

## Full length article

# Correlates of frequent alcohol consumption among middle-aged and older men and women in Russia: A multilevel analysis of the PrivMort retrospective cohort study



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## ABSTRACT

**Background:** A large proportion of premature deaths in Russia since the early 1990s, following the transition from communism, have been attributed to hazardous drinking. Little is known about the correlates of alcohol consumption. We present new data on the consumption of alcoholic beverages among middle-aged and older Russians and identify socio-demographic, socio-economic, and life-course correlates of frequent drinking.

**Methods:** Within the framework of the PrivMort project, conducted in 30 industrial towns in the European part of Russia, we acquired information on the frequency of drinking among 22,796 respondents and 57,907 of their surviving and deceased relatives. We fit three-level mixed-effects logistic regression models of frequent drinking in which respondents' relatives, aged 40 and over, are nested in their families and towns.

**Results:** Deceased male relatives consumed alcohol significantly more often, while deceased female relatives consumed alcohol significantly less often than the respondents of corresponding gender. In a multivariable analysis, we found that individuals' education, communication with family members, labour market status, history of unemployment, and occupational attainment are all significant correlates of frequent drinking in Russia. These associations are stronger among men rather than among women.

**Conclusion:** There are significant differences between frequency of drinking among surviving and deceased individuals and frequent drinking is associated with a wide array of individual socio-demographic, socio-economic, and life course factors that can partially explain high alcohol consumption in post-communist Russia.

## 1. Introduction

The post-communist transition in Russia in the beginning of the 1990s was associated with the greatest surge in mortality of humanity in recorded history outside of war, famine or pestilence (Gustafson, 1999). There is now extensive evidence that many of these premature deaths were linked directly to hazardous alcohol consumption, resulting from conditions such as alcohol poisoning, heart disease, and cirrhosis (Leon et al., 2009, 2007; McKee, 1999; Stickley et al., 2011), or indirectly, from alcohol-related suicides, homicides, accidents, and risky health behaviours (Cepeda et al., 2013; Nemtsov, 2003; Shkolnikov et al., 2001; Stickley et al., 2013). Nonetheless, our

understanding of patterns and correlates of alcohol consumption in post-Soviet Russia is limited, with many studies using indirect estimates derived from mortality data (Leon et al., 2009; Saburova et al., 2011; Tomkins et al., 2007).

The availability of quality data on alcohol consumption is important to reveal the individual-level correlates of frequent drinking in Russia. The sharp, post-collapse increase in impoverishment and economic marginalization, coupled with the availability of cheap alcohol (Treisman, 2010), appears to be one of the main causes of increased alcoholism (McKee, 1999), but certain individual and family characteristics have also shown a significant association with alcohol consumption. For instance, married men are least likely and divorced and

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separated men are most likely to have drinking problems (Malyutina et al., 2003; Tomkins et al., 2007). Perceived social support and good family relations have been shown to be negatively related to drinking (Carlson and Vagero, 1998; Peirce et al., 1994). Educational level is associated with alcohol consumption in Russia (Bobrova et al., 2010; Shkolnikov, 2006), with drinking being more prevalent in people with lower levels of education (Carlson and Vagero, 1998; Cockerham, 2007; Cornia and Panizza, 2004). Material deprivation, financial strain and other income-related problems can contribute to more frequent drinking (Bobak et al., 1999; Bobrova et al., 2010; Luoto, 1998). Lastly, a direct association has also been found between unemployment and drinking, while among employed individuals, low occupational status and work strain are related to frequent alcohol consumption (Bobak et al., 2005; Tomkins et al., 2007). Nonetheless, we are not aware of any studies that simultaneously account for all of these correlates of drinking in Russia.

In this study, using a novel large individual-level dataset collected in 2014–2015, we present the new estimates of the frequency of drinking among middle-aged and older Russian respondents and their surviving and deceased relatives. The latter improves our understanding of the patterns of alcohol consumption in post-transition Russia and of the quality of self-reported accounts of drinking. Since our multivariable analysis of frequency of drinking among relatives also includes individuals who are always or usually omitted in conventional self-reported modes of surveys, such as deceased individuals and typically unreachable heavy drinkers, using three-level mixed-effects logistic regression models, we are able to provide more robust estimates of correlates of frequent drinking than in previously conducted studies. Our dataset not only includes a wide array of individuals' socio-demographic and socio-economic characteristics, but it also allows us to see if individuals' life course trajectories of unemployment, material deprivation, and occupational attainment between the 1980s and 2000s explain their propensities for frequent drinking in post-communist Russia. Indirect estimation of mortality collected through surviving relatives was employed previously in Russia to explore socio-economic and lifestyle factors and their relationship with mortality. However, this is the first time that this sampling approach has been combined with investigation of correlates of hazardous behaviours.

