

# The determinants of sexually transmitted infections among reproductive age women in St. Petersburg, Estonia and Finland

Elena Regushevskaya · Tatiana Dubikaytis · Made Laanpere · Minna Nikula · Olga Kuznetsova · Hele Karro · Elina Haavio-Mannila · Elina Hemminki

Received: 28 January 2009/Revised: 18 May 2010/Accepted: 7 June 2010/Published online: 30 June 2010  
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## Abstract

**Objectives** Sexually transmitted infections' (STIs) rate vary in St. Petersburg, Estonia and Finland; the aim was to compare the determinants of self-reported sexually transmitted infections in these areas.

**Methods** Data from four population-based questionnaire surveys were used (Finland in 1992 and 1999; St. Petersburg in 2003; Estonia in 2004). With the exception of the 1992 Finnish survey (interview) all were postal surveys, with 1,070 respondents in Finland (78 and 52% response rates), 1,147 (68%) in St. Petersburg, and 5,190 (54%) in Estonia.

**Results** Risky sexual behaviours were equally common in the three areas and the determinants were the same. Women with an STIs history more often had had their first sexual intercourse when aged under 18, had not used condom during first intercourse, had a high number of lifetime or previous year sexual partners. However, marital

status and education were not similar determinants. Cohabiting and well-educated women in Finland were more likely to have STIs while in other areas the associations found were not statistically significant.

**Conclusions** Risky behaviour predicts STIs, but does not explain the varying rates of STIs between areas.

**Keywords** Sociodemographic characteristics · Sexual behaviour · Sexually transmitted infections · Russia · Estonia · Finland

## Introduction

The reported incidence of different STIs is decreasing in Russia, but it is still much higher than in the neighbouring countries of Estonia and Finland. For example, in 2003 the reported syphilis incidence was 68/100,000 in St. Petersburg (unpublished data from the St. Petersburg Medical Analytical Center 2008), 16/100,000 in Estonia and 2.6/100,000 in Finland (HFA-DB 2009). For gonorrhoea the respective figures were 53, 39 and 3.6 per 100,000. In St. Petersburg the number of reported cases indicates a decreasing trend for STIs (unpublished data from St. Petersburg Medical Analytical Center 2008) although true figures are unknown.

While gonorrhoea and syphilis have been decreasing in Estonia since the end of the 1990s, chlamydial infection remains a leading cause of bacterial infection, with its incidence highest among those aged 20–24 years. The incidence was 933/100,000 in 2005 (Uuskula et al. 2008). In Finland STI rates have been relatively stable, with a slight increase over the same period (HFA-DB 2009; Hiltunen-Back et al. 1998, 2003; Panchaud et al. 2000). Overall the rates of gonorrhoea and syphilis are low.

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E. Regushevskaya (✉) · M. Nikula · E. Hemminki  
National Institute for Health and Welfare, Helsinki, Finland  
e-mail: elena.regushevskaya@thl.fi

T. Dubikaytis  
Medical Academy for Postgraduate Studies,  
St Petersburg, Russia

M. Laanpere · H. Karro  
Department of Obstetrics and Gynaecology,  
University of Tartu, Tartu, Estonia

O. Kuznetsova  
Medical Academy for Postgraduate Studies,  
St Petersburg, Russia

E. Haavio-Mannila  
Department of Sociology, University of Helsinki,  
Helsinki, Finland

In 2008 the incidence of gonorrhoea was 3.8 and that of syphilis 4.08 per 100,000 (HFA-DB 2009), but the chlamydial infection rate was high (264.8 per 100,000 in 2008), especially among adolescents (Hiltunen-Back et al. 2003). Differences in STIs rates in the three areas can be partly attributed to the different care settings, diagnostics and reporting systems. In Russia, for example, official statistics do not cover people who seek help in the private sector. Furthermore, self-treatment with antibiotics is common, and the high cost of STI diagnostics and treatment can prevent care seeking (Domeika et al. 2008; Platt and McKee 2000). In Estonia infectious disease surveillance is based on mandatory universal notification to the Health Protection Service. Reporting policies and procedures have been stable for the past several decades (Uuskula et al. 2008). Statistical data on diagnosed sexually transmitted infections in Finland are very reliable (Moi 2001). Many studies have shown the relation between socioeconomic characteristics and sexual behaviour. Various studies conducted in different populations have shown that young age (Khryanin 2004; Hiltunen-Back et al. 2001), being unmarried or cohabiting (Radcliffe et al. 2001; Nikula et al. 2007) and having low education (Nikula et al. 2007) are associated with gonorrhoea and chlamydial infection. Behavioural risk factors include early age at first sexual contact (Khryanin 2004), high number of sexual partners (Uuskula et al. 2008; Khryanin 2004; Hiltunen-Back et al. 2001; Nikula et al. 2007), and not using condoms (Gallo et al. 2007).

