

ORIGINAL ARTICLE

# SECULAR TRENDS IN PREGNANCY OUTCOMES IN 1980–1999 IN THE KOMI REPUBLIC, RUSSIA

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## ABSTRACT

**Objectives.** To describe secular trends in selected pregnancy outcomes in the Komi Republic, Russia, in 1980–1999.

**Study design.** A descriptive study.

**Methods.** Data on all single infants born in Syktyvkar and Vorkuta during the period 1980–1999 were abstracted from the birth journals at maternity homes (n=69,340). Proportions of stillbirths, preterm and post-term births as well as the mean values for birth weight and length of term infants were estimated in each of the locations over time and summarized in 5-year periods. Multiple logistic and linear regression analyses were used to study independent effects of the time periods on the outcomes, adjusted for maternal age in Syktyvkar and for maternal age, parity and infant gender in Vorkuta.

**Results.** Considerable variations over time were observed for all studied outcomes except for stillbirths. The lowest prevalence of both preterm and post-term births was observed in 1985–1989 in both Syktyvkar (4.3% and 3.2%) and Vorkuta (3.5% and 3.1%). Average birth weight in term infants was significantly lower in 1995–1999 in both Syktyvkar (-33 g, 95% CI: -46,-21) and Vorkuta (-81 g, 95% CI: -100, -62) than in 1980–1984.

**Conclusions.** The proportions of preterm and post-term births increased while the average birth weight in term infants decreased over the 20-year period of observation. Further research should address those factors that could explain the observed pattern of pregnancy outcomes in the Komi Republic. (*Int J Circumpolar Health* 2007;66(5): 437-448)

**Keywords:** birth weight, post-term, preterm, stillbirth, transition

## INTRODUCTION

The importance of optimal antenatal development for future health is well known. In spite of the fact that foetal growth is believed to be genetically determined, environmental factors also influence the anthropometric characteristics of the newborns (1). Large variations in preterm births and average birth weight exist both between and within countries (2). Given that compromised foetal growth and preterm delivery are associated with infant mortality (3), childhood morbidity and some adult diseases such as coronary heart disease, hypertension and diabetes (4), studies on pregnancy outcomes may have implications for the future health of the population.

Several studies from developed countries have reported an increase in average birth weight during the past decades, which has been paradoxically accompanied by an increase in preterm births (5). While improved socio-economic conditions, reduced prevalence of smoking during pregnancy and increased maternal anthropometric characteristics have led to the better realization of the foetal growth potential, steadily increasing numbers of multiple births, obstetric interventions and the introduction of the ultrasound-based estimates of gestational age have led to an increased incidence of preterm births (6). Less is known about the secular trends in the pregnancy outcomes of Eastern European countries during the same period.

The initiation of the economic and social reforms in 1989 in the Czech Republic was accompanied by a decrease in the average

birth weight from 3,323 g to 3,292 g in 1992 followed by an increase to 3,353 g in 1996, which was parallel to the improvements in the economic situation (7). Babies born in 1984–1985 in East Germany were about 150 g lighter and 0.2 cm shorter than babies born in the same area in 1997, reflecting the improvements in well-being after the reunification of Germany (8). In Estonia, the mean birth weight increased from 3,465 g in 1992 to 3,497 g in 1997 and the proportion of preterm births decreased from 5.8% to 5.1% during the same period (9).

Russia experienced a long-lasting economic crisis after the break-up of the USSR in 1991, which was characterized by a decline of the national economy, the impoverishment of the majority of the population and an increase in social inequalities during the 1990s. The peak of the crisis was in 1998. From 1999 and up until the present, a gradual recovery of the national economy has been observed with an average annual increase in the GDP of 6–7%.

In spite of the fact that the transition in Russia has been more painful than in Eastern Europe, the information on secular trends in pregnancy outcomes and their determinants in Russia during this period is scarce.

Two studies exploring the social determinants of pregnancy outcomes in Russia during the transition have been published. In the first study, 1,559 women registered at prenatal care centres in Severodvinsk, north-west Russia, in 1999 were followed from the first examination until delivery (10,11). The second study included 11,172 births in the Tula region of central Russia in the year 2000 (12). Both studies have reported considerable

variations in pregnancy outcomes by maternal sociodemographic characteristics. However, both studies were performed immediately after the culmination of the crisis and included only one year of observation, thus precluding any conclusions on the longitudinal changes in pregnancy outcomes in Russia during the transition.

