

## RESEARCH PAPER

## Changes in smoking prevalence in Russia, 1996–2004

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**Objectives:** In Russia, smoking prevalence has historically been high in men and relatively low in women. Female smoking prevalence is predicted to rise but assessment of changes has been limited by the lack of comparable data. Changes in the prevalence of smoking in Russia between 1996 and 2004, and whether these changes differed by sociodemographic groups, were investigated.

**Design:** Repeated national interview surveys in 1996 (731 men and 868 women) and 2004 (727 men and 864 women) aged 18 years or more.

**Main outcome measure:** Prevalence of current smoking.

**Results:** The age standardised prevalence of smoking in 1996 and 2004 was 61% and 63%, respectively in men and 15% and 16%, respectively in women (both  $p$  values  $> 0.4$ ). In men, the prevalence of smoking seemed to decline in those with university education (from 51% to 40%,  $p = 0.085$ ). Among women, smoking appeared to increase in those with university education (from 10% to 17%,  $p = 0.071$ ) and low levels of self-reported material deprivation (from 11% to 18%,  $p = 0.053$ ). There was a pronounced increase in prevalence among women living in villages (from 8% to 14%,  $p = 0.049$ ); the strong urban/rural gradient seen in 1996 became considerably weaker by 2004.

**Conclusions:** Overall smoking prevalence in both men and women in Russia remained stable between 1996 and 2004 but, given the sample size, a moderate increase in female smoking cannot be ruled out. In men, smoking increased among the least educated and declined in the most educated. In women the opposite appeared to occur, in addition to an increase in smoking in rural areas. More long term monitoring of smoking patterns in Russia, especially among women, using sufficiently large surveys, is required.

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Smoking is a major cause of premature mortality among men in Russia (and other countries of the former Soviet Union) whose mortality from smoking-attributable diseases is among the highest in the world.<sup>1</sup> One notable feature of the smoking epidemic in Russia is the continued, pronounced sex difference; despite the longevity of the epidemic the prevalence of smoking remains much lower in women than in men.<sup>1–2</sup> This, and the fact that male smoking has yet to show a decline, has led to suggestions that the epidemic is taking a slightly different form in the former Soviet Union than in the west.<sup>3</sup>

The predicted increase in female smoking, however, has seemed inevitable.<sup>4</sup> Recent studies show that smoking is several times more common in younger than older women.<sup>2–3</sup> Assuming that young women will continue smoking at higher rates than in earlier generations, this would lead to an increase in smoking prevalence over time. Moreover, although historical data are fragmentary and not directly comparable, it suggests that smoking among women in Russia has been increasing since the 1970s and more noticeably since the 1990s.<sup>2–5–7</sup>

Other predicted changes as the tobacco epidemic progresses include a reverse in its socioeconomic gradient.<sup>8</sup> Early in the epidemic smoking is typically more common in the higher social classes, but this pattern reverses as the better educated quit in response to health promotion messages. Previous studies in Russia are in keeping with this pattern, with a consistent and positive relationship between social disadvantage and smoking in men.<sup>2–9</sup> Among women, the relationship has been far less clear.<sup>2–9–10</sup> However, an overwhelmingly consistent finding in all recent surveys in Russia and other former Soviet Union countries is the notably higher prevalence of female smoking in urban areas.<sup>2–11–12</sup>

Many of the observed prevalence patterns and the predicted changes based on age specific data are consistent

with what would be expected given the notable changes seen in Russia's tobacco industry since the early 1990s. The state-owned industry was privatised with transnational tobacco companies (TTCs) buying up major factories and constructing new ones, transforming the monopolised market to a highly competitive one. As each company vied for market share there was a massive increase in marketing.<sup>13</sup> The TTCs' own records suggest that their marketing and distribution strategies in the former Soviet Union particularly targeted women (among whom there was scope to increase both the number smoking and amount smoked), young people and urban residents.<sup>14–15</sup>

These major changes, the massive tobacco-attributable mortality in Russia and the need for more effective tobacco control policies underpin the need for an ongoing system of regular accurate assessments of changes in smoking over time. Until now, analyses of changes have been hindered by the lack of comparative data. In the present study we took advantage of data from two national cross sectional surveys in 1996 and 2004, collected by the same agency using very similar methodologies, in order to examine changes in smoking. We give specific attention to changes within socioeconomic strata and to urban–rural gradients in smoking prevalence. On the basis of initial patterns (high rates among men and low among women) as well as the activities of the TTCs, we predicted that male smoking would remain steady with the relationship with deprivation becoming more entrenched and that female smoking would increase, particularly among women in rural areas.

