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Beverage-Specific Alcohol Sales and Gender Difference in Suicide Rates in Russia

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Abstract

Background: In the Western world, males die from suicide three to four times more often than females. The reasons behind the gender gap in suicide mortality are hotly debated in the scientific literature. Russia retains one of the highest gender gap in suicide rates in the world. Some researchers have reported a close link between alcohol and suicide in Russia both in present and the past.

Objective: The aim of the current study was to examine the aggregate-level relationship between the consumption of different alcoholic beverages and gender difference in suicide rates in Russia between 1970 and 2015.

Method: The ARIMA (autoregressive integrated moving average) modeling technique was used to evaluate the relationship between changes in the consumption of different types of alcoholic beverages and gender difference in suicide mortality across the study period.

Results: The results of ARIMA analysis indicate that vodka sales is closely linked with gender difference in suicide mortality in Russia: an additional liter of vodka sales per capita was estimated to increase in the difference between male and female suicide mortality rates by 10.3%.

Conclusions: This piece of evidence provides support for the hypothesis that high level of vodka consumption in conjunction with binge drinking pattern may be a major reason for the high gender difference in suicide rates and its dramatic fluctuations in Russia during the last few decades.

Keywords: Beverage-specific alcohol sales; Gender difference; Suicide rates; Russia; 1970-2015

Introduction

In the Western world, males die from suicide three to four times more often than females [1]. The reasons behind the gender gap in suicide mortality are hotly debated in the scientific literature [2,3]. Several factors are proposed as potentially contributing to the suicide-gender gap paradox: men tend to use more lethal methods; less likely seek help for depression; more likely behave impulsively [2,3]. It is clear, however, that even a combination of these factors cannot explain the gender difference in the suicide rates.

Russia retains one of the highest gender gap in suicide rates in the world [4,5]. Some researchers have reported a close link between alcohol and suicide in Russia both in present and the past [6-11]. Moreover, beverage-specific effect of vodka consumption on suicide rates has been observed in Russia at the aggregate level [12]. In line with these pieces of evidence, we assume that binge drinking of vodka in Russia should result in a close link between vodka sales and gender difference in suicide rates at the aggregate level.

The aim of the current study was therefore to examine the aggregate-level relationship between the consumption of different alcoholic beverages and gender difference in suicide rates in Russia between 1970 and 2015.

Material and Methods

Data

The data on sex-specific suicide mortality rates (per 1000.000 population) and beverage-specific alcohol sales (in liters of pure alcohol per capita) between 1970 and 2015 were taken from the Rosstat's (Russian State Statistical Committee) annual reports.

Statistical analysis

The ARIMA (autoregressive integrated moving average) modeling technique was used to evaluate the relationship between changes in the consumption of different types of alcoholic beverages and gender difference in suicide mortality across the study period. This method is most commonly used to reduce the risk of spurious trend relationship [13,14]. The first difference of log transformed beverage-specific alcohol sales and gender difference in suicide mortality series was used to remove time trends. The final models were tested using the Ljung-Box Q statistics. A time series analysis was performed using the statistical package "Statistica 12. StatSoft."

Results

The sharp fluctuations have occurred in the type of alcohol consumed in Russia across the study period (Figure 1). Vodka sales rose steadily in the 1970s, before leveling off in the early 1980s and then, falling sharply during the anti-alcohol campaign in 1985-1987 (from 5.6 to 2.1 liters). In this period there was also a change in the structure of beverage sales with vodka sales falling over 10%. The collapse of the Soviet Union and the ending of the state's alcohol monopoly in the early 1990s were associated with a sharp rise in vodka sales. Between 1995 and 2007 vodka sales fell substantially, while sales of beer increased rapidly (from 1.5 to 4.8 liters).