In Monchegorsk, located on the Kola Peninsula, the mean birth weight decreased from 3,440 g in 1989 to 3,245 g in 1993 (13). Similar patterns were observed in Astrakhan in southern Russia from 1979–1995 (14). Tretyak et al. reported an increase in the average weight and length of newborns as a result of pregnancies reaching term without complications between 1987 and 2002 in Moscow and in Saratov, a large city in the south of the European part of Russia, while the opposite trend was observed in a smaller town, Khvalynsk,

situated near Saratov (15). However, the first study included only a short observation period while the last 3 used only 2 time points, included only term infants and suffered from a small sample size.

Thus, given the small number of studies, their controversial results and methodological limitations, the secular trends in pregnancy outcomes in Russia during the time of the transition remain largely unknown. Almost all women in Russia deliver in maternity homes (17). Basic maternal and infant data are routinely registered in the medical files providing an opportunity to study the trends in pregnancy outcomes over time.

The aim of this study is to describe the secular trends in the prevalence of stillbirths, preterm and post-term births as well as infants' anthropometric characteristics in two areas of the Komi Republic from 1980 to 1999.

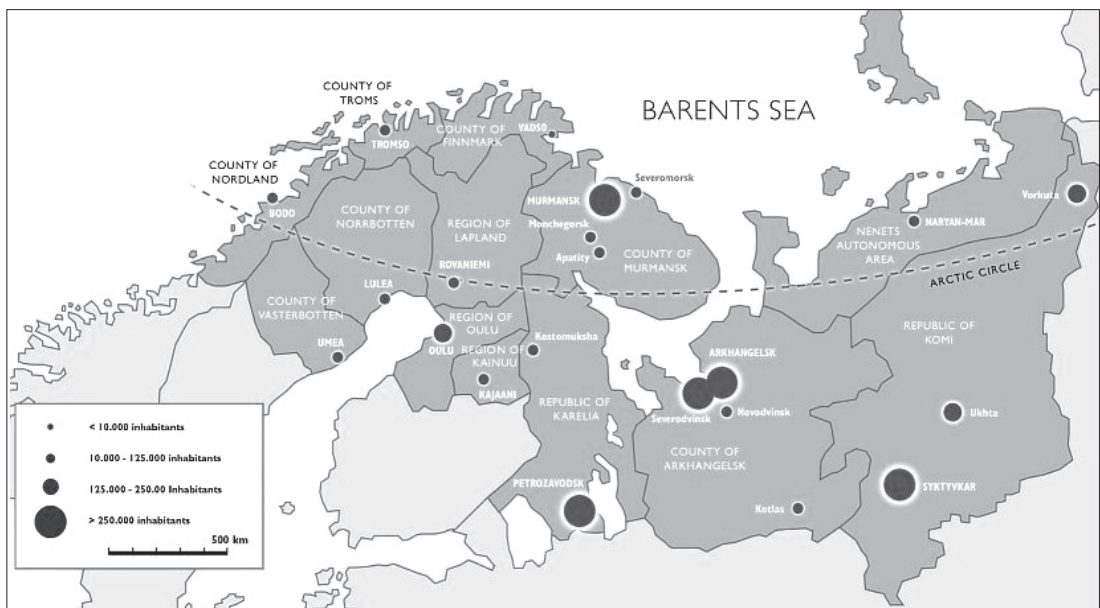


Figure 1. Map of the Euro-Arctic Barents region (<http://www.barentsinfo.fi/barentsmap.htm>).

## MATERIAL AND METHODS

### *Setting*

The Komi Republic is located in the north of the European part of Russia and covers an area of 416.0 thousand square kilometers; its population was 996.4 thousand in 2005 (Fig. 1). Russians constitute about 75% of the population and live predominantly in urban areas. The remaining 25% of the population are the Komi people, the indigenous minority, who live predominantly in rural areas. Syktyvkar is the capital of the Komi Republic whose population was 244.5 thousand in 2005. The second largest town, Vorkuta, had a population of 127.5 thousand in 2005. Vorkuta is the centre of the Russian coal industry in the Arctic zone. The Komi Republic is one of the areas that were seriously hit by the economic crisis in the 1990s (16). However, all public medical care is free of charge and available to most women. Details on maternal and child health care in the Komi Republic are described elsewhere (17).

