Population Drinking and Gender Gap in Coronary Heart Disease Mortality in Russia

*Razvodovsky YE
*International Academy of Sobriety, Russia

Abstract

Background
A great deal of evidence indicates that high level of alcohol consumption has been implicated both in the high coronary heart disease (CHD) mortality and its dramatic fluctuations during the recent decades in Russia. This evidence suggests that alcohol may play an important role in explaining the pronounced gender gap in CHD mortality in Russia.

Objective
This study aims to test the hypothesis of the close aggregate level link between alcohol consumption and gender difference in CHD mortality rates in Russia using data on sex-specific CHD mortality rates and alcohol consumption per capita between 1956 and 2010.

Method
Time-series analytical modeling techniques were used to examine the relationship between the gender difference in CHD mortality and trend in alcohol consumption per capita.

Results
The results of the analysis suggest that 55% of the difference in CHD mortality rates between males and females in Russia could be attributed to alcohol.

Conclusions
The outcomes of this study provide indirect support for the hypothesis that alcohol is a major contributor to the high gender gap in CHD mortality and its dramatic fluctuations in Russia during the last few decades.

Keywords
Alcohol; Coronary Heart Disease; Mortality; Gender; Russia; 1956-2010

Introduction
Coronary heart disease (CHD) is the largest contributor to the morbidity and mortality in all developed countries [1]. Mortality from CHD remains substantially higher among men than women across a range of countries that have very different economic, social and cultural background [2, 3]. The reasons underpinning sex differences in CHD mortality rates are not fully understood. A protective effect of estrogens on CHD risk in women has often been suggested [4]. In particular, the reduced risk of CHD in women who take hormone replacement therapy points to the hormone-mediated sex differences in the relative risk of CHD mortality [5]. It was suggested, however, that differences in unhealthy behavior, including cigarette smoking and binge drinking, were more important determinants of the excess male mortality than sex differences in physiology [6-8].
Russia has one of the highest CHD mortality rates when compared to European Union countries [9]. It is important to point out that, while the gender difference in CHD mortality rates in Western Europe remains relatively stable across time, Russia shows huge fluctuations in the gender gap [10]. This suggests that although biological risk factors may account for some of the gender difference in CHD mortality rates in Russia, it is likely that other factors also contribute to the CHD mortality-gender paradox in this country. A great deal of evidence indicates that high level of alcohol consumption has been implicated both in the high CHD mortality and its dramatic fluctuations during the recent decades in Russia [9, 11-16]. It has also been reported that Russian men have considerably higher level of alcohol consumption than women [17]. This evidence suggests that alcohol may play an important role in explaining the pronounced gender gap in CHD mortality in Russia.

This study aims to test the hypothesis of the close aggregate level link between alcohol consumption and gender difference in CHD mortality rates in Russia using data on sex-specific CHD mortality rates and alcohol consumption per capita between 1956 and 2010.

**Material and Methods**

**Data**

The data on sex-specific CHD mortality rates (per 1000.000 of the population) between 1956 and 2010 are taken from the Rosstat (Russian State Statistical Committee). The total level of alcohol consumption (in litres of pure alcohol) in Russia has been estimated using the indirect method based on alcohol poisonings mortality rate [17-19].

**Statistical Analysis**

To estimate the relation between changes in population drinking and gender difference in CHD mortality rates across the study period a time series analysis was performed using the statistical package “Statistica 12. StatSoft.” The dependent variable was the gender difference in CHD mortality and the independent variable was aggregate alcohol consumption. The correlations between the raw data from two time series can often be spurious due to common sources in the trends and due to autocorrelation [20]. In order to reduce the risk of obtaining spurious correlation between variables that have common trends we removed these trends by means of a “differencing” procedure. The procedure which eliminates the systematic variation within a time series is referred to as “prewhitening.” We used ARIMA (autoregressive integrated moving average) modeling to estimate the relationship between gender difference in CHD mortality and population drinking in this paper. In addition, the effect of population drinking on gender difference in CHD mortality rates will be presented in terms of alcohol-attributable fraction [21].

**Results**

Figure 1 shows the dynamic of gender difference in CHD mortality between 1956 and 2010. The graphical evidence suggests that the trend of gender gap in CHD fluctuated dramatically over time: it increased from 1964 to 1980, decreased markedly between 1980-1982, dropped sharply between 1983-1988, than jumped dramatically between 1992 and 1994. From 1994-1998 there was a fall in rates of before they again rose between 1998 and 2003, and then finally started to decrease. The graphical evidence also suggests that the temporal pattern of gender difference in CHD mortality fits closely with changes in alcohol consumption per capita (Figures 1).

A Spearman correlation analysis suggests a strong association between the gender gap in CHD mortality and alcohol consumption per capita (r=0.86; p<0.000). There were sharp trends in the time series data across the entire study period. These systematic variations were well accounted for by the application of first-order differencing and the specification of a first order moving average parameter. After pre-whitening the cross-correlations between alcohol consumption and gender difference in CHD mortality time series were inspected. The outcome indicated statistically significant cross-correlation between the two variables at lag zero (r=0.71; SE=0.143). According to the results of ARIMA analysis, alcohol consumption is a statistically significant factor associated with gender difference in CHD mortality rates in Russia, implying that a 1-litre increase in alcohol consumption per capita is associated with an increase in the difference between male and female CHD mortality rates by 5.9%. The results of the analysis also suggest that 55 % of the difference in CHD mortality rates between males and females in Russia could be attributed to alcohol.

**Discussion**

The dramatic fluctuations in the gender gap of CHD mortality rates in Russia suggest that the determinants cannot be purely biological, but might also...
reflect changes in sex-specific, modifiable lifestyle risk factors. It is well established in Russia that behavioral risk factors alone, primarily binge drinking and smoking, account for extremely higher rates in male CHD mortality [22]. Therefore, the alcohol-related hypothesis may help in explaining the high gender gap in CHD mortality and its dramatic variations in Russia during the last few decades. The results of the time series analysis, which suggest positive and statistically significant effects of alcohol consumption per capita on gender difference in CHD mortality rates in Russia between 1956 and 2010 indirectly supports the alcohol-related hypothesis.

Before concluding, some potential limitations of this study must be mentioned. It should be recognized that ignoring the confounding variables may imply that the effect of population drinking on sex differences in CHD mortality is overestimated. It can be assumed that the alcohol consumption effect on gender gap in CHD mortality is a spurious indicator of the impact of other powerful risk factors such as smoking. There is general agreement that cigarette smoking is a major contributor to the sex difference in CHD mortality in developed countries [22]. The high prevalence of smoking among Russian men (about 60%) probably explains a fact of the high male CHD mortality rate compared with the female mortality rate [4]. However, taking into account the fact that smoking has a long term effect on CHD mortality, this factor alone cannot explain the trajectories in the gender difference in Russian mortality rates during the last decades.

In conclusion, the outcomes of this study provide indirect support for the hypothesis that alcohol is a major contributor to the high gender difference in CHD mortality and its dramatic fluctuations in Russia during the last few decades. Further efforts in the understanding of the underlying mechanisms of sex differences in CHD mortality are needed for the development of strategies to prevent and treat CHD more efficiently.

References