## 2. Methods

### 2.1. Dataset

To understand the frequency of alcohol consumption in Russia and ascertain which factors are associated with frequent drinking, we use the PrivMort convenience cohort study that was conducted in 30 towns of the European part of Russia in 2014–2015. Only one respondent was selected from each randomly selected household. A respondent had to have at least one family member living in the same settlement for a prolonged period during and after the transitions and who was born before 1972. The latter accounts for reason that the sample includes only those aged 40 and over. In addition to collecting information on respondents, the PrivMort survey collected data on their relatives. This data collection method, which gathers information not directly but through relatives, was originally developed by demographers and is often referred to as the “Brass method”. The convenience cohort in this study relies on collecting data for three types of relatives of the respondents: parents, siblings and spouses/partners. Information was collected for a maximum of two siblings who survived to the age of 20. The third group of relatives consists of the first partners (married or long-term cohabiters) of female respondents. Only male spouses were included in the convenience cohort, as the relevant literature suggests that women are more likely to report more reliably on their former partners due to social pressures, cultural perceptions, and other factors (Murphy et al., 2006). 22,796 individuals were interviewed, yielding information on the frequency of drinking among 57,907 relatives. The

overall response rate was 48%, using the Response Rate 1 as defined by the American Association for Public Opinion Research. Full details concerning the selection of towns and other aspects of the PrivMort methodology are given in Online Supplement A and elsewhere (Azarova et al., 2017; Gugushvili et al., 2018a, b; Irdam et al., 2016).

### 2.2. Frequency of drinking

Respondents were asked how often they and their fathers/mothers/siblings/partners consume/consumed alcoholic beverages. This method addresses some important shortcomings of alternative datasets on alcohol consumption based on alcohol sales statistics (Radaev, 2015). Previous research also indicates that people tend to underreport their own alcohol consumption in surveys (see Online Supplement B on self-reported data on alcohol consumption), while information reported by relatives can often be more reliable than self-reported data (Bobrova et al., 2010; Laatikainen et al., 2002; Tomkins et al., 2007). We are able to include in our analytical sample two groups that are typically not captured in conventional surveys of the frequency of drinking; the survey collected information about both surviving and deceased relatives, which means that the proportion of deceased is higher in parents, who are much older on average, and lower in partners and siblings. The overall proportion of deceased relatives is 58%. Our survey also includes those individuals, reported by their relatives, who would be otherwise unreachable or unresponsive in face-to-face interview situations because of alcohol-related problems.

Unsurprisingly, Fig. 1 shows that drinking in Russia is much more prevalent among men than among women. Among respondents, about 40% of men and 4% of women report drinking two to four times a month or more often. Male respondents are significantly less likely to report frequent drinking than the levels reported for their male relatives. For instance, only 2.2% of respondents reported that they drink almost every day and 4.7% several times a week, but the corresponding figures for all relatives are 4.0 and 10.6%, respectively. The disaggregation of the relatives by their vitality status suggests that these differences stem from significantly higher frequencies of drinking among deceased relatives, 19.1% of whom consumed alcohol several times a week or more often. Among women, we also observed significant differences between respondents' and their relatives' frequencies of drinking. In this case, however, female respondents report higher levels of drinking. For instance, 41.3% of them drink up to once a month, only 35.2 and 24.4% of surviving and deceased relatives drink alcohol this often. Female respondents are also less likely to report that they have never drunk (32.8%) than their relatives (48.8%).

### 2.3. Analytic strategy

The reported frequencies of drinking among respondents and their relatives suggest that there are non-trivial differences in alcohol consumption patterns between these two groups, with more frequent drinking among deceased men and less frequent drinking among deceased women. Based on the previous research showing a strong link between alcohol consumption and mortality in Russia (Nemtsov, 2002; Norström, 2011; Pridemore, 2013; Pridemore and Chamlin, 2006), it is likely that the sample of surviving relatives does not include individuals who were frequent drinkers but died due to alcohol-related causes. Therefore, to derive more robust estimates of individual-level correlates of frequent drinking, we analyse the sample of both surviving and deceased relatives. To study individual-level correlates of the frequency of alcohol consumption, we created a dummy variable for frequent drinking among male relatives, which takes a value of 1 if they drink alcoholic beverages “almost every day” or “several times a week” and 0 otherwise. For women, the frequent drinking variable also takes a value of 1 if they drink “about 2–4 times a month”. This definition is necessary because the share of female relatives consuming alcohol several times a week or more often is about 0.7%, which makes meaningful