### *Data collection*

For the purpose of this study we used data from the Komi database, which was collected in 2002–2003 and based on the birth journals at maternity homes in Syktyvkar and Vorkuta (18). We attempted to extract data on all births in Syktyvkar and Vorkuta during the 20-year period between 1 January 1980 and 31 December 1999. However, the data for births in 1990, 1994 and 1997–1998 in Vorkuta were unavailable because the journals for these years were destroyed when, in the early 2000s, a water pipe ruptured in the basement of the maternity home in Vorkuta where all birth journals were being stored at the time.

The inclusion criteria were gestational age of 28 completed weeks and birth weight of  $\geq 1,000$  g, similar to other population-based studies from Russia (10,11,19). All births prior to the twenty-eighth week of pregnancy are considered as miscarriages in Russia (20) and are not included in the birth journals. The database included year of birth, gender of the baby (only in Vorkuta), birth weight, length at birth and whether a birth was preterm, term or post-term. Births before 37 weeks and at or after 42 completed weeks of gestation were classified as preterm and post-term births, respectively, based on the Naegele term calculation. Available maternal information included maternal age in both settings and parity in Vorkuta. The data were abstracted manually from the maternity journals by the first author and checked by an independent observer (18).

### **Data analysis**

The studied outcomes included proportions of stillbirths, preterm births and post-term births and mean values for weight and length at birth in term babies. Given the large variability in the studied outcomes over time, years of birth were grouped in 5-year intervals corresponding to the historical periods of the Soviet era (1980–1984), Perestroika (1985–1989), the break-up of the Soviet Union and initiation of the reforms (1990–1994) and partial recovery of the economy followed by the second crisis (1995–1999). Maternal age was categorized in 4 groups: <20 years, 20–29 years, 30–39 years and 40 years and older. By parity, all women were classified in 3 groups: 0, 1 and 2 or more births. Women with missing data formed separate groups.

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

by using chi-square tests and one-way ANOVA for the categorical and continuous data, respectively. Independent effects of the birth year on stillbirths, preterm births and post-term births were studied by multiple logistic regression with adjustment for maternal age, parity and infant sex in Vorkuta and for maternal age in Syktyvkar. The differences in average infant weight and length at birth between the time periods were analyzed by multiple linear regression with adjustments as described above. Analyses were performed separately for each of the outcomes. The first time-period (1980–1984), maternal age below 20 years, null-parity and female gender of the baby were used as reference categories. All analyses were performed

in SPSS, v.12.0 (SPSS Inc., Chicago, IL). Due to small absolute numbers, subjects with missing data were excluded from the multivariable analyses.

## RESULTS

Altogether, the data were available for 43,078 and 26,262 births in Syktyvkar and Vorkuta, respectively, during the study period. Maternal characteristics varied over time in both locations (Table I). The proportions of primiparous women and teenage mothers were higher in the 1990s than in the 1980s in Vorkuta. Moreover, significant differences in infant sex were

