome in north-west Russia. Paediatr Perinat Epidemiol. 2002;16(3):255–262.

[12] Lenoir C, Boumaïza S, Ing Lorenzini KR. Outcomes of drug exposition during pregnancy: analysis from a teratology information service. Eur J Obstet Gynecol Reprod Biol. 2020Apr;247:42–48.

[13] Fatkullina I, Sadykova L, Fatkullina Y. The influence of drug abuse on the pregnancy and perinatal terminations. *Archive akusherstva I ginekologii (Archive of Obstetrics and Gynecology V.F. Snegirev) in Russian*. 2020;7(3):134–137.

[14] Statistics Norway. Mean age of parent at first child's birth, by contents and year, 2021. Available online: https://www.ssb.no/en/befolkning/fodte-og-dode/statistikk/fodte. Accessed 2022 Nov 30.

[15] Mathews TJ, Hamilton BE. Mean age of mother, 1970–2000. Natl Vital Stat Rep. 2003;51(1):1–13.

[16] Statistics Finland. Population and society. Available oline: https://stat.fi/en/publication/cku2ehapc8hl90c58br8mqkkj. Accessed 2022 Nov 30.

[17] Statista. Average age of women at the birth of the first child in the Nordic countries from 2011 to 2021. Available oline: https://www.statista.com/statistics/1297799/average-age-women-birth-first-child-nordic-countries. Accessed 2022 Nov 30.

[18] Statistics Denmark. Average age of women given birth and new fathers by age and time. Available oline: https://statistikbanken.dk/statbank5a/SelectVarVal/saveselections.asp. Published 2022. Accessed 2022. Accessed 30 Nov 2022 Nov 30.

[19] Department of Health and Social Services of Alaska. Teen births in Alaska, 1993 to 2002. Alaska vital signs. Available online: http://dhss.alaska.gov/dph/VitalStats/Documents/PDFs/vitalsigns/Teen_Births_20.02.pdf. Published 2005. Accessed 2005. Accessed 31 Mar 2022 Mar 31.

[20] Department of Health and Social Services of Alaska. Alaska vital statistics 2018 annual report. Available online: http://dhss.alaska.gov/dph/VitalStats/Documents/PDFs/VitalStatistics_AnnualReport_2018.pdf. Published 2019. Accessed 2022 Apr 01.

[21] Statistics Norway. Live births, by parity, cohabitation status of mother 2002 – 2019. Available online: https://www.ssb.no/en/statbank/table/08451. Published 2019. Accessed 2022 Mar 28.

[22] Finnish institute for health and well-being. Perinatal statistics – women in labor, childbirth and newborns. Available online: https://thl.fi/documents/10531/0/Tr49_19_liitetaulukot.pdf/712d65c7-3e78-d811-6aab-bee80ccaa12f?t=1576739595794. Published 2018. Accessed 2022 Mar 23.

[23] Edwards NM, Audas RP. Trends of abnormal birthweight among full-term infants in Newfoundland and Labrador. Can J Public Health. 2010;101(2):138–142.

[24] Shapiro GD, Bushnik T, Wilkins R, et al. Adverse birth outcomes in relation to maternal marital and cohabitation status in Canada. Ann Epidemiol. 2018;28(8):503–509.e511.

[25] Kozlovskaya A, Bojko E, Odland JO, et al. Secular trends in pregnancy outcomes in 1980-1999 in the Komi Republic, Russia. Int J Circumpolar Health. 2007;66(5):437–448.