## METHODS

## Study samples

The data come from two national surveys, both of which were conducted by the Levada Institute, Moscow (formerly known as VCIOM) for the New Russia Barometer programme

(www.abdn.ac.uk/cspp) in July 1996 and April 2004. In both cases, a multi-stage nationwide sample of the Russian population aged 18 years and over was interviewed; in both cases, the distribution of the samples by age, sex and education corresponded well with the general population.

### 1996 survey

The 1996 survey has been described elsewhere.<sup>2</sup> Briefly, the Russian Federation was first stratified into 22 regions, then into urban and rural areas, and then, for urban areas, into regional centres and other towns. Within this framework, 69 urban and rural settlements were randomly selected with a probability equal to their share of the population. Within the locations, primary sampling units (enumeration districts) were randomly drawn. In each primary sampling unit, households were listed by address, an address was selected randomly as the starting point, and interviewers were instructed to seek an interview at every n-th house. At each address the interviewer asked for a respondent who matched an age-sex-education grid; if such person was found, he/she was invited for a face-to-face interview. Interviewers stopped recruiting new participants when they fulfilled a given quota.

Of 3379 households with someone at home, in 965 cases no one met the requirements of the age-sex-education sample grid. Of the 2414 remaining households, in 470 (20%) the interview was refused, in 271 (11%) the door was not answered, in 63 (3%) the identified individual was unable to answer, and 11 interviews (0.4%) were interrupted. The 1599 completed interviews represent a final response rate of 66%.

### 2004 survey

The Russian Federation was first divided into seven federal regions (North-Western, Central, Southern, Povolzhskii, Uralskii, Siberian, and Far Eastern), and each region was divided into five strata by degree of urbanisation. In the next step, one to eight urban settlements (rural districts in rural areas) were randomly selected with possibility proportional to size of a settlement; all cities with a population of over one million were automatically included. In total, there were 128 primary sampling units (PSU) (88 urban settlements and 40 rural districts). In each PSU, one or more secondary sampling units (polling districts in urban settlements, villages in rural districts) were randomly selected. Households were then selected by the random route method. One respondent per household (using the sex-age-education grid) was asked for an interview.

The number of households contacted but where no one met the requirements of the grid was not reported by the survey team. Of 2229 contacts, 534 (24%) refused to be interviewed; 87 (4%) were unable to answer (mostly because of poor health), 8 (0.4%) interviews were interrupted, and 9 (0.4%) were excluded after logical checks. The final sample size of 1591 thus represents a response rate of 71%.

### Measurements

The main focus of the New Russia Barometer is on political, demographic, social, and economic characteristics and attitudes (see www.abdn.ac.uk/cspp for more detail); the 1996 and 2004 surveys also included a short module covering health and health behaviours. Both surveys used identical questions.

Current smoking, the main outcome variable, was based a question "Do you smoke?" and response "Yes, currently". Education was measured on a seven point scale, which was collapsed into three levels: primary, secondary, and university. Material deprivation was measured by three questions on frequency of not having enough money for food, clothes/shoes, and paying bills.<sup>16</sup> The responses (never, rarely, sometimes and often) were assigned values 0, 1, 2 and 3, and

**Table 1** Description of the samples, percentages (differences from 100 due to rounding)

	Men		Women	
	1996 (n = 731)	2004 (n = 727)	1996 (n = 868)	2004 (n = 864)
Age group (years)				
18–24	15	15	12	12
24–34	18	21	14	16
35–44	23	21	20	18
45–54	21	20	19	19
55–64	14	12	18	12
65+	10	12	18	22
Education				
Primary	36	29	40	28
Secondary	50	57	47	58
University	14	14	13	14
Material deprivation				
Least	28	45	20	38
Medium	35	32	29	34
Most	37	23	51	28
Settlement size				
Moscow	6	6	7	7
>0.5 million	24	21	24	21
100000–0.5 million	13	21	14	20
Towns <100000	31	22	31	21
Villages	26	31	26	31
Smoking				
Current	63	64	14	15
Past	19	19	9	7
Never	18	17	77	78

were summed into a material deprivation score with values from 0 to 9. For the present analysis, subjects were classified into three groups, based on tertiles of the deprivation scale, with cut-off points based on the distribution of the whole sample (men and women in both surveys combined). Settlement size was categorised into the following groups by population size: villages; towns of < 100 000; cities 100 000–500 000; cities >500 000, and Moscow.