**Table I.** Births by available maternal characteristics in Syktyvkar and Vorkuta, 1980–1999.

Location	Characteristics	1980–1984 n (%)	1985–1989 n (%)	1990–1994 n (%)	1995–1999 n (%)	p <sup>a</sup>
Syktyvkar	Maternal age, years					<0.001
	<20	1211 (8.9)	1085 (10.6)	1491 (16.7)	1543 (15.0)	
	20–29	9419 (69.3)	6692 (65.2)	5560 (62.2)	6804 (66.2)	
	30–39	2547 (18.7)	2326 (22.6)	1742 (19.5)	1837 (17.9)	
	40+	111 (0.8)	54 (0.5)	55 (0.6)	73 (0.7)	
	Missing	297 (2.2)	114 (1.1)	89 (1.0)	28 (0.3)	
	Total <sup>b</sup>	13585 (100)	10271 (100)	8937 (100)	10285 (100)	
Vorkuta	Maternal age, years					<0.001
	<20	905 (9.6)	1105 (10.7)	574 (19.3)	611 (17.3)	
	20–29	6515 (69.0)	6361 (61.7)	1711 (57.5)	2230 (63.2)	
	30–39	1887 (20.0)	2372 (23.0)	609 (20.5)	649 (18.4)	
	40+	83 (0.9)	72 (0.7)	22 (0.7)	32 (0.9)	
	Missing	50 (0.5)	406 (3.9)	60 (2.0)	8 (0.2)	
	Parity					<0.001
	0	4453 (47.2)	4439 (43.0)	1638 (55.0)	2063 (58.4)	
	1	3827 (40.5)	4236 (41.1)	912 (30.6)	1062 (30.1)	
	2+	1111 (11.8)	1589 (15.4)	394 (13.2)	385 (10.9)	
	Missing	48 (0.5)	52 (0.5)	32 (1.1)	20 (0.6)	
	Infant sex					<0.001
	Male	4865 (51.5)	5329 (51.7)	1493 (50.2)	1792 (50.8)	
	Female	4552 (48.2)	4962 (48.1)	1454 (48.9)	1719 (48.7)	
	Missing	23 (0.2)	25 (0.2)	29 (1.0)	19 (0.5)	
Total <sup>b</sup>	9440 (100)	10316 (100)	2976 (100)	3530 (100)		

<sup>a</sup>Calculated by chi-square tests of homogeneity.

<sup>b</sup>May not be exactly 100% due to rounding.

found across the time periods. Distribution of maternal age over time in Syktyvkar was similar to that observed in Vorkuta.

No differences in the proportions of stillbirths over time were found in any of the locations. The period of Perestroika (1985–1989) was characterized by the lowest prevalence of preterm births and post-term births in both Syktyvkar and Vorkuta. The average birth weight and length at birth for the term infants were the highest in this period in Syktyvkar. The proportions of both preterm and post-term births were higher in the 1990s than in the 1980s in both areas (Table II).

In Syktyvkar, the proportion of stillbirths tended to decrease from 1980–1984 onwards, but the differences did not reach the level of statistical significance. The prevalence of preterm births was lower in 1985–1989 and higher in both 1990–1994 and 1995–1999

than in the reference time period, independently of maternal age. A similar pattern was observed for post-term births, except that their proportion in 1990–1994 was similar to 1980–1984 (Table III).

In Vorkuta, the prevalence of stillbirths, preterm births and post-term births followed the same pattern over time as in Syktyvkar. The proportion of both preterm and post-term births was lower during Perestroika than in the reference period. While the prevalence of preterm births was significantly higher in 1990–1994 than in the reference group, the proportion of post-term births was higher than in the reference group in 1995–1999 (Table IV).

Average birth weight in term babies in Syktyvkar remained stable until the mid-1990s, but then decreased and became on average 33 g lower than at the beginning of

**Table II.** Pregnancy outcomes in Syktyvkar and Vorkuta, 1980–1999.

Pregnancy outcomes	1980–1984	1985–1989	1990–1994	1995–1999	p <sup>a</sup>	p <sup>b</sup>
Stillbirths, %						
Syktyvkar	0.9	0.7	0.7	0.7	0.307	0.083
Vorkuta	0.6	0.7	0.9	0.7	0.326	0.269
Preterm births, %						
Syktyvkar	4.9	4.3	5.7	5.8	<0.001	<0.001
Vorkuta	4.4	3.5	6.2	5.2	<0.001	0.002
Post-term births, %						
Syktyvkar	3.6	3.2	3.6	5.6	<0.001	<0.001
Vorkuta	4.9	3.1	5.5	6.3	<0.001	<0.001
Birth weight (term infants), g, mean (SD)						
Syktyvkar	3404 (486)	3415 (476)	3397 (438)	3366 (438)	<0.001	<0.001
Vorkuta	3468 (481)	3457 (474)	3395 (454)	3371 (475)	<0.001	<0.001
Length (term infants), cm, mean (SD)						
Syktyvkar	52.0 (2.5)	52.6 (2.5)	52.1 (2.2)	51.5 (2.0)	<0.001	<0.001
Vorkuta	51.8 (2.6)	52.2 (2.6)	52.1 (2.9)	52.1 (2.8)	<0.001	<0.001

<sup>a</sup>Calculated by chi-square of homogeneity and ANOVA for dichotomous and continuous variables, respectively.