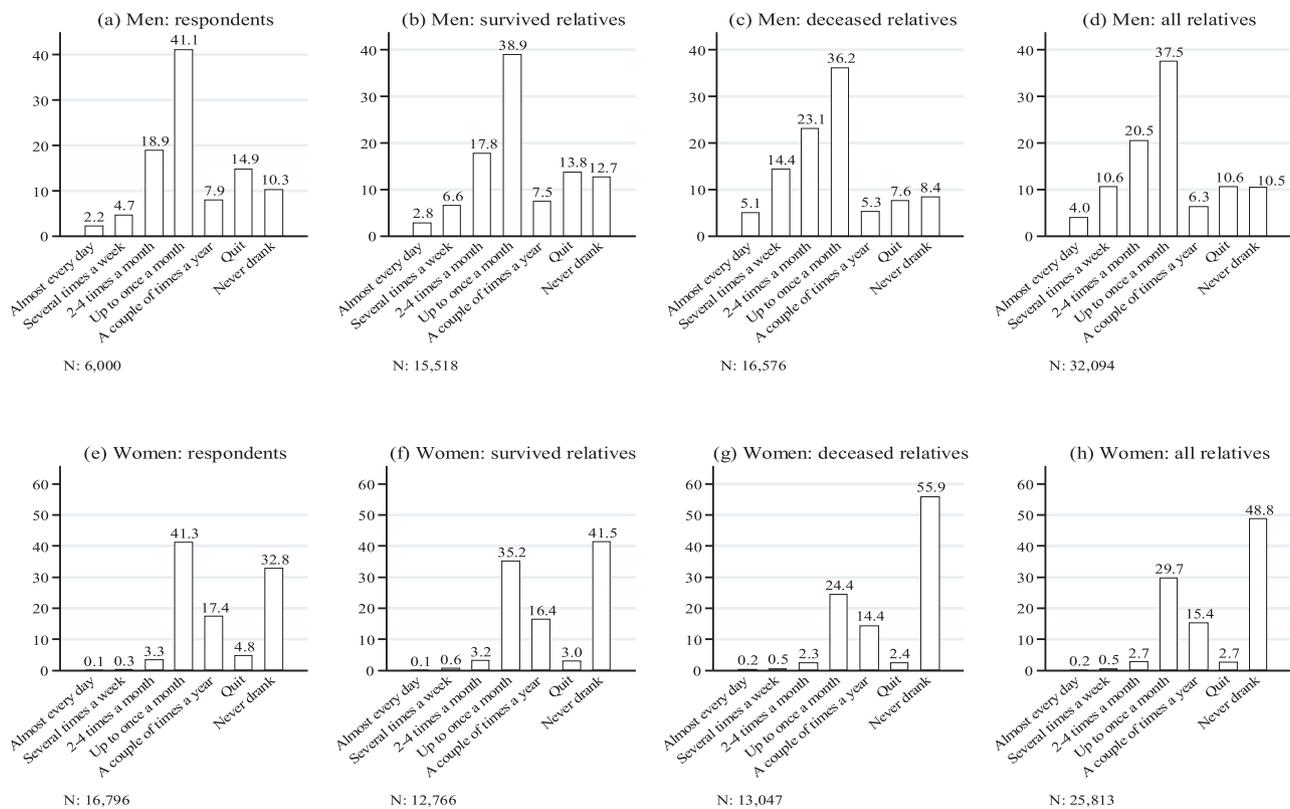


Fig. 1. Frequencies of responses on the question: “Do you/does/did your father/mother/siblings/partner drink alcoholic beverages?” Respondents and their survived and deceased relatives aged 40 and above.

analyses of its individual-level explanations unfeasible among women.

To account for the dependence between individuals in the same families and towns, we fit three-level mixed-effects logistic regressions as commonly used in such analyses (Gibbons and Hedeker, 1997). Models are run separately by gender, with level 1 consisting of individuals, level 2 of their families, and level 3 of the 30 towns in which the PrivMort survey was conducted. We employ essentially three-level models with two random-effects equations in which the first is a random intercept at the settlement level, and the second is a random intercept at the family level. The estimations are performed with the procedure “Melogit” in Stata 14 which achieves optimization using the original metric of variance components, while the conditional distribution of the response given the random effects is assumed to be Bernoulli with a logit link function. For informative purposes, we also calculated town-level and family-level variance components and intraclass correlation coefficients (ICC) for each multivariable regression model. Although the latter measure is sub-optimal for binary outcome variables, the variance and ICC estimates jointly suggest that, controlling for fixed-effects on individual-level, within the same town the correlation of frequent drinking among individuals is weaker than the correlation of frequent drinking within the same families.

#### 2.4. Correlates of frequent drinking

Individual-level correlates included in our multilevel logistic regression models correspond to the explanations of drinking discussed in the introductory section. The age of individuals, at death for decedents and at survey for survivors, is collapsed into five categories: 40–49, 50–59, 60–69, 70–79 and 80 and more years old. We control for the type of relative included in the analytical sample. The variable on education is operationalized in the following five categories: elementary; secondary; vocational secondary; vocational higher; and complete academic higher education. Marital status consists of singles (i.e.,

never-married), married, separated/divorced, and widows/widowers. The survey respondents were asked to report the frequency of communication between them and their relatives including face-to-face, phone, internet, telegraph, and letters. The labour market variable is divided into individuals who are in work, were redundant/fired, cannot work because of illness, already retired, or do not work for other reasons.

