EXTENDED ABSTRACT
Alcohol and mortality in Russia: a study based on mortality of relatives

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Background

The dramatic mortality fluctuations in Russia since the mid 1980s have attracted considerable attention[1;2]. During the societal transformation that followed the fall of communism, Russian mortality increased dramatically between 1987–1994 and it has been fluctuating since then. The scale of the mortality changes is striking; between 1990–1995 alone, the rise in mortality was equivalent to more than 2 million additional deaths above long-term mortality rates[3].

While it has been recognised that the causes of the mortality crisis are complex[3;4], it has been proposed that alcohol was an important proximal cause of these changes[1;5]. The hypothesised powerful role of alcohol has been attributed to the drinking pattern common in Russia, i.e. drinking of large amounts of alcohol, mainly vodka[6-8]. Since this drinking pattern is uncommon in most populations where most studies of alcohol and mortality have been conducted, previous research is of limited value to assess the role of alcohol in the Russian mortality crisis. Studies in Russia are acutely needed.

To our knowledge, there have been only three studies on the relation between alcohol and mortality in Russia. The studies produced conflicting results. One cohort study found no relation between alcohol and mortality at all[9]; one found increased mortality among frequent heavy drinkers only[10]; and one case-control study found increased mortality risk among binge drinkers[11]. However, these studies were relatively small, and the inconsistency of the findings could be due to limited statistical power of these studies.

We have developed a quick and effective approach to assess predictors of mortality in a population. It borrows from demographers' indirect methodology to estimate mortality in countries without vital statistics. A number of indirect demographic methods using survey or census data, often called "Brass techniques",[12;13] have been used to estimate mortality from information on the survival of close kin (such as spouses and parents) where conventional data are unavailable. These methods use simple information on the number of close kin and on how many of them have died. We modified

this method for literate and numerate populations, and in two pilot studies we found that the method, based on spouses, is a useful tool to study mortality and its individual level determinants in Russia[14;15].

Methods

Subjects
In collaboration with the Russian Centre for Public Opinion Research (VCIOM) and the New Russian Barometer survey program [www.cspp.strath.ac.uk/index.html?catalog1_0.html], we conducted three cross-sectional surveys of national samples of the Russian population in July, September and November 2002. The population sample was selected as follows. The whole Russian Federation was first stratified into 22 regions, and each region was further stratified into urban and rural areas. Within this framework, towns and settlements were randomly selected proportionately to population size. Within these locations, primary sampling units (locations) were randomly drawn. In each primary sampling unit, an address was randomly selected, and interviewers were instructed to seek a face-to-face interview at every n-th eligible household. At each address, the interviewer asked for a respondent matching an age-sex-education grid, and if more than one respondent was eligible, the person with the most recent birthday was selected.

A total of 7172 respondents, (2825 male, 4347 female) were successfully interviewed (2407, 2359 and 2406 in the July, September and November rounds respectively) and provided information on 26709 relatives. In total, 11776 households containing an eligible respondent were identified. Of these 3837 declined to be interviewed, 608 were unable to answer due to bad health or other reasons, 159 interviews were interrupted or rejected during control, yielding an overall response rate of 61%. The analyses presented here were restricted to male relatives (fathers, brothers and husbands).

Measurements
The respondents were asked about their parents, eldest two siblings and first husbands. Information collected about each relative included whether they were alive or dead, year of birth and if applicable year of (or age at) death. Further details including cause of death and other details of relatives' lifestyle was sought for parents (except those who died before 1972), siblings aged 20 years and older, and husbands. Two questions concerning alcohol consumption were asked about all relatives except mothers. First, the frequency of drinking vodka or other spirits, and second, the frequency of drinking more than 0.5 l (half bottle) of vodka on a typical occasion (binge drinking). Additional data collected on relatives included smoking (all relatives), education (sibs and husbands), frequency of contact with respondent and marital status (sibs only). Respondents also answered questions concerning their own age, sex, socio-economic characteristics, and social and political attitudes, childhood circumstances, such as lack of food, and family size.

Statistical analyses
Since we were interested in determinants of adult mortality, only relatives who had reached 30 years of age were included in these analyses. Alcohol data were not collected on mothers, and the analyses were therefore restricted to male relatives. Fathers who died before 1972, and therefore without covariate data, were not included.

We calculated the Cox proportional hazard ratios (relative risks) to assess the effect of relatives' characteristics on their survival. The proportional hazards assumptions were fulfilled. Since we

relied on survey responders' reports about their relatives, relatives with unknown vital status or age were excluded from the analyses. Data were left-censored at respondent's birth for fathers and year of marriage for husbands since survival prior to these events should not be considered time at risk. Husbands who were separated or divorced from the respondent and whose vital status was unknown were right-censored at the year of separation. We present results for mortality from all-causes, cardiovascular disease (CVD, including chronic cardiovascular disease, sudden unexpected fatal heart attack and stroke), and violent or alcohol related (including the categories of alcohol poisoning, violence, criminal attack and accident). Relatives who died from other causes, including unknown, were censored at time of death.