<sup>b</sup>Tests for linear trends.

**Table III.** Crude and adjusted odds ratios (OR) with 95% confidence intervals (CI) for stillbirths, preterm births and post-term births in Syktyvkar, 1980–1999.

Period, years	Stillbirths		Preterm births		Post-term births	
	Crude OR	Adjusted OR <sup>a</sup>	Crude OR	Adjusted OR <sup>a</sup>	Crude OR	Adjusted OR <sup>a</sup>
1980–1984	1	Reference	1	Reference	1	Reference
1985–1989	0.84 (0.63, 1.12)	0.84 (0.63, 1.13)	0.88 (0.77, 0.99)	0.86 (0.76, 0.97)	0.87 (0.75, 0.99)	0.87 (0.75, 0.99)
1990–1994	0.81 (0.60, 1.10)	0.82 (0.61, 1.12)	1.18 (1.05, 1.33)	1.15 (1.02, 1.30)	1.00 (0.87, 1.15)	1.01 (0.88, 1.17)
1995–1999	0.78 (0.58, 1.05)	0.81 (0.60, 1.09)	1.19 (1.06, 1.33)	1.17 (1.04, 1.31)	1.58 (1.40, 1.79)	1.60 (1.41, 1.81)
Maternal age, years						
<20	1	Reference	1	Reference	1	Reference
20–29	0.96 (0.67, 1.36)	0.93 (0.66, 1.33)	0.78 (0.68, 0.88)	0.79 (0.70, 0.90)	1.16 (0.99, 1.36)	1.20 (1.03, 1.41)
30–39	1.44 (0.97, 2.12)	1.41 (0.61, 1.12)	1.08 (0.94, 1.25)	1.12 (0.97, 1.29)	1.21 (1.01, 1.44)	1.27 (1.06, 1.52)
40+	5.58 (2.82, 11.06)	5.41 (2.73, 10.74)	2.17 (1.50, 3.14)	2.21 (1.52, 3.20)	0.87 (0.44, 1.72)	0.89 (0.45, 1.76)
Missing	2.76 (1.37, 5.59)	2.57 (1.27, 5.23)	0.25 (0.12, 0.50)	0.26 (0.13, 0.53)	0.97 (0.59, 1.59)	1.11 (0.68, 1.82)

<sup>a</sup>Adjusted for the variables in the table.

**Table IV.** Crude and adjusted odds ratios (OR) with 95% confidence intervals (CI) for stillbirths, preterm births and post-term births in Vorkuta, 1980–1999.

Period, years	Stillbirths		Preterm births		Post-term births	
	Crude OR	Adjusted OR <sup>a</sup>	Crude OR	Adjusted OR <sup>a</sup>	Crude OR	Adjusted OR <sup>a</sup>
1980–1984	1	Reference	1	Reference	1	Reference
1985–1989	1.21 (0.86, 1.72)	1.23 (0.86, 1.75)	0.81 (0.70, 0.93)	0.79 (0.68, 0.92)	0.64 (0.54, 0.72)	0.63 (0.54, 0.73)
1990–1994	1.53 (0.97, 2.43)	1.42 (0.88, 2.29)	1.44 (1.20, 1.73)	1.41 (1.17, 1.69)	1.14 (0.95, 1.37)	1.16 (0.96, 1.39)
1995–1999	1.15 (0.71, 1.85)	1.09 (0.67, 1.78)	1.20 (1.00, 1.43)	1.18 (0.99, 1.42)	1.31 (1.11, 1.54)	1.31 (1.11, 1.55)
Maternal age, years						
<20	1	Reference	1	Reference	1	Reference
20–29	0.83 (0.52, 1.34)	0.99 (0.60, 1.62)	0.92 (0.77, 1.12)	1.01 (0.83, 1.23)	1.15 (0.95, 1.40)	1.31 (1.07, 1.60)
30–39	1.66 (1.01, 2.74)	2.02 (1.13, 3.61)	1.23 (1.00, 1.51)	1.28 (1.01, 1.63)	1.26 (1.01, 1.57)	1.59 (1.24, 2.03)
40+	3.70 (1.38, 9.93)	4.46 (1.56, 12.75)	2.51 (1.55, 4.07)	2.34 (1.41, 3.88)	1.79 (1.02, 3.17)	2.20 (1.22, 3.97)
Parity						
0	1	Reference	1	Reference	1	Reference
1	0.81 (0.58, 1.13)	0.65 (0.44, 0.94)	0.86 (0.75, 0.99)	0.84 (0.72, 0.97)	0.87 (0.76, 0.99)	0.82 (0.72, 0.95)
2+	1.50 (1.02, 2.22)	0.93 (0.58, 1.49)	1.43 (1.22, 1.69)	1.26 (1.03, 1.53)	0.93 (0.78, 1.12)	0.83 (0.67, 1.02)
Infant sex						
Male	1.11 (0.83, 1.50)	1.10 (0.82, 1.49)	0.88 (0.78, 0.99)	0.88 (0.78, 0.99)	1.22 (1.09, 1.38)	1.23 (1.09, 1.38)
Female	1	Reference	1	Reference	1	Reference