The PrivMort survey asked about unemployment spells lasting for 6 months or longer or if respondents’ relatives ever had to go without things people need, like food, heat or clothes in the 1980s, 1990s, and 2000s (descriptive statistics are reported in Online Supplement C). Their answers are used as the proxy for material deprivation. The survey also inquired into individuals’ occupational status, which is collapsed into four major groups of the International Standard Classification of Occupation (ISCO-88). ISCO 1–2 includes legislators, senior officials, managers, and professionals and is the most advantaged group of occupations. The most precarious jobs are, in turn, included in the ISCO 9 major group consisting of occupations such as agricultural, mining, manufacturing labourers, sales and elementary services occupations. All remaining types of jobs are collapsed together into the ISCO 3–8 groups. We also separate individuals with occupations related to state security and the military, as they might exhibit different patterns of drinking.

### 3. Results

#### 3.1. Socio-demographic correlates, education, and social support

Table 1 shows multivariable odds ratios (OR) from multilevel mixed-effects logistic regressions with corresponding 95% confidence intervals (CI). After list-wise deletion of missing data, men constitute 55.9% of relatives and models are run separately by gender. Our multivariable analysis, in line with the bivariate estimates (reported in

**Table 1**  
Multivariable odds ratios from three-level mixed-effects logistic regressions of frequent drinking among respondents' relatives.

	Males OR (95% CI)	Females OR (95% CI)
<b>Relatives</b>		
Father	1.00	–
Mother	–	1.00
First sibling	<b>0.51</b> (0.38–0.68)	<b>2.36</b> (1.86–3.00)
Second sibling	0.74 (0.53–1.04)	<b>1.69</b> (1.08–2.64)
First partner	<b>3.56</b> (2.20–5.76)	–
<b>Age groups</b>		
42–49	<b>2.85</b> (1.31–6.17)	<b>4.35</b> (2.16–8.75)
50–59	<b>2.54</b> (1.23–5.26)	<b>3.95</b> (2.15–7.24)
60–69	1.73 (0.85–3.55)	<b>1.97</b> (1.20–3.21)
70–79	1.11 (0.65–1.90)	<b>1.72</b> (1.19–2.47)
80+	1.00	1.00
<b>Education</b>		
Elementary	<b>2.12</b> (1.46–3.09)	1.27 (0.79–2.05)
Secondary	<b>1.72</b> (1.15–2.59)	0.98 (0.60–1.61)
Vocational secondary	<b>1.95</b> (1.35–2.80)	1.03 (0.65–1.65)
Vocational higher	<b>1.85</b> (1.26–2.72)	<b>0.65</b> (0.46–0.91)
Academic higher	1.00	1.00
<b>Marital status</b>		
Single	1.15 (0.57–2.31)	1.60 (0.80–3.19)
Married	1.00	1.00
Separated/divorced	<b>1.32</b> (1.03–1.69)	1.40 (0.95–2.06)
Widow/widower	0.85 (0.55–1.33)	1.34 (0.99–1.81)
<b>Communication</b>		
Live in the same household	1.20 (0.94–1.55)	0.98 (0.63–1.51)
Every day	1.00	1.00
Once a week	1.01 (0.81–1.26)	1.17 (0.83–1.63)
Once a month	0.96 (0.74–1.26)	1.36 (0.97–1.91)
A few times a year	1.36 (0.97–1.91)	<b>1.81</b> (1.08–3.03)
Once a year	<b>1.86</b> (1.23–2.81)	0.80 (0.20–3.16)
Less	<b>1.78</b> (1.05–3.02)	0.91 (0.21–3.90)
No communication	<b>2.51</b> (1.49–4.23)	–
<b>Labour market</b>		
Working	1.00	1.00
Redundant/fired	<b>3.03</b> (2.13–4.31)	1.25 (0.48–3.27)
Ill health	<b>1.48</b> (1.12–1.95)	1.19 (0.62–2.29)
Early retirement	1.27 (0.88–1.84)	1.49 (0.94–2.36)
Retired	<b>1.36</b> (1.02–1.81)	1.29 (0.89–1.88)
Other reasons	<b>2.50</b> (1.71–3.65)	1.38 (0.50–3.85)
<b>Long-term unemployment</b>		
In the 1980s		
Was not unemployed	1.00	1.00
Unemployed	1.63 (0.83–3.19)	2.41 (0.84–6.95)
Was not working	0.75 (0.47–1.19)	0.64 (0.37–1.10)
In the 1990s		
Was not unemployed	1.00	1.00
Unemployed	<b>1.97</b> (1.42–2.75)	1.40 (0.81–2.42)
Was not working	0.91 (0.75–1.10)	0.81 (0.57–1.15)
Was not alive	0.97 (0.74–1.28)	0.58 (0.31–1.08)
In the 2000s		
Was not unemployed	1.00	1.00
Unemployed	1.65 (0.91–3.01)	<b>2.29</b> (1.30–4.04)
Was not working	<b>1.91</b> (1.56–2.36)	1.26 (0.76–2.10)
Was not alive	<b>1.83</b> (1.37–2.44)	<b>1.65</b> (1.04–2.62)
<b>Material deprivation</b>		
In the 1980s		
Never	1.00	1.00
Sometimes	1.24 (0.67–2.30)	1.18 (0.70–2.00)
In the 1990s		
Never	1.00	1.00
Sometimes	1.03 (0.72–1.46)	1.16 (0.60–2.22)
In the 2000s		
Never	1.00	1.00
Sometimes	1.33 (0.71–2.51)	1.46 (0.71–3.01)
<b>Occupations</b>		
In the 1980s		
Managers & professionals	0.96 (0.60–1.55)	0.57 (0.32–1.02)
Intermediate occupations	1.00	1.00
Unskilled working class	1.42 (1.11–1.82)	1.02 (0.79–1.34)
Armed forces	0.91 (0.39–2.10)	0.74 (0.15–3.81)
In the 1990s		
Managers & professionals	0.73 (0.46–1.14)	1.19 (0.65–2.18)