In Russia previous studies have been conducted among STI clinic attendees, high-risk groups, or among adolescents (Aral et al. 2005; Ivanov 2004). However, factors correlated to STIs in the general population may differ from those in high-risk groups (Domeika et al. 2008). The aim of the present study is to compare the determinants of self-reported STIs in population-based surveys in St. Petersburg, Estonia and Finland. Comparing the determinants in different areas that have a common administrative and health care background (Russia and Estonia), and cultural background (Estonia and Finland) but which have experienced different political and economic development may help to explain the causes of varying STIs rates. In Estonia, the study population was grouped into Russian-speaking and Estonian-speaking women to explore and highlight the differences in populations who differ culturally but use the same healthcare system.

St. Petersburg is one of the largest cities in Russia with a population of around 5 million. Political and economic changes have occurred over recent decades in Russia as a result of the collapse of the Soviet Union. Estonia is another former-Soviet state, with a population of 1.2 million and a large Russian-speaking minority. Finland is an

affluent Nordic welfare state with a population of 5 million.

## Methods

Data from four population-based surveys were used. The St. Petersburg and Estonian surveys were similar and were constructed by the researchers of the REFER project (Reproductive Health and Fertility Patterns in Russia—a comparative approach) (Kesseli et al. 2005). In the case of Finland, two previously constructed surveys were used. The questionnaires in St. Petersburg and Estonia were similarly formulated and many questions were taken from the Finnish survey. In St. Petersburg the target population were women aged 18–44. The sample was drawn using the database maintained by a department of the District Authority Police. We chose a random sample of 2,501 women living in 2003 in 2 of 20 city districts. Of them 1,718 women were reached, and 1,147 participated (a response rate of 67%, based on the women reached). The survey was approved by the Ethical Committee of the St. Petersburg Medical Academy for Postgraduate Studies. The survey was conducted in 2003–2004. Each potential participant was telephoned to fix an appointment for a clinic visit to complete an anonymous questionnaire. Some women completed the questionnaire at home. More detailed descriptions have been published previously (Kesseli et al. 2005; Regushevskaya et al. 2008).

The survey in Estonia was conducted in 2004–2005. A stratified random sample of equal numbers of women in the age groups 16–25, 26–35 and 36–44 was taken from the national population register (Part et al. 2007). The total sample size was 5,190 women (3,472 Estonian-speaking and 1,718 Russian-speaking women). The survey was approved by the Ethics Review Committee on Human Research at the University of Tartu, Estonia. The study was conducted through anonymous postal questionnaires. The total response rate was 54%. For this study we chose only those aged 18–44 ( $n = 2,525$ ). A more detailed description of the method has been reported earlier (Part et al. 2007).

In Finland two surveys on human relationships, sexual attitudes and sexual lifestyles were conducted in 1992 and 1999, with response rates among women of 78 and 52%, respectively (Haavio-Mannila and Kontula 2003). In both studies, a random sample of all Finns aged 18–74 years was taken from the central population register. In the 1992 survey, a two-stage interview was conducted in interviewee's homes, but sensitive questions, including those on sexual behaviour and STIs were answered by a self-completed questionnaire. The 1999 study was administered as a postal survey. We selected women aged 18–44 from both surveys to increase the study power, giving a total number

of respondents in the two surveys of 1,070 (606 in 1992 and 464 in 1999). Questions on sexual behaviour were not available in more recent national surveys in Finland.