[26] Grjibovski AM, Bygren LO, Svartbo B, et al. Social variations in fetal growth in a Russian setting: an analysis of medical records. Ann Epidemiol. 2003;13(9):599–605.
[27] Kozlovskaya AV, JØ O, Grjibovski AM. Maternal occupation and marital status are associated with birth weight and risk of preterm birth in Monchegorsk (Murmansk region) during a 30-year period. *Ekologiya cheloveka (Human Ecology) in Russian*. 2014;21(8):3–12.
[28] Zakharova TG, Petrova MM, Kashina MA, et al. Pregnancy, labor, and neonatal status in women of smaller indigenous peoples in the Far North of the Krasnoyarsk Territory. *Rossiisky bulletin akusherstva I ginekologii (Russian Bulletin of Obstetrician-Gynecologist) in Russian*. 2012;12(1):53–56.
[29] Chegus LA, Solovyeva AV, Solovev VG. Pregnancy and childbirth in women from among the indigenous minorities of the north in the context of urbanization. *Medicinskii soven (Medical advice) in Russian*. 2021;21(2):124–130.
[30] Kharkova OA, Krettek A, Grjibovski AM, et al. Prevalence of smoking before and during pregnancy and changes in this habit during pregnancy in Northwest Russia: a Murmansk county birth registry study. Reprod Health. 2016;13(1):18.
[31] Smedberg J, Lupattelli A, Mårdby A-C, et al. Characteristics of women who continue smoking during pregnancy: a cross-sectional study of pregnant women and new mothers in 15 European countries. BMC Pregnancy Childbirth. 2014;14(1):213.
[32] Balachova TN, Isurina GL, Skitnevskaya LV, et al. Alcohol consumption among pregnant and non-pregnant women in Russia: evidence for prevention. Acta Biomedica Scientifica. 2018;3(3):59–68. In Russ.
[33] Vaktskjold A, Talykova L, Chashchin V, et al. The kola birth registry and perinatal mortality in Moncegorsk, Russia. Acta Obstet Gynecol Scand. 2004;83(1):58–69. Published 2003/12/18.
[34] Anda EE, Nieboer E, Voitov AV, et al. Implementation, quality control and selected pregnancy outcomes of the murmansk county birth registry in Russia. Int J Circumpolar Health. 2008;67(4):318–334.
[35] Usynina AA, Odland J, Pylaeva ZA, et al. Arkhangelsk county birth registry as an important source of information for research and healthcare. Ekologiya cheloveka (Human Ecology). 2017. 24(2):58–64.
[36] The Human Fertility Database. Crude birth rate. Available oline: https://www.humanfertility.org/cgi-bin/country.php?country=RUS&tab=si. Updated 01 April 2022. Accessed 2022 Apr 01.
[37] Odland JO, Tchachtchine VP, Bykov V, et al. Critical evaluation of medical, statistical, and occupational data sources in the Kola Peninsula of Russia pertinent to reproductive health studies. Int Arch Occup Environ Health. 1999;72(3):151–160.
[38] The Human Fertility Database. Mean age at first birth. Available online:https://www.humanfertility.org/cgi-bin/main.php. Accessed 2022 Apr 01.
[39] Rosstat. Demographic yearbook of Russia 2019. Available online:http://www.gks.ru/storage/mediabank/Dem_ejegod-2019.pdf. Accessed 2022 Mar 25.
[40] Rosstat. Total fertility rate 2020. Available online: https://rosstat.gov.ru/storage/mediabank/ZuJNCyDI/7.1.xlsx. Accessed 2022 Apr 01.
[41] Rosstat. Healthcare in Russia 2021. Available online: https://rosstat.gov.ru/storage/mediabank/Zdravoohran-2021.pdf. Accessed 2022 Dec 02.
[42] Orazulike N, Sharma JB, Sharma S, et al. Tuberculosis (TB) in pregnancy – a review. Eur J Obstet Gynecol Reprod Biol. 2021;259:167–177.
[43] Rosstat. Health status of pregnant women, women in childbirth, puerperas, newborns. Available online: https://rosstat.gov.ru/storage/mediabank/zdr3-2.xls. Accessed 2022 Dec 02.
[44] Saeedi M, Cao Y, Fadl H, et al. Increasing prevalence of gestational diabetes mellitus when implementing the IADPSG criteria: a systematic review and meta-analysis. Diabet Res Clin Pract. 2021;172:108642.
[45] United Nations. World Population Prospects Highlights, 2019 Revision. Available online:https://population.un.org/wpp/Publications/Files/WPP2019_Highlights.pdf. Accessed 2022 Apr 01.
[46] Ganchimeg T, Ota E, Morisaki N, et al. Pregnancy and childbirth outcomes among adolescent mothers: a world health organization multicountry study. Bjog. 2014;121 Suppl 1:40–48.
[47] Perelli-Harris B, Gerber TP. Nonmarital childbearing in russia: second demographic transition or pattern of disadvantage? Demography. 2011;48(1):317–342.
[48] Tollånes MC, Thompson JM, Daltveit AK, et al. Cesarean section and maternal education; secular trends in Norway, 1967-2004. Acta Obstet Gynecol Scand. 2007;86(7):840–848.
[49] Statistics Finland. Turn in the birth rate was especially visible among persons aged over 30 and highly educated, 2021. Available online: https://www.stat.fi/til/synt/2020/02/synt_2020_02_2021-12-03_tie_001_en.html. Accessed 2022 Nov 30.
[50] Gissler M, Rahkonen O, Arntzen A, et al. Trends in socioeconomic differences in Finnish perinatal health 1991–2006. J Epidemiol Community Health. 2009;63(6):420–425.
[51] Arntzen A, Moum T, Magnus P, et al. The association between maternal education and postneonatal mortality. Trends in Norway, 1968-1991. Int J Epidemiol. 1996;25(3):578–584.
[52] Grøtvedt L, Kvalvik LG, Grøholt EK, et al. Development of social and demographic differences in maternal smoking between 1999 and 2014 in Norway. Nicotine Tob Res. 2017;19(5):539–546.
[53] Mårdby AC, Lupattelli A, Hensing G, et al. Consumption of alcohol during pregnancy-A multinational European study. Women Birth. 2017;30(4):e207–e213.