**Table 1 (continued)**

	Males OR (95% CI)	Females OR (95% CI)
Intermediate occupations	1.00	1.00
Unskilled working class	0.97 (0.64–1.48)	1.08 (0.72–1.62)
Armed forces	0.67 (0.24–1.84)	<b>9.72</b> (1.05–89.7)
<b>In the 2000s</b>		
Managers & professionals	<b>0.57</b> (0.38–0.86)	0.67 (0.29–1.53)
Intermediate occupations	1.00	1.00
Unskilled working class	<b>1.61</b> (1.17–2.22)	1.27 (0.75–2.17)
Armed forces	0.99 (0.39–2.54)	1.13 (0.00–5.19)
<b>Variance</b>		
Town-level	0.42 (0.24–0.74)	0.94 (0.45–1.96)
Family-level	1.30 (0.70–2.43)	1.96 (1.20–3.22)
<b>Statistics</b>		
ICC on settlement-level	0.08 (0.05–0.14)	0.15 (0.09–0.25)
ICC on family-level	0.34 (0.26–0.44)	0.47 (0.34–0.60)

Notes: Statistically significant associations are shown in bold.

Online Supplement D), suggest that different relatives have varying odds of being frequent drinkers. Among men, the first brothers have significantly lower odds ratios (0.51; CI 0.38–0.68) and first partners significantly higher odds ratios (3.56; CI 2.20–5.57) of consuming alcohol more frequently than fathers. Among women, when compared with mothers, both the first and the second sisters are more likely to consume alcohol more frequently, with corresponding odds ratios of 2.36 (CI 1.86–3.00) and 1.69 (CI 1.08–2.64). As expected, younger individuals are more likely to consume alcohol frequently; however, we have to emphasise once again that the older age groups contain a higher ratio of decedents to survivors than the younger groups. Among men aged 40–49, the odds of frequent drinking are 2.85 (CI 1.31–6.17) times higher than for those aged 80 and older, while for women this effect is even stronger with the odds ratio of 4.35 (CI 2.16–8.75).

Low educational attainment is associated with more frequent drinking among men but not among women. Men with low educational attainment are at higher risk of alcohol consumption with odds ratios of 2.12 (CI 1.46–3.09), 1.72 (CI 1.15–2.59), 1.95 (CI 1.35–2.80), and 1.85 (CI 1.26–2.72) for elementary, secondary, vocational secondary, and vocational higher education, respectively, when compared with academic higher education. In regards to marital status, women are much more likely to be widowed than men, but only separated/divorced men have higher odds of drinking than married ones (OR 1.32 CI 1.03–1.69). Men who do not communicate with respondents or communicate about once a year have, respectively, odds ratios of 2.51 (95% CI 1.49–4.23) and 1.86 (95% CI 1.23–2.81) of being frequent drinkers compared with those who stay in touch daily with their relatives. Similarly, women who are in touch with their family members only a few times a year drink more often (OR 1.81, CI 1.08–3.03) than those who stay in touch on a daily basis.

### 3.2. Labour market and life course correlates

The results for labour market characteristics suggest that, in comparison to working men, those who were made redundant due to enterprise closure (about 2% of the sample) have an odds ratio of 3.03 (CI 2.13–4.31) with respect to drinking at least several times a week. In addition, we find that men who do not work because of poor health are more likely to consume alcohol more often (OR 1.48 CI 1.12–1.95) than working individuals. Adjusting for all covariates, those men who experienced six or more months of unemployment in the 1990s were found to have an odds ratio of 1.97 (CI 1.42–2.75) and long-term unemployed women in the 2000s have an odds ratio of 2.29 (CI 1.30–4.04) with respect to drinking frequently. We also found that, in the 2000s, those men who were economically inactive have higher chances of being frequent drinkers.

Unlike bivariate analysis, our three-level multivariable logistic

regressions do not suggest that men or women who experienced material deprivation anytime in the 1980s–2000s have higher odds of frequently consuming alcohol. Lastly, men in the unskilled working class have a higher bivariate odds of frequent drinking when compared with those in the types of jobs that are collapsed together into the ISCO 3–8 groups. We find that those with elementary occupations in the 1980s have an odds ratio of 1.42 (CI 1.11–1.82) of drinking frequently when compared with men in the intermediate group of occupations. In the 2000s, men in professional occupations had 43% (OR 0.57 CI 0.38–0.86) lower odds of frequent drinking. At the other end of the occupational hierarchy, individuals with unskilled working occupations have an odds ratio of 1.61 (CI 1.17–2.22) of consuming alcohol at least several times a week (further robustness checks are reported in Online Supplement E).