All questionnaires were checked for missing rates, which were low in all study areas. Having ever had a sexually transmitted infection was determined through the question “Have you ever had any of the following infections?” (Kesseli et al. 2005). In St. Petersburg and Estonia the infections listed were genital herpes, chlamydial infection, gonorrhoea, syphilis, HIV infection and trichomoniasis. In St. Petersburg, the additional infections ureaplasmosis and mycoplasmosis were asked about. In Finland the participants had fewer alternatives: syphilis, gonorrhoea, chlamydial infection and genital herpes. Lay terms for the infections were used in the questionnaire to be well understood by respondents.

Education was divided into four categories. St. Petersburg and Estonia had a similar educational system and so were similarly categorised thus: less than 11, 11–13, 14–16 and more than 16 years of education. The closest comparable grouping in the Finnish data was less than 10, 11–12, 13–15, and 16 or more years of education.

Only sexually experienced women were included in the analysis. They were defined as women who had ever had sexual intercourse, using the questions: “How old were you when you had sexual intercourse for the first time?” and “When was the last time that you had sexual intercourse?” The proportions of sexually experienced women were 99% in St. Petersburg and 89% in Estonia. In Finland we got a dataset which included only sexually experienced women, aged 18–44; the proportion of sexually experienced among women was around 98% of all women over 30 years (Haavio-Mannila and Kontula 2003).

Contraception use at first intercourse was determined with the question “What kind of contraceptive methods did you use when you had sexual intercourse for the first time?” Women were classified into three groups: (1) used condom, (2) used a contraceptive method other than a condom, and (3) no method.

Women who had reported two or more sexual partners in the previous year preceding the survey and those who had four or more lifetime partners were defined as having multiple sexual partners. Sexual relationships with other than a husband or cohabitant during the present partnership were defined as parallel sexual relationships.

In accordance with the definition found in the literature, for some analyses we created a technical variable (Finner et al. 1999; Johnson et al. 2001; Regushevskaya et al. 2008) “risky sexual behaviour”, consisting of any of the following: aged below 18 at first intercourse, no condom use in the first intercourse, having two or more sexual partners in the previous year, four or more lifetime sexual partners, and parallel sexual relationships.

To find out whether women with STI history are the same or different from women with abortion history, we calculated a ratio in each area. It was calculated by dividing the number of women having had both STI and abortion by the number of women having had either abortion alone or STI alone.

#### Statistical analysis

In studying risk factors, we combined three of the STIs (chlamydial infection, gonorrhoea and syphilis), and categorised women who had at least one of them as women with “typical STIs”. The data were first analysed by cross-tabulation to examine the bivariate association between sociodemographic characteristics, risky sexual behaviour and self-reported STIs. Two logistic regression analyses were made separately for each independent variable and each country, producing age-adjusted odds ratios and 95% confidence intervals. The first model included only age and the second all socioeconomic characteristics. All analyses were conducted with SPSS version 12.0 (SPSS Inc, Chicago, Illinois, USA).

#### Results

The numbers of respondents were 1,147 in St. Petersburg, 2,525 in Estonia and 1,070 in Finland. Respondents' background characteristics were relatively similar in the studied populations (Regushevskaya et al. 2009). The main difference was that women in Estonia were younger (41% Russian-speaking in the youngest age group and 43% of Estonian-speaking women) than in St. Petersburg (27%) and Finland (26%). There were less married women in Estonia (38% among Russian-speaking women and 26% among Estonian-speaking women) than in St. Petersburg (47%) or Finland (45%). In Estonia there were slightly more married women among Russian-speaking (38%) than among Estonian-speaking women (26%). Cohabiting status was common in Estonia (23% among Russian-speaking and 33% among Estonian-speaking) and in Finland (24%). The length of education of women was similar in St. Petersburg and Estonia. In Estonia there were more Estonian-speaking women (15%) than Russian-speaking women (6%) who had more than 16 years of education. In Finland there were more women with both short and long periods of education. In all the studied areas most women had at least one child.