<sup>a</sup>Adjusted for the variables in the table.

the 1980s. Length at birth was significantly higher during Perestroika and the first part of the 1990s than in the reference period, but lower during the late 1990s (Table V). Adjustments for maternal age only slightly changed the estimates.

In Vorkuta, the average birth weight progressively decreased from 1980–1984 through 1995–1999 independently of other characteristics, while length at birth increased from 1980–1984 to 1985–1989 and remained relatively stable afterwards (Table VI).

**Table V.** Crude and adjusted differences with 95% confidence intervals (CI) in birth weight and length at birth in term infants in Syktyvkar, 1980–1999.

	Difference in birth weight, g		Difference in length at birth, cm	
	Crude (95% CI)	Adjusted <sup>a</sup> (95% CI)	Crude (95% CI)	Adjusted <sup>a</sup> (95% CI)
Period, years				
1980–1984	0	Reference	0	Reference
1985–1989	11 (-2, 23)	10 (-2, 23)	0.59 (0.52, 0.65)	0.59 (0.52, 0.65)
1990–1994	-8 (-21, 6)	-1 (-14, 12)	0.14 (0.07, 0.20)	0.16 (0.10, 0.23)
1995–1999	-39 (-52, -27)	-33 (-46, -21)	-0.45 (-0.51, -0.38)	-0.43 (-0.49, -0.36)
Maternal age, years				
<20	0	Reference	0	Reference
20–29	88 (74, 102)	86 (72, 100)	0.35 (0.28, 0.43)	0.33 (0.26, 0.40)
30–39	147 (130, 163)	143 (127, 160)	0.55 (0.46, 0.64)	0.49 (0.40, 0.57)
40+	124 (65, 183)	123 (64, 182)	0.30 (-0.01, 0.60)	0.32 (0.02, 0.62)

<sup>a</sup>Adjusted for the variables in the table.

**Table VI.** Crude and adjusted differences with 95% confidence intervals in birth weight and length at birth in term infants in Vorkuta, 1980–1999.

	Difference in birth weight, g		Difference in length at birth, cm	
	Crude (95% CI)	Adjusted <sup>a</sup> (95% CI)	Crude (95% CI)	Adjusted <sup>a</sup> (95% CI)
Period, years				
1980–1984	0	Reference	0	Reference
1985–1989	-13 (-27, 1)	-20 (-33, -6)	0.38 (0.31, 0.45)	0.36 (0.29, 0.43)
1990–1994	-72 (-93, -51)	-59 (-79, -38)	0.42 (0.32, 0.52)	0.47 (0.37, 0.57)
1995–1999	-97 (-117, -78)	-81 (-100, -62)	0.28 (0.19, 0.37)	0.33 (0.24, 0.42)
Maternal age, years				
<20	0	Reference	0	Reference
20–29	75 (56, 93)	10 (-10, 29)	0.17 (0.08, 0.26)	0.06 (-0.03, 0.15)
30–39	130 (108, 151)	15 (-9, 39)	0.37 (0.26, 0.47)	0.10 (-0.02, 0.21)
40+	78 (4, 151)	-35 (-108, 39)	0.30 (-0.06, 0.65)	0.07 (-0.28, 0.43)
Parity				
0	0	Reference	0	Reference
1	144 (131, 157)	136 (122, 150)	0.41 (0.34, 0.47)	0.40 (0.34, 0.47)
2+	134 (115, 153)	127 (106, 148)	0.38 (0.29, 0.47)	0.33 (0.23, 0.43)
Infant sex				
Male	138 (126, 150)	139 (127, 151)	0.72 (0.66, 0.78)	0.72 (0.66, 0.78)
Female	0	Reference	0	Reference