### Statistical analysis

Data were analysed separately for men and women. Smoking prevalence rates were standardised for age (in 10 year age groups) by the direct method, using the whole sample (men and women in both surveys combined) as the standard population. Changes in the age-standardised rates between the two surveys were assessed by prevalence rate ratios (2004/1996); 95% confidence intervals were calculated using the Greenland method.<sup>17</sup> Statistical significance of the differences of the 2004/1996 ratios by education or deprivation was assessed by fitting an interaction term (survey\* education or survey\*deprivation) into an age-adjusted logistic regression models, using the STATA statistical package.

**Table 2** Prevalence of smoking by sex and age group in 1996 and 2004 (percentages)

Age group (years)	Men		Women	
	1996 (n = 731)	2004 (n = 727)	1996 (n = 868)	2004 (n = 864)
18–24	65	63	27	28
24–34	73	69	28	31
35–44	71	74	14	17
45–54	64	66	12	12
55–64	49	55	5	8
65+	41	46	5	1
All ages*	63	64	14	15

\*Not standardised for age.

## RESULTS

Table 1 shows the distribution of the samples, separately for men and women, by age group, education, deprivation and smoking. Within each sex, there were no major differences between the surveys, other than a pronounced decline in deprivation between 1996 and 2004, a reduction in the number of people with only primary education (consistent with generational changes), and some migration out of small towns.

Age-specific prevalence of smoking by sex and age group in 1996 and 2004 is shown in table 2. There were no significant differences in smoking prevalence between the two surveys in any age group. We also assessed differences between the two surveys in broader age bands, adjusting for education and deprivation; the pattern remained unchanged (not shown in table).

Age-standardised prevalence of current smoking in men is shown in table 3. Overall prevalence remained high but stable. Although an inverse relationship between smoking prevalence and education was observed in both surveys, it is more pronounced in the second survey owing to the decline in smoking in the most educated men and an increase in the least educated (p value for interaction between survey and education 0.040). Although an inverse relationship is also seen with deprivation (only reaching significance in the first survey), changes in smoking over time did not differ by material deprivation.

As in men, there were no significant changes in the overall prevalence of smoking in women after standardisation for age (table 4). Prevalence of smoking somewhat declined in women with primary education and increased in women with university education, but the interaction between survey and education was not significant (p = 0.13). Analogously, prevalence of smoking declined slightly in the most deprived women and increased in the least deprived; the interaction between deprivation and survey was of borderline statistical significance (p = 0.049). Further adjustment for urban/rural differences did not affect the temporal changes.

The relationship between smoking with settlement size changed between 1996 and 2004 in both sexes (tables 3 and 4) although more notably so in women. In men, there was little gradient in 1996; by 2004 men in rural areas smoked more often than men in cities (p for trend for 2004 = 0.002). However, the interaction between survey and settlement size was not significant (p = 0.126). In women, there was a

strong inverse association between settlement size and smoking in 1996; at that time, women in Moscow smoked almost four times more often than women from villages. By 2004, this ratio fell to only 1.5. Smoking prevalence declined somewhat in Moscow, although the change was not significant, but increased by 69% in villages (p = 0.049); the p value for interaction between survey and settlement size was 0.033. The relation between settlement size and smoking was independent from education (not shown in table). The differences between the male and female patterns are noteworthy; the relationships of smoking with education and settlement size differed significantly between men and women (both p values for interaction < 0.001, not shown in table).

## DISCUSSION

There are three main findings of this study. First, in both sexes the prevalence of smoking was approximately the same at these two points in time, with male smoking prevalence remaining high at some 60%. Second, in men, smoking has fallen among the most educated and risen among the least educated. Third, in women, smoking appears to have increased among the least deprived and the gradient in smoking by settlement size has become less pronounced as the prevalence in villages increased steeply.