Table 1 describes respondents' sexual behaviour by age. The proportion of those who started sexual intercourse when aged under 18 was highest in Finland, and the difference by age group was modest (51–69%). In contrast, in St. Petersburg and Estonia, the difference by age group for

**Table 1** Sexual and birth control behaviour of ever sexually active women according to age, St. Petersburg (2003), Estonia (2004) and Finland (1992, 1999), % of women

	St. Petersburg				Russian-speaking, Estonia				Estonian-speaking, Estonia				Finland		
	18–24 (n = 268)	25–34 (n = 344)	35–44 (n = 489)	18–24 (n = 261)	25–34 (n = 205)	35–44 (n = 215)	18–24 (n = 644)	25–34 (n = 497)	35–44 (n = 511)	18–24 (n = 277)	25–34 (n = 384)	35–44 (n = 409)	18–24 (n = 277)	25–34 (n = 384)	35–44 (n = 409)
Age at first intercourse															
<18 years	50.0	41.3	16.8	66.7	47.3	19.4	70.9	18.0	29.2	69.0	60.3	50.6	69.0	60.3	50.6
Contraception use at first intercourse															
Condom	43.6	21.5	9.7	47.7	19.4	6.3	45.2	22.1	5.6	68.8	62.1	66.1	68.8	62.1	66.1
Other	33.2	37.3	31.0	36.3	43.4	33.2	37.9	47.4	47.2	19.4	20.3	15.9	19.4	20.3	15.9
Nothing	23.2	41.2	59.3	16.0	37.2	60.5	17.0	30.5	47.2	11.8	17.6	18.0	11.8	17.6	18.0
Two or more sexual partners in the past year	30.9	15.0	10.9	33.2	22.9	18.4	27.7	16.8	14.0	33.9	18.1	14.4	33.9	18.1	14.4
Four or more lifetime sexual partners	51.8	54.7	44.7	50.6	63.1	48.5	43.3	53.9	53.8	53.4	63.6	57.4	53.4	63.6	57.4
At least one abortion	25.4	55.8	70.8	13.1	49.2	82.5	16.3	31.4	60.0	7.9	15.1	20.8	7.9	15.1	20.8
Parallel sexual relationships <sup>a</sup>	15.8 (n = 120)	20.8 (n = 226)	24.3 (n = 355)	18.0 (n = 114)	19.1 (n = 161)	29.9 (n = 170)	15.3 (n = 315)	16.2 (n = 381)	22.4 (n = 361)	13.8 (n = 109)	15.1 (n = 299)	20.3 (n = 310)	13.8 (n = 109)	15.1 (n = 299)	20.3 (n = 310)

<sup>a</sup> Only those who are married or cohabiting are included in the analysis

starting intercourse was very large, and early first sexual contact was common only in the youngest age group.

Contraceptive methods used during the first sexual intercourse differed between the countries (Table 1). In St. Petersburg and in Estonia's Russian and Estonian-speaking populations, condom use was higher among the youngest age groups. Most women in the oldest age group had used nothing. In Finland, most women in all age groups had used condoms during their first sexual intercourse. Other methods and no method were reported much more rarely in Finland than in St. Petersburg or Estonia.

In all countries around one-third of women aged 18–24 had had two or more sexual partners in the previous year; the older the women were, the less frequently they had had two or more sexual partners (Table 1). In all countries, around half of the women had had four or more lifetime sexual partners, with the highest proportion among women aged 25–34. The proportions of women who had had parallel sexual relationships were similar in all areas, increasing from younger to older age groups.

In St. Petersburg the proportion of women with an abortion history was higher than in Estonia in those aged 18–24 and 25–34 and notably higher than in all age groups in Finland (Table 1). In Estonia the abortion rate was higher among Russian-speaking than among Estonian-speaking women in the age groups 25–34 and 35–44. In all countries the highest proportion of those with an abortion history was found among the oldest women.

The proportion of women who had at least one of the three STIs, chlamydial infection, gonorrhoea or syphilis, was highest among women in St. Petersburg and among older Estonian women: a fifth or more of women reported at least one of these STIs (Table 2). Among the youngest age groups in Estonia and in Finland, the proportions varied between 7 and 12%.

In all countries chlamydial infection was the most common STI and the highest rates were reported by 25–34 year old women (Table 2). The rate was higher in St. Petersburg and Estonia than in Finland. Trichomoniasis was the second most frequent infection in St. Petersburg and Estonia (not asked in Finland) and the highest rate was among women aged 35–44. The highest rate of reporting at least one STI was found among St. Petersburg and Estonian women aged 25–34.