#### 4. Discussion

In this study, we presented new data on the frequency of drinking among middle-aged and older Russian men and women and attempted to explain the frequent consumption of alcoholic beverages in 30 towns of the European part of Russia. We observed that the reported frequency of drinking among male respondents is only marginally lower than levels reported for their surviving male relatives. The lack of difference between self-reports and reports for non-deceased relatives suggests that self-reported measure might accurately reflect real frequency of alcohol consumption among the surviving male population. However, our results also indicate that those relatives who are deceased have a much higher level of alcohol consumption and therefore should be included in the analysis of correlates of frequent drinking. Among women, self-report estimates are somewhat greater than reports for female relatives. Based on the results of cognitive testing we carried out in the field in 2014, we assume that this, at least partially, has to do with respondents under-reporting alcohol consumption, particularly for older female relatives (i.e., mothers) because of the negative cultural context with traditional gender normativity, where drinking is seen as unacceptable in women and acceptable in men.

We also find that different correlates are independently associated with frequent alcohol consumption. Our results indicate an inverse association between education and frequent drinking in Russia, but we do not observe this effect among women. We find that married people and those with strong family ties are less likely to drink than divorced individuals and individuals without family connections. The results also revealed the significant associations of long-term unemployment and occupational status in the 1990s–2000s with frequent drinking. Accounting for other correlates, material deprivation does not contribute to frequent alcohol consumption, which is a novel finding that contradicts the earlier studies on a salient effect of material deprivation, financial strain and other income-related problems for frequent drinking (Bobak et al., 1999; Bobrova et al., 2010; Luoto, 1998). These reported associations are stronger among men than among women. One explanation for this could be the gender-specific coding of frequent drinking (for other study limitations, see Online Supplement F). The reported findings are important in the context of previous research for three main reasons. First, this is one of the most comprehensive studies of correlates of alcohol consumption in Russia to date, as it includes more correlates than in previous studies, using an unusually large sample of individuals. Second, the use of the Brass method to build a retrospective convenience cohort allows us to take account of the potential bias of misreporting of alcohol consumption commonly present in self-reported surveys. Third, this study provides substantive evidence that, in addition to current socio-demographic and socio-economic explanations, individuals' life course trajectories of losing a job, long-term unemployment, and occupational attainment in transition explain their propensity of frequent drinking in post-communist Russia.

One of the major findings of this study is that most of the correlates of frequent drinking, with individuals' age being one exception,

demonstrate effects that are more salient for men than for women. The latter suggests that men are especially vulnerable to inequality in educational and occupational attainment, labour market conditions and social support in Russia. To remedy inequalities in drinking stemming from factors such as individuals' education, labour market status and unemployment, requires systemic intervention, probably at the national level, but local governments could also play a positive role. For instance, there might be few settings to facilitate positive, non-alcohol dominated space for social interaction in small towns that were included in the PrivMort dataset. Policy measures that can promote a culture of more frequent communication among relatives and encourage more active participation in social, cultural and recreational activities such as participating in sport clubs or visiting cinemas and theatres may positively affect the levels of substance abuse (Orozco et al., 2017; Zoorob and Salemi, 2017).

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#### Contributors

AG designed and conducted the empirical analysis, drafted the report, and interpreted the results. AA compiled the datasets, coordinated the early stages of the project, contributed to the report, and commented on drafts. DI provided background information, oversaw the raw data collection via survey, and facilitated the interpretation of results. WCJ facilitated interpretation of findings and contributed to the report. MMu helped to design the statistical analysis, oversaw the grand design of the study, facilitated the interpretation of results, and commented on drafts. MMC oversaw the grand design of the study, facilitated the interpretation of results, and commented on and contributed to the draft. LK led the project, was the author of the grand design of the study, and contributed to the draft. All authors have read and approved the final manuscript before submission.

#### Conflict of interest

None.

#### Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at <https://doi.org/10.1016/j.drugalcdep.2018.03.038>.