### Potential limitations

This study has several limitations. Firstly, the sample size was relatively small. This means that smaller changes in women or population subgroups may not have been captured because of the uncertainty of the estimates. The sample size was sufficient to identify major changes in smoking in men (the study had 80% power to demonstrate a 15% change in smoking prevalence) but less so in women (80% to demonstrate a 40% increase in smoking prevalence). The problem of sample size is compounded by the relative insensitivity of tests for interaction.

The second main concern is the potential for selection bias. Given the sampling method (with absence of an individual level sampling frame) and incomplete response rate, the samples may not be fully representative of the Russian population. On the other hand, the sampling methods were similar and data collection protocols were identical in both surveys. The data should therefore be directly comparable,

**Table 3** Prevalence of smoking in 1996 and 2004 by education and material deprivation in men, directly standardised for age

	1996		2004		RR <sub>2004/1996</sub> (95% CI)	p Value
	n	Smokers	n	Smokers		
All	728	61%	726	63%	1.03 (0.95 to 1.12)	0.471
Education						
Primary	260	65%	214	73%	1.12 (0.99 to 1.27)	0.066
Secondary	363	60%	413	63%	1.05 (0.94 to 1.17)	0.403
University	105	51%	99	40%	0.77 (0.56 to 1.04)	0.085
p for trend		0.003		<0.001		Heterogeneity p=0.040
Deprivation						
Least	207	56%	326	61%	1.09 (0.94 to 1.27)	0.237
Medium	254	57%	230	61%	1.07 (0.92 to 1.24)	0.399
Most	270	70%	171	68%	0.96 (0.85 to 1.10)	0.574
p for trend		0.01		0.156		Heterogeneity p=0.42
Urbanisation						
Moscow	43	62%	43	47%	0.74 (0.50 to 1.10)	0.131
>0.5 M	170	58%	149	56%	0.96 (0.79 to 1.16)	0.649
<0.5 M	93	62%	152	62%	0.99 (0.81 to 1.21)	0.935
Towns	225	64%	158	61%	0.95 (0.81 to 1.11)	0.519
Villages	190	63%	225	71%	1.13 (0.98 to 1.29)	0.085
p for trend		0.567		0.002		Heterogeneity p=0.126

CI, confidence interval; M, million; RR, relative risk.

**Table 4** Prevalence of smoking in 1996 and 2004 by education and material deprivation in women, directly standardised for age

	1996		2004		RR <sub>2004/1996</sub> (95% CI)	p Value
	n	Smokers	n	Smokers		
All	868	15%	864	16%	1.07 (0.86 to 1.33)	0.567
Education						
Primary	345	16%	238	12%	0.75 (0.50 to 1.12)	0.157
Secondary	406	15%	499	17%	1.12 (0.83 to 1.52)	0.461
University	117	10%	127	17%	1.84 (0.93 to 3.63)	0.071
p for trend		0.962		0.720		Heterogeneity p=0.13
Deprivation						
Least	173	11%	332	18%	1.60 (0.98 to 2.59)	0.053
Medium	256	12%	293	15%	1.31 (0.85 to 2.02)	0.216
Most	439	18%	239	14%	0.73 (0.50 to 1.06)	0.091
p for trend		0.026		0.247		Heterogeneity p=0.049
Urbanisation						
Moscow	56	30%	57	21%	0.69 (0.37 to 1.32)	0.767
>0.5 M	205	20%	184	17%	0.81 (0.47 to 1.28)	0.423
<0.5 M	116	13%	176	18%	1.41 (0.80 to 2.48)	0.232
Townes	263	13%	181	13%	0.99 (0.60 to 1.62)	0.962
Villages	219	8%	266	14%	1.69 (0.99 to 2.89)	0.049
p for trend		<0.001		0.052		Heterogeneity p=0.033

CI, confidence interval; M, million; RR, relative risk.

certainly more so than most hitherto used to assess changes over time in Russian smoking prevalence.

Third, confounding by unmeasured variables cannot be excluded. However, the profiles of the respondents in the two surveys were similar, and it is unlikely that the two surveys differed to such an extent that would obscure any pronounced underlying changes over time.

Fourth, like most other surveys of this nature, we were unable to validate smoking by biomarkers, such as cotinine. It is possible that some underestimation of smoking occurred, particularly in women.<sup>10</sup> However, such underestimation should remain stable over the relatively short time between the two surveys. If anything, as smoking in women becomes more socially acceptable, it should be reported more completely in the second survey.