In St. Petersburg and Estonia, genital herpes was highest among women in the two oldest age groups. In Finland, genital herpes was rare and most common among women aged 25–34 years. In all areas gonorrhoea rates were highest among women aged 25–34 and 35–44. Syphilis was most commonly reported by women in St. Petersburg and its highest rate was among the age groups 18–24 and 25–34. In Finland, few women reported syphilis. HIV infection was more common in St. Petersburg than in

**Table 2** Proportion (%) of ever sexually active women who reported to had ever had sexually transmitted infections according to age, St. Petersburg (2003), Estonia (2004) and Finland (1992, 1999)

	St. Petersburg			Russian-speaking, Estonia			Estonian-speaking, Estonia			Finland		
	18-24 (n = 268)	25-34 (n = 344)	35-44 (n = 489)	18-24 (n = 261)	25-34 (n = 205)	35-44 (n = 215)	18-24 (n = 644)	25-34 (n = 497)	35-44 (n = 511)	18-24 (n = 277)	25-34 (n = 384)	35-44 (n = 409)
Chlamydia infection	18.3	21.8	16.8	6.5	21.0	13.0	11.0	23.9	18.4	10.7	13.3	5.8
Trichomoniasis	10.5	21.4	26.4	2.8	23.7	29.0	4.7	18.5	35.4	na	na	na
Genital herpes	7.0	9.6	9.2	4.1	6.0	8.6	2.9	11.5	7.8	1.1	5.1	2.0
Gonorrhoea	2.2	5.3	4.3	0.4	4.9	5.1	0.9	5.6	5.5	2.2	3.9	3.9
Syphilis	2.2	1.9	1.3	0.8	0.5	0.9	0.2	0.4	0.6	0.8	0	0
HIV infection	1.4	0.4	0.3	0.9	0.7	0	0.7	0	0.3	na	na	na
At least one typical STI <sup>a</sup>	20.5	25.6	19.8	6.9	23.9	18.1	11.8	27.2	22.9	11.2	15.4	8.6

<sup>a</sup> Only syphilis, gonorrhoea and chlamydia infection are taken into account

na Not available

Estonia (not asked in Finland) and in both areas it was most common in the youngest age group.

In Finland, logistic regression adjusting for all sociodemographic characteristics gave similar results to the analyses adjusting only for age, and so only the latter results are presented. In Finland after adjusting for age, cohabiting and more educated women were more likely to report typical STIs (Table 3). In St. Petersburg the findings for cohabitation was similar to that of Finland (even though not statistically significant). But women with short education were likely to report typical STIs (statistically significant difference to the education group 14–16 years). In Estonia there was no differences by marital status, but combining the two language groups, more educated women were more likely to report typical STIs, like in Finland.

In all areas risky sexual behaviour characteristics were related to STIs in a similar way: starting sexual life before the age of 18, not using a condom at first sex, having multiple sexual partners (past year or lifetime) and parallel sexual relationships were risk factors. However, among Russian-speaking women in Estonia and among Finnish women, not all odds ratios were statistically significant. When combining the two Estonian groups all characteristics, except starting sexual life before the age 18, showed statistically significant associations with reporting STIs. In Finland the high number of lifetime sexual partners was a strong risk factor, much stronger than in St. Petersburg and Estonia.

In Finland, the logistic regression analyses without gonorrhoea gave results mostly similar to those presented in Table 3 with gonorrhoea, but the results by marital status and education were not statistically significant.

To find out whether women with STI history are the same or different from women with abortion history, we calculated a ratio in each area.

Women with STIs are not the same women having had abortions (Table 4). The highest ratio of those with both abortions and STIs were found in St. Petersburg and the lowest ratio in Finland.