#### References

- Azarova, A., Irdam, D., Gugushvili, A., Fazekas, M., Scheiring, G., Horvat, P., Stefler, D., Kolesnikova, I., Popov, V., Szelenyi, I., Stuckler, D., Marmot, M., Murphy, M., McKee, M., Bobak, M., King, L., 2017. The effect of rapid privatisation on mortality in mono-industrial towns in post-soviet Russia: a retrospective cohort study. *Lancet Public Health* 2, e231–e238. [http://dx.doi.org/10.1016/S2468-2667\(17\)30072-5](http://dx.doi.org/10.1016/S2468-2667(17)30072-5).
- Bobak, M., McKee, M., Rose, R., Marmot, M., 1999. Alcohol consumption in a national sample of the Russian population. *Addiction* 94, 857–866. <http://dx.doi.org/10.1046/j.1360-0443.1999.9468579.x>.
- Bobak, M., Pikhart, H., Kubinova, R., Malyutina, S., Pajak, A., Sebakova, H., Topor-Madry, R., Nikitin, Y., Caan, W., Marmot, M., 2005. The association between psychosocial characteristics at work and problem drinking: a cross-sectional study of men in three Eastern European urban populations. *Occup. Environ. Med.* 62, 546–550. <http://dx.doi.org/10.1136/oem.2004.017202>.
- Bobrova, N., West, R., Malyutina, D., Malyutina, S., Bobak, M., 2010. Gender differences in drinking practices in middle aged and older Russians. *Alcohol Alcohol.* 45, 573–580. <http://dx.doi.org/10.1093/alcac/agq069>.
- Carlson, P., Vagero, D., 1998. The social pattern of heavy drinking in Russia during transition. Evidence from Taganrog. *Eur. J. Public Health* 8, 280–285. <http://dx.doi.org/10.1093/eurpub/8.4.280>.