Fifth, education should remain stable but perceptions of deprivation (and what the needs of family/households are) may change over time. We acknowledge that the changes by deprivation group might be affected by such bias.

Finally, the period between 1996 and 2004 may be too short for pronounced changes in smoking prevalence to occur or too long for shorter-term changes to be picked up.

### Interpretation

The findings among men are not surprising. It is, however, of major concern in a population with such high rates of premature mortality that male smoking prevalence has remained at such high levels for so prolonged a period without showing any evidence of decline. In women, we expected to find that the overall smoking prevalence had gone up, particularly as our age-specific estimates of smoking prevalence were virtually identical to those found in the Living Conditions, Lifestyles and Health Study in Russia in 2001.<sup>3</sup> We do not have a clear explanation for the lack of a clear trend, although a small rise in female smoking could have been missed due to the sample size problems outlined above. It is also theoretically possible that female smoking increased and then decreased again between the two surveys but, given the lack of effective tobacco control policies, this is unlikely. Thus, although this study offers advantages over previous ones, using comparable data to assess changes in Russia (which hitherto relied on totally different surveys), the modest sample size remains a major limitation.

In Russia and other parts of the former Soviet Union, more women in large cities smoke than those from rural areas.<sup>2 18</sup>

Our data indicate that women in rural areas may now be starting to take up the habit and that female smoking will rise in the future. This is consistent with tobacco industry plans as revealed in internal documents. British American Tobacco company documents, for example, outline how marketing will be heavily focused on Moscow initially and then to be rolled out to other key cities and the regions<sup>19 20</sup> as its distribution systems, initially focused on the Moscow/St Petersburg corridor, developed further.<sup>21</sup> A wide ranging tobacco control law was adopted in 2001 requiring health warnings on packets, banning the sale of cigarettes in packs of less than 20 and from vending machines, prohibiting almost all forms of tobacco advertising, and outlawing smoking at places of work; however, important articles of the law were neutralised as result of industry lobbying.<sup>22</sup> Thus the law is widely ignored, and bans on advertising and smoking in public places remain partial and largely ineffective.<sup>23</sup>

The changes by education and deprivation also deserve comment. There was a suggestion that among men, smoking had become more entrenched among the least educated and in women among the better educated/least deprived. This would be consistent with the later stage of the epidemic in men and with experience with the epidemic in the west. The latter suggests that, as with the diffusion of any new technology,<sup>24</sup> uptake tends to occur first among the better educated, but so too do subsequent improvements in health behaviours in response to health education messages.

### What this paper adds

In Russia, smoking rates have historically been high in men and relatively low in women. Female smoking rates are predicted to rise but assessment of trends has been limited by the lack of comparable data.

Overall smoking rates in both men and women in Russia remained stable between 1996 and 2004 but, given the sample size, a moderate increase in female smoking cannot be ruled out.

In men, smoking increased among the least educated and declined in the most educated. In women the opposite appeared to occur, in addition to an increase in smoking in rural areas.

## Conclusions

These data suggest that overall smoking prevalence in Russia between 1996 and 2004 remained stable. For women, this was an unexpected finding and may be explained by the relatively small sample size and thus limited ability to detect less pronounced differences over time. There is some suggestion that in men smoking increased among the least educated while declining among the most educated, suggesting that inequalities in health will increase in the future. In women the opposite appeared to occur in addition to an increase in smoking in rural areas. However, the numbers of subjects in individual subgroups are relatively low and these estimates are imprecise. Future surveys, using constant methodology over time, are required but they would need to be larger to be more sensitive to smaller changes, particularly among women. Regular surveys among adults should also be supplemented by ones among adolescents. The lack of a fall in male smoking prevalence illustrates the ineffectiveness of current tobacco control measures and the urgent need for more effective measures to be implemented and enforced. The still relatively low prevalence of smoking in women indicate the real opportunities that exist for implementing such measures in the immediate future.

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Conflict of interest: None

M Bobak participated in the study design, analysed the data and drafted the paper. A Gilmore participated in data analysis and writing of the paper. M McKee commented on the analysis and participated in the writing of the paper. R Rose and M Marmot participated in the study design, commented on the analysis and participated in the writing of the paper.

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