## Discussion

The study provides information on the numbers and characteristics of women with STIs and adds to knowledge on the comparative aspects of STI determinants in three neighbouring areas, thus helping to find ways to prevent STIs. We chose Finland as it is a country with relatively low rates of sexually transmitted infections in the last decades (HFA-DB 2009). Estonian women were divided into two language subgroups. Most Russian-speaking women are first or second generation immigrants who

**Table 3** Proportion (%) of ever sexually active women with “typical STIs” (syphilis, gonorrhoea or chlamydial infection) history by background characteristics and age-adjusted OR (95% CI), St. Petersburg (2003), Estonia (2004) and Finland (1992, 1999)

Characteristic	St. Petersburg			Russian-speaking in Estonia			Estonian-speaking in Estonia			Estonia <sup>c</sup>			Finland		
	n	%	OR (95% CI)	n	%	OR (95% CI)	n	%	OR (95% CI)	n	%	OR (95% CI)	n	%	OR (95% CI)
<b>Marital status</b>															
Married	541	20.9	1.00	223	14.3	1.00	396	21.2	1.00	622	18.6	1.00	466	7.1	1.00
Cohabiting	169	28.4	1.43 (0.96–2.15)	134	14.2	1.09 (0.54–2.17)	484	20.0	1.32 (0.91–1.90)	619	18.7	1.02 (0.77–1.36)	237	14.3	2.08 (1.22–3.56)
Single	386	20.5	0.93 (0.67–1.30)	196	11.7	0.95 (0.50–1.81)	493	16.0	0.93 (0.63–1.37)	692	14.9	0.78 (0.58–1.01)	319	11.0	1.51 (0.88–2.60)
<b>Education<sup>a</sup></b>															
<11 (<10) years	60	30.0	1.00	61	11.5	1.00	60	16.7	1.00	123	14.6	1.00	203	4.9	1.00
11–13 (10–12) years	463	23.8	0.73 (0.40–1.32)	250	10.8	1.97 (0.38–2.55)	622	17.4	0.86 (0.40–1.84)	875	15.5	1.08 (0.64–1.85)	279	10.4	1.99 (0.92–4.30)
14–16 (13–15) years	427	19.2	0.54 (0.30–0.99)	200	15.0	1.46 (0.57–3.75)	474	17.5	0.96 (0.45–2.05)	678	16.7	1.19 (0.69–2.04)	333	11.7	2.35 (1.13–4.89)
More than 16 (16+) years	144	21.5	0.65 (0.33–1.28)	43	23.5	2.44 (0.80–7.44)	215	26.5	1.53 (0.69–3.37)	258	26.0	2.07 (1.17–3.67)	206	10.7	2.20 (1.01–4.79)
<b>Age of first coitus</b>															
18 or more years	709	16.8	1.00	286	12.6	1.00	671	18.9	1.00	961	16.9	1.00	426	5.9	1.00
Under 18 years	379	31.9	2.49 (1.81–3.43)	269	14.9	1.56 (0.89–2.75)	713	18.6	1.40 (1.03–1.91)	988	17.6	1.22 (0.99–1.52)	599	12.9	2.27 (1.41–3.65)
<b>Condom use at first sex</b>															
Yes	261	16.8	1.00	171	9.4	1.00	424	12.3	1.00	598	11.4	1.00	661	8.9	1.00
No	842	23.5	1.75 (1.19–2.56)	186	17.4	1.49 (0.74–3.00)	535	20.9	1.61 (1.08–2.42)	724	20.4	1.93 (1.41–2.64)	363	11.8	1.40 (0.92–2.12)
<b>Number of sexual partners in the past year</b>															
1 partner	875	13.4	1.00	388	12.5	1.00	1,034	17.5	1.00	428	16.1	1.00	791	7.5	1.00
2 or more partners	181	16.2	1.95 (1.36–2.80)	131	16.0	1.43 (0.79–2.59)	253	23.3	1.57 (1.11–2.25)	385	20.8	1.39 (1.04–1.84)	204	19.1	2.83 (1.80–4.43)
<b>Lifetime sexual partners</b>															
Less than 4 partners	492	6.3	1.00	246	5.6	1.00	715	9.7	1.00	966	8.6	1.00	420	1.4	1.00
4 or more partners	484	19.7	2.14 (1.55–2.95)	272	20.6	4.18 (2.20–7.93)	617	28.2	3.35 (2.49–4.61)	893	25.9	3.72 (2.84–4.87)	580	15.5	12.96 (5.61–29.96)
<b>Parallel sexual relationships<sup>b</sup></b>															
No	549	20.2	1.00	277	14.3	1.00	736	18.8	1.00	1,016	17.1	1.00	573	9.1	1.00
Yes	152	32.2	2.05 (1.37–3.08)	75	16.8	1.28 (0.62–2.64)	138	32.0	1.95 (1.28–2.97)	214	24.7	1.76 (1.25–2.48)	118	11.9	1.41 (0.75–2.64)