- Cepeda, J.A., Niccolai, L.M., Eritsyan, K., Heimer, R., Levina, O., 2013. Moderate/heavy alcohol use and HCV infection among injection drug users in two Russian cities. *Drug Alcohol Depend.* 132, 571–579. <http://dx.doi.org/10.1016/j.drugalcdep.2013.04.004>.
- Cockerham, W.C., 2007. Health lifestyles and the absence of the Russian middle class. *Sociol. Health Illn.* 29, 457–473. <http://dx.doi.org/10.1111/j.1467-9566.2007.00492.x>.
- Cornia, G.A., Paniccia, R., 2004. The transition mortality crisis: evidence, interpretation and policy responses. In: Cornia, G.A., Paniccia, R. (Eds.), *The Mortality Crisis in Transitional Economies*. Oxford University Press, New York.
- Gibbons, R.D., Hedeker, D., 1997. Random effects probit and logistic regression models for three-level data. *Biometrics* 53, 1527. <http://dx.doi.org/10.2307/2533520>.
- Gugushvili, A., McKee, M., Azarova, A., Murphy, M., Irdam, D., King, L., 2018a. Parental transmission of smoking among middle-aged and older populations in Russia and Belarus. *Int. J. Public Health* 63, 349–358. <http://dx.doi.org/10.1007/s00038-017-1068-0>.
- Gugushvili, A., McKee, M., Murphy, M., Azarova, A., Irdam, D., Doniec, K., King, L., 2018b. Intergenerational mobility in relative educational attainment and health-related behaviours. *Soc. Indic. Res.* 2018, 1–29. <http://dx.doi.org/10.1007/s11205-017-1834-7>.
- Gustafson, T., 1999. *Capitalism Russian-Style*. Cambridge University Press, Cambridge.
- Irdam, D., King, L., Gugushvili, A., Azarova, A., Fazekas, M., Scheiring, G., Stefler, D., Doniec, K., Horvat, P., Kolesnikova, I., Popov, V., Szelenyi, I., Marmot, M., Murphy, M., McKee, M., Bobak, M., 2016. Mortality in Transition: study protocol of the PrivMort project, a multilevel convenience cohort study. *BMC Public Health* 16, 672. <http://dx.doi.org/10.1186/s12889-016-3249-9>.
- Laatikainen, T., Alho, H., Vartiainen, E., Jousilahti, P., Sillanaukee, P., Puska, P., 2002. Self-reported alcohol consumption and association to carbohydrate-deficient transferrin and gamma-glutamyltransferase in a random sample of the general population in The Republic Of Karelia, Russia and in North Karelia, Finland. *Alcohol Alcohol.* 37, 282–288. <http://dx.doi.org/10.1093/alcac/37.3.282>.
- Leon, D.A., Saburova, L., Tomkins, S., Andreev, E., Kiryanov, N., McKee, M., Shkolnikov, V.M., 2007. Hazardous alcohol drinking and premature mortality in Russia: a population based case-control study. *Lancet* 369, 2001–2009. [http://dx.doi.org/10.1016/S0140-6736\(07\)60941-6](http://dx.doi.org/10.1016/S0140-6736(07)60941-6).
- Leon, D.A., Shkolnikov, V.M., McKee, M., 2009. Alcohol and Russian mortality: a continuing crisis. *Addiction* 104, 1630–1636. <http://dx.doi.org/10.1111/j.1360-0443.2009.02655.x>.
- Luoto, R., 1998. Unemployment, sociodemographic background and consumption of alcohol before and during the economic recession of the 1990 in Finland. *Int. J. Epidemiol.* 27, 623–629. <http://dx.doi.org/10.1093/ije/27.4.623>.
- Malyutina, S., Bobak, M., Kurilovitch, S., Nikitin, Y., Marmot, M., 2003. Trends in alcohol intake by education and marital status in an urban population in Russia between the mid 1980 and the mid 1990. *Alcohol Alcohol.* 39, 64–69. <http://dx.doi.org/10.1093/alcac/agh022>.
- McKee, M., 1999. Alcohol in Russia. *Alcohol Alcohol.* 34, 824–829. <http://dx.doi.org/10.1093/alcac/34.6.824>.
- Murphy, M., Bobak, M., Nicholson, A., Rose, R., Marmot, M., 2006. The widening gap in mortality by educational level in the Russian Federation, 1980–2001. *Am. J. Public Health* 96, 1293–1299. <http://dx.doi.org/10.2105/AJPH.2004.056929>.
- Nemtsov, A.V., 2002. Alcohol-related human losses in Russia in the 1980 and 1990. *Addiction* 97, 1413–1425. <http://dx.doi.org/10.1046/j.1360-0443.2002.00262.x>.
- Nemtsov, A., 2003. Suicides and alcohol consumption in Russia, 1965–1999. *Drug Alcohol Depend.* 71, 161–168. [http://dx.doi.org/10.1016/S0376-8716\(03\)00094-2](http://dx.doi.org/10.1016/S0376-8716(03)00094-2).
- Norström, T., 2011. The role of alcohol in the Russian mortality crisis. *Addiction* 106, 1957–1965. <http://dx.doi.org/10.1111/j.1360-0443.2011.03513.x>.
- Orozco, R., Benjet, C., Ruiz Velasco-Acosta, S., Moreno Altamirano, L., Karriker-Jaffe, K.J., Zemore, S., Cherpitel, C., Borges, G., 2017. Area-level disadvantage and alcohol use disorder in northern Mexico. *Drug Alcohol Depend.* 175, 219–226. <http://dx.doi.org/10.1016/j.drugalcdep.2017.02.011>.
- Peirce, R.S., Frone, M.R., Russell, M., Cooper, M.L., 1994. Relationship of financial strain and psychosocial resources to alcohol use and abuse: the mediating role of negative affect and drinking motives. *J. Health Soc. Behav.* 35, 291. <http://dx.doi.org/10.2307/2137211>.
- Pridemore, W.A., Chamlin, M.B., 2006. A time-series analysis of the impact of heavy drinking on homicide and suicide mortality in Russia, 1956–2002. *Addiction* 101, 1719–1729. <http://dx.doi.org/10.1111/j.1360-0443.2006.01631.x>.
- Pridemore, W.A., 2013. The impact of hazardous drinking on suicide among working-age Russian males: an individual-level analysis. *Addiction* 108, 1933–1941. <http://dx.doi.org/10.1111/add.12294>.
- Radaev, V., 2015. Impact of a new alcohol policy on homemade alcohol consumption and sales in Russia. *Alcohol Alcohol.* 50, 365–372. <http://dx.doi.org/10.1093/alcac/avg008>.
- Saburova, L., Keenan, K., Bobrova, N., Leon, D.A., Elbourne, D., 2011. Alcohol and fatal life trajectories in Russia: understanding narrative accounts of premature male death in the family. *BMC Public Health* 11, 481. <http://dx.doi.org/10.1186/1471-2458-11-481>.
- Shkolnikov, V., McKee, M., Leon, D.A., 2001. Changes in life expectancy in Russia in the mid-1990s. *Lancet* 357, 917–921. [http://dx.doi.org/10.1016/S0140-6736\(00\)04212-4](http://dx.doi.org/10.1016/S0140-6736(00)04212-4).
- Shkolnikov, V.M., 2006. The changing relation between education and life expectancy in central and eastern Europe in the 1990. *J. Epidemiol. Commun. Health* 60, 875–881. <http://dx.doi.org/10.1136/jech.2005.044719>.
- Stickley, A., Jukkala, T., Norström, T., 2011. Alcohol and suicide in Russia, 1870–1894 and 1956–2005: evidence for the continuation of a harmful drinking culture across time? *J. Stud. Alcohol Drugs* 72, 341–347. <http://dx.doi.org/10.15288/jsad.2011.72.341>.
- Stickley, A., Koyanagi, A., Kopusov, R., Razvodovsky, Y., Ruchkin, V., 2013. Adolescent binge drinking and risky health behaviours: findings from Northern Russia. *Drug Alcohol Depend.* 133, 838–844. <http://dx.doi.org/10.1016/j.drugalcdep.2013.08.028>.
- Tomkins, S., Saburova, L., Kiryanov, N., Andreev, E., McKee, M., Shkolnikov, V., Leon, D.A., 2007. Prevalence and socio-economic distribution of hazardous patterns of alcohol drinking: study of alcohol consumption in men aged 25–54 years in Izhevsk, Russia. *Addiction* 102, 544–553. <http://dx.doi.org/10.1111/j.1360-0443.2006.01693.x>.
- Treisman, D., 2010. Death and prices. *Econ. Transit.* 18, 281–331. <http://dx.doi.org/10.1111/j.1468-0351.2009.00382.x>.
- Zoorob, M.J., Salemi, J.L., 2017. Bowling alone, dying together: the role of social capital in mitigating the drug overdose epidemic in the United States. *Drug Alcohol Depend.* 173, 1–9. <http://dx.doi.org/10.1016/j.drugalcdep.2016.12.011>.