<sup>a</sup>Adjusted for the variables in the table.

## DISCUSSION

This is the largest study on trends in pregnancy outcomes during the Russian transition to our knowledge. The main results suggest that the prevalence of both preterm and post-term births were lowest during the period of Perestroika while no time trends in stillbirth prevalence was observed. While average birth weight in term babies in Vorkuta was steadily decreasing, the Syktyvkar study group remained stable until the mid-1990s and decreased afterwards. A similar pattern was observed for length at birth for babies born in Syktyvkar. In Vorkuta, the average length of the newborns was higher in all periods compared with 1980–1984.

In spite of the large sample size and inclusion of data on all registered births in the areas of interest, the study has several limitations. The main limitation is the missing data on all pregnancy outcomes in 1990, 1994 and for 1997–1998 in Vorkuta. To test whether the missing data might influence the findings within the 5-year periods in Vorkuta, we compared the outcomes from Syktyvkar in the years for which the data in Vorkuta were available (1991–1993 for the third 5-year period and 1995–1996 and 1999 for the fourth 5-year period) with the outcomes during the years for which the data in Vorkuta were missing separately in each 5-year period. In 1990–1994, the proportions of stillbirths (0.9% vs. 0.6%,  $\chi^2=3.71$ ,  $df=1$ ,  $p=0.054$ ), preterm births (6.0% vs. 5.5%,  $\chi^2=0.72$ ,  $df=1$ ,  $p=0.395$  and post-term births (4.5% vs. 3.0%,  $\chi^2=14.09$ ,  $df=1$ ,  $p<0.001$ ) tended to be higher in the years with missing data. In 1995–1999, the proportions of stillbirths (0.7% vs. 0.7%,  $\chi^2=0.01$ ,  $df=1$ ,  $p=0.912$ ), preterm births

(6.0% vs. 5.6%,  $\chi^2=0.68$ ,  $df=1$ ,  $p=0.408$ ) and post-term births (6.0% vs. 5.4%,  $\chi^2=2.15$ ,  $df=1$ ,  $p=0.143$ ) were also slightly higher in the years for which the results from Vorkuta were missing. Babies born in 1990–1994 were on average 28 g lighter ( $p=0.005$ ), but 0.2 cm longer ( $p<0.001$ ) than those who were born in 1991–1993. No differences in either weight or length at birth between the years with missing and available data were found for the fourth 5-year period. These results suggest that if the pattern within each time period in Vorkuta is similar to that in Syktyvkar, there might be some underestimation of all studied dichotomous outcomes and average birth weights in 1990–1994 but not in 1995–1999.

The validity of the Russian medical documentation was considered acceptable for using the data in epidemiological studies (21). However, another serious limitation of the study is the small number of variables included in the statistical models. Given that the available database was created prior to this study (18), the additional data collection was not possible due to logistical problems. We used all the data available in the birth journals. Given that these journals have a very limited number of registered characteristics, they could not be recommended for research purposes. We recommend using maternal files from both prenatal care centres and maternity home in future research.

In spite of the fact that the distribution of maternal age, parity and infant gender changed over time and that all of these factors had an independent effect on all of the studied outcomes, adjustment for these factors had only a minor influence on the association between the time periods and the

outcomes in Vorkuta. Thus, it is uncertain if adjustment for these factors would change the observed trends in pregnancy outcomes in Syktyvkar. The associations between pregnancy outcomes and maternal age, parity and infant gender were all in the expected direction (10-12). A minor influence of the parity and maternal age on the differences in prevalence of preterm and post-term births as well as the average weight and length at birth over time suggests that there are other factors that might explain the observed trends.