Numbers (n) refer to denominators

<sup>a</sup> (<10), (10–12), (13–15) comparable to St. Petersburg and Estonia years of education in Finland

<sup>b</sup> Only those who are married or cohabiting were included in the analysis

<sup>c</sup> The total is larger than the sum of Russian-speaking and Estonian-speaking, as some women lacked information of mother tongue

**Table 4** The proportion of women with both “typical STIs” (syphilis, gonorrhoea or chlamydial infection) and abortion, in studied areas

	STIs and abortion (%)	STIs but no abortion (%)	Abortion but no STIs (%)	Neither abortion nor STIs (%)	Ratio <sup>a</sup>
St. Petersburg	14	7	41	38	0.29
Russian-speaking, Estonia	8	5	36	51	0.20
Estonian-speaking, Estonia	8	10	25	58	0.27
Finland	2	8	13	77	0.10

<sup>a</sup> Ratio expresses the relation of having had both STI and abortion, to having had either abortion or STI

came after the Second World War from the Russian part of the former Soviet Union. Our expectations were that Russian-speaking women would show the same characteristics related to STIs as women in St. Petersburg and their position would be in between Estonian-speaking women in Estonia and women in St. Petersburg. We believed that such an approach could explain the reasons for the differences and clarify possible methods of STI prevention.

We found that women in St. Petersburg and Estonia more frequently than Finnish women reported having STIs. For closer examination we chose women who had had chlamydial infection, gonorrhoea or syphilis, as these are notifiable infections and the reporting system of these infections is systematized in all the study areas.

Many of the sexual behaviour risk factors with regard to the three STIs (chlamydial infection, gonorrhoea, syphilis) were similar in the study areas (even though not always statistically significant). Women with an STI history more often had had their first sexual intercourse when aged under 18, had not used condoms during first intercourse, had a high number of lifetime or previous-year sexual partners. However, other risk factors studied (marital status and education) were not similar determinants in the three areas. Cohabiting and well-educated women in Finland were more likely to have STIs, while no significant association was found in St. Petersburg and Estonia. In Estonia, the risk factors for having had STIs were similar among Russian-speaking and Estonian-speaking women.

In Finland, the reported history of gonorrhoea was relatively higher than that of reported statistics (Härö 1996). Thus we analysed the risk factors without gonorrhoea, although the results remained the same.

Having first intercourse at an early age and having multiple sexual partners were more common in Finland than in St. Petersburg or similar. Other sexual behaviour risk factors had almost the same prevalence in all areas. Thus, the extent of risky sexual behaviour in the population cannot explain the different STIs rates.

We used the ratio to clarify whether women with sexually transmitted infections are the same women having abortions. It showed that women with STIs and those having abortions were largely different women. However,

in St. Petersburg and Estonia it may be worth doing STI diagnostics among women who undergo abortion.

When interpreting the results of the study a number of factors should be taken into account: the cross-sectional design of the surveys, the non-respondents' sexual behaviour, timing of the surveys, and self-reported information on STIs. Women may not correctly remember diseases that occurred a long time previously. Due to the cross-sectional design, recall bias can arise and older women may remember differently than younger women what happened during their first sexual intercourse and how many partners they had had in their life. Non-respondents may have had different determinants and rates of STIs. We used an anonymous questionnaire, which may have reduced any response bias related to sensitive questions concerning sexual experience and having had STIs.

The data from Finland was older than in the two other areas. More recent surveys did not contain questions similar to Russian and Estonian surveys. Even though the 1992 study was an interview survey, the sensitive questions were asked using self-reporting cards.

The most important weakness of our study is that it relies on self-reported information on STIs; the determinants were such that they can only be reported by women themselves. To correctly report STIs, the women have to visit a health professional, have a correct diagnosis, understand and remember the diagnosis, and correctly report it in the survey. Bias by country and background characteristics can occur at any of these stages. Having had an STI is often a sensitive subject. Respondents may be concerned that having had an STI carries a negative stigma in the eyes of the researcher. On the other hand, social expectations and values are changing, and the extent of underreporting of STIs and risky sexual behaviour may be decreasing.