For drinking and other variables, we included the response "unknown" as a separate category. For drinking frequency in men, we used those who drank "occasionally, up to once a month" as the reference group. (The use of abstainers as the baseline category in studies of the effects of alcohol has been criticized because this group can contain ex-drinkers in poor health). For binge drinking, we used "occasional drinkers who never binged" as the reference category. We also used drinking and binge frequency as a linear variable, excluding the unknown category, to assess the significance of linear trends. In addition, drinkers were divided into ever/ never binge drinkers in order to investigate whether binge drinking has an effect of mortality beyond that of drinking frequency.

Results

There were the 10497 male relatives (4456 fathers, 3109 siblings and 2932 first husbands) included in analyses, with 3874 deaths (2201 among fathers, 768 among siblings and 905 among husbands). Of these men, 41% were occasional and 6% were daily drinkers. The prevalence of weekly or more frequent binge drinking (amongst drinkers) was 13%. Over 50% of the population were described as regular smokers.

Both drinking frequency and binge drinking were associated with mortality. Compared with occasional drinkers, the relative risk of death in daily drinkers was 2.0 (95% CI 1.7-2.2) for all-causes, 1.2 (0.9-1.5) for CVD and 5.6 (4.4-7.1) for external causes. For binge drinking at least weekly, the relative risks, compared with occasional drinkers who never binged, were 2.2 (1.9-2.4) for all causes, 1.6 (1.3-1.9) for CVD and 5.1 (3.8-6.7) for external causes. The trends for linear associations between drinking frequency / frequency of binge drinking and all mortality categories were highly statistically significant. The relative risk estimates were attenuated after adjustment for smoking and decade of birth but remained significant. For example, the adjusted relative risk of death from all causes was 1.5 (1.3-1.7) for daily drinking and 1.6 (1.4-1.8) for weekly binge drinking. Further adjustment for education and marital status had only small effects on the estimates. There was no evidence for an interaction between drinking frequency and binge drinking (p for interaction 0.29), with mortality increasing with drinking frequency in men who both did and did not binge.

Comments

We found strong and robust associations between frequency of drinking and binge drinking and mortality from all causes, CVD and external causes. The associations were linear; there was no suggestion of the U- or J-shaped association usually seen in western populations. The pattern of drinking is similar to that previously reported for Russian men with over 20% of men drinking at least once a week and over 20% of drinkers bingeing several times a month or more[8]. Previous

studies have found either no association between drinking frequency and mortality in adjusted analyses[9] or an effect restricted to heavy drinkers[10]. Earlier findings on binge drinking in Russia have been contradictory[11;10]. This study, larger than those previously reported, shows an effect of both drinking and binge frequency on mortality.

The design of this study offers great advantages in terms of time and expense, but several potential limitations need to be considered. Firstly, the data are retrospective and reliant on informants. It is possible that respondents were more likely to over-estimate alcohol consumption in dead relatives. Changes in alcohol behaviour prior to death may influence the results but one would expect that ill persons would tend to limit their alcohol consumption, rather than increase it. Secondly, mortality of fathers is underestimated in the dataset since alcohol consumption was not obtained for fathers who died before 1972 but those still alive were included. We assessed the effect of this bias by analysing only fathers born after 1941 - the results were very similar to that in all fathers, suggesting that the results are not affected by this bias. Thirdly, frequent contact with sibling was associated with higher mortality. This observation is probably due to increased contact with sick relatives and to under-reporting of mortality in sibs with less contact. However, adjustment for the frequency of contact did not materially alter the results. We consider the nature of the biases and how question wording may reduce these.

Secular trends in mortality were not addressed directly by the present paper. Alcohol has been linked with the increase in mortality since 1991 but we have not looked at this question specifically. However, such a role depends on demonstrating a positive association between alcohol consumption and mortality; as such this paper is consistent with the hypothesis.

Conclusions

This paper makes an important contribution to the debate on alcohol and mortality in Russia. It demonstrates the absence of the protective effect of moderate drinking seen in most western populations. Furthermore, the results suggest that binge drinking does not necessarily underlie the increased mortality in drinkers – mortality was increased also in drinkers who were not binge drinkers. Finally, this study shows that the method, based on the indirect demographic techniques, can be a valuable tool in the study of determinants of mortality in populations with sparse epidemiological data.

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