Changes in maternal socio-economic status, prevalence of smoking, alcohol consumption and pregnancy complications could explain the observed differences in the proportion of adverse pregnancy outcomes and infant anthropometry between the time periods. Previous studies have shown that all these factors are important determinants of foetal growth and preterm delivery (10-12). Given that the break-up of the Soviet Union in 1991 was followed by major societal changes, including impoverishment of the major part of the population, one could speculate that these changes might be reflected in a higher prevalence of preterm births and lower birth weight in the 1990s in both settings compared with the 1980s. Ethnic minorities in the Russian North generally have smaller infants than ethnic Russians (22). Although the proportion of ethnic Komi population in the Komi Republic is about 25%, their proportion in the urban areas is very low and it did not increase during the study period.

Changes in prenatal care routines as well as changes in the coverage and use of prenatal care services may also influence the proportion of adverse pregnancy outcomes. Late initiation of prenatal care was associated

with compromised infant growth and higher risk of preterm delivery in northwest Russia, although the differences were attenuated after adjustment for maternal sociodemographic characteristics (10,11). The coverage by prenatal care services in northwest Russia is high. For example, more than 99% of pregnant women were registered at prenatal care centres, with 84% of them having registered during the first trimester in the town of Severodvinsk in 1999 (23). Large variations in the coverage over time would be unlikely given that early registration at prenatal care facilities gives rights to additional maternal benefits. However, the quality of care may have fluctuated substantially between the periods taking into account the financial crisis in health care during the 1990s.

Introduction of a computerized regional birth registry in the Komi Republic could ensure successful monitoring of pregnancy outcomes at the republican level. This registry should include information on maternal sociodemographics and lifestyle characteristics, such as age, height, pre-pregnancy weight, parity, education, occupation, marital status, smoking and alcohol consumption; pre-pregnancy medical history, such as presence of chronic diseases, reproductive history, including data on outcomes of previous pregnancies, pregnancy weight gain and complications of the index pregnancy; birth characteristics and infant characteristics, including birth weight, length, head circumference, sex, Apgar scores at the first and fifth minutes, inborn abnormalities and neonatal diagnoses. Birth registries have been valuable sources of data for epidemiological studies in the Nordic countries for decades (24) and the experience from these

countries should be used in both the selection of parameters for registration and the logistic issues. The first birth registry in Russia, the Kola Birth Registry (KBR), was established in the Murmansk oblast (19). It was initiated during the 1990s by a retrospective registration of births based on the data from maternal journals. To date, the registry includes all births in the town of Monchegorsk from 1973 onwards and all births in the Mumansk oblast from 2005 onwards. In the Komi Republic, more than 90% of births take place in urban areas, that is, in maternity homes where there are good possibilities of registration (17). The remaining births take place at the first level of care, that is, in the obstetric units of hospitals in small towns and villages (17) where there are less than 200 births per year. However, maternity units at all levels could provide adequate registration of births if clear inclusion criteria and universal guidelines on data collection are provided. Given that nearly all women give birth in maternity wards and that the documentation is universal across delivery units, the establishment of the birth registry in the Komi Republic seems feasible. This possibility was discussed at the local Ministry of Health in the late 1990s–early 2000s, but no practical steps were taken, which could indicate that there was a lack of political will and/or resources at the time.

To conclude, we observed an increase in the prevalence of both preterm and post-term births over the 20-year period in the Komi Republic. Moreover, the average birth weight among term infants has decreased in both Syktyvkar and Vorkuta while average length at birth decreased only in Syktyvkar. The variables available to the investigators were

unable to explain the findings, warranting more detailed studies with a broader range of potential confounders. The increased prevalence of smoking and alcohol consumption during pregnancy, high levels of psychosocial stress, poor nutrition and other factors are among the potential explanatory factors of the observed trends. However, such information was not available and conclusions should be kept to a minimum. Establishment of the Komi birth registry using the experience from the KBR and Nordic registries would allow long-term monitoring of pregnancy outcomes and their determinants in the Komi Republic in the future.

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