In St. Petersburg and Estonia the most common infections were trichomoniasis and chlamydial infections. This may partly reflect the fact that testing for chlamydial infection became common in the mid-1990s in Russia and post-Soviet Estonia (Naaber et al. 2005; Savicheva et al. 2000). In Finland, chlamydial infection was less common than in St. Petersburg and, among the two older age groups,

in Estonia. The rate in Finland was lowest among the oldest women, which is consistent with earlier studies (Hiltunen-Back et al. 2001; Hiltunen-Back et al. 2003).

Single women did not have higher STI rates than married women. However, in Finland cohabiting women had a higher risk of STIs. The relationship between marital status and having had STIs has varied in earlier studies. In an earlier Finnish study (Hiltunen-Back et al. 1998) and in a large STD clinic study in the UK (Radcliffe et al. 2001), unmarried women had a higher probability of chlamydial infection. It has been speculated that this is due to having multiple sexual partners and more inconsistent condom use (Nikula et al. 2007).

The impact of education was not uniform in the three areas. Unlike in St. Petersburg those with a longer education in Finland were more likely to report STIs. They may be more informed about STI symptoms, be more likely to visit health care, be more aware of their diagnosis or more willing to report STIs compared to longer educated women in St. Petersburg and Estonia. Another possible reason for the area differences in educational gradient could be the differences in the likelihood of exposure. In St. Petersburg and Estonia, high STIs rates may lead to higher proportions of women of different education being infected with STIs, which would dilute the differences between the social groups. Another possible explanation is that differences in sexual behaviour by education vary in different areas. However, a previous study in Finland did not support that women with longer education have more risky sexual behaviour than women with shorter education (Nikula et al. 2007).

The associations between sexually transmitted infections with many partners, (Benotsch et al. 2006; Hiltunen-Back et al. 2001, 2003; Khryanin 2004; Radcliffe et al. 2001; Uuskula et al. 2008) early age at first sexual intercourse (Khryanin 2004) and low condom use (Benotsch et al. 2006; Radcliffe et al. 2001) is consistent with the known risk behaviours for the acquisition of STIs. Even though in all three studied areas, sexual behaviour showed the same relation to contracting STIs, the occurrence of some risky behaviour was different. For example, condom use at the first intercourse was highest in Finland, especially among young women. Condom use is an effective strategy for preventing STIs (Gallo et al. 2007; Holmes et al. 2004; Warner et al. 2008). Using a condom at first intercourse provides an immediate protective effect and also predicts an increased probability of use in future sexual life (Shafi et al. 2004). The high rate of condom use among young adults in Finland has been previously shown (Nikula et al. 2007).

Our study and previous statistics suggest that the rates of sexually transmitted infections differ in the three areas, Finland having lower prevalence of sexually transmitted

infections than that found in St. Petersburg and Estonia. With the exception of condom use at first intercourse, risky sexual behaviours are equally common in the three areas. In all the studied areas, most women with STIs had similar sociodemographic and sexual behaviour characteristics. Thus, risky behaviour predicts STIs, but does not explain the varying rates of STIs. The higher baseline prevalence of STIs in the population in St. Petersburg is the likely cause of the higher risk of STIs acquisition.

To decrease the baseline prevalence of STIs at the population level the main activities should include proper diagnostics, treatment and prevention of further transmission. To prevent the transmission, various measures including health education of safe sexual behaviour should be done, especially among young people.

**Acknowledgments** The survey in St. Petersburg was financially supported by a grant from the Baltic Sea Task Force and the Academy of Finland (Russia in Flux program, project N 208180 and 208186). The survey in Estonia was financed by the Estonian Science Foundation (Grant 5456), the Academy of Finland, the Estonian Ministry of Education and Science (SF0182641 and SF940026s07) and the Baltic Sea Task Force (PH030). The surveys in Finland were financially supported by the Academy of Finland. The authors would like to thank Kaja Rahu for the advice and work on the database of the study "Estonian Women's Health".

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