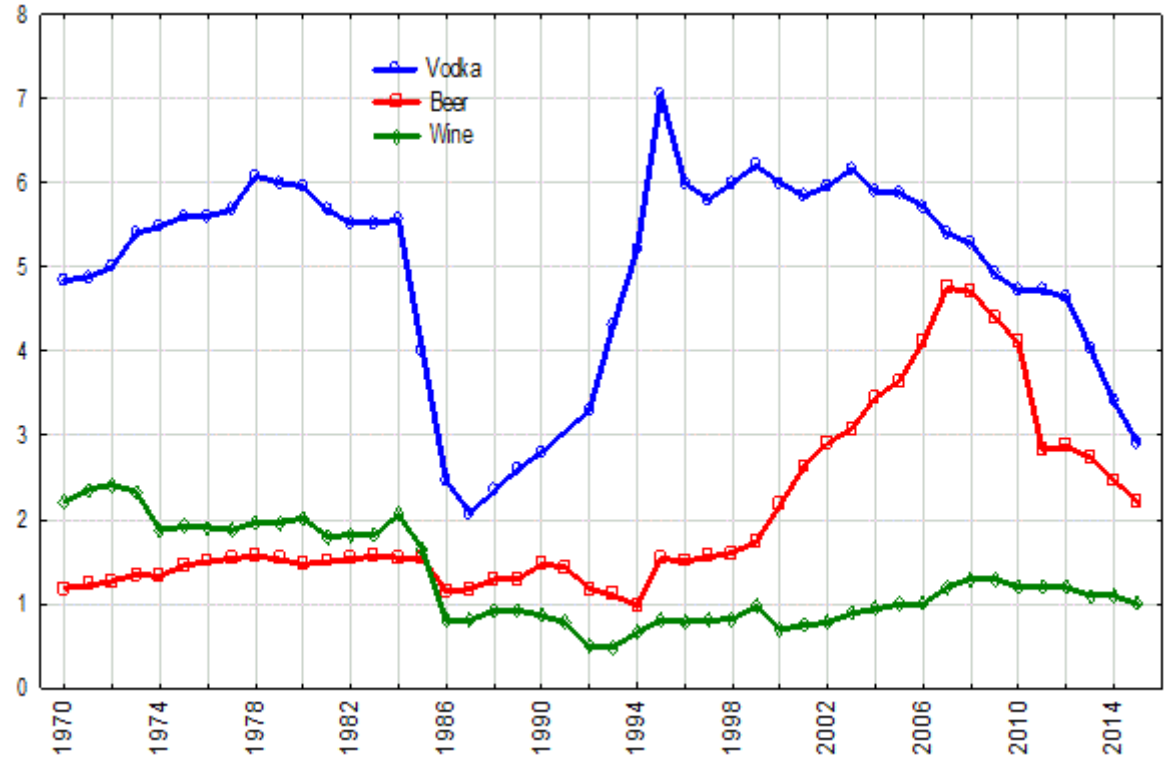

Figure 1: Beverage-specific alcohol sales in Russia between 1970 and 2015.

Figure 2 provides graphical evidence that the temporal pattern of gender gap in suicide mortality fits closely with changes in vodka sales per capita. There was a strong trend in the time series across the study period. This trend was removed by means of a first order differencing procedure. After prewhitening of the data, the cross-correlations between beverage-specific alcohol sales and the gender difference in suicide rates time series were inspected. This indicated that there was a statistically significant cross-correlation between vodka sales and gender difference in suicide rates at first lags 0 and 1 (Table 1). At the same time, there were no cross-correlations between prewhitened wine/beer sales and gender difference in suicide rates: these series were therefore not included in the model estimations.

The results of ARIMA analysis indicate that vodka sales is closely linked with gender difference in suicide mortality in Russia: an additional liter of vodka sales per capita was estimated to increase in the difference between male and female suicide mortality rates by 10.3%. The results of the analysis also suggest that 40.0% of the difference in suicide mortality rates between males and females in Russia could be attributed to consumption of vodka.

Discussion

This is the first study to examine if there are beverage-specific effects on the gender difference in suicide rates in Russia. The finding that only vodka was associated with the difference in suicide mortality between men and women replicates early research from neighbouring Belarus [15,16]. There is reason to believe that the same may be true for other post-communist countries in this region. There are several factors which may result in vodka having a strong effect in terms of suicide-gender paradox in Russia, including: vodka dominates in term of consumption; a heavy drinking of vodka is much more frequent among men than among women [17-21]. Furthermore, the results from previous time series analysis based on Russian data indicate that the relationship between vodka sales and suicide rates was stronger for males than females [12].

In conclusion, this study has shown that although sales of vodka was associated with gender difference in suicide rates in Russia during the later-Soviet and post-Soviet period, no effects were observed for the consumption of either wine or beer. This piece of evidence provides support for the hypothesis that high level of vodka consumption in conjunction with binge drinking pattern may be a major reason for the

high gender difference in suicide rates and its dramatic fluctuations in Russia during the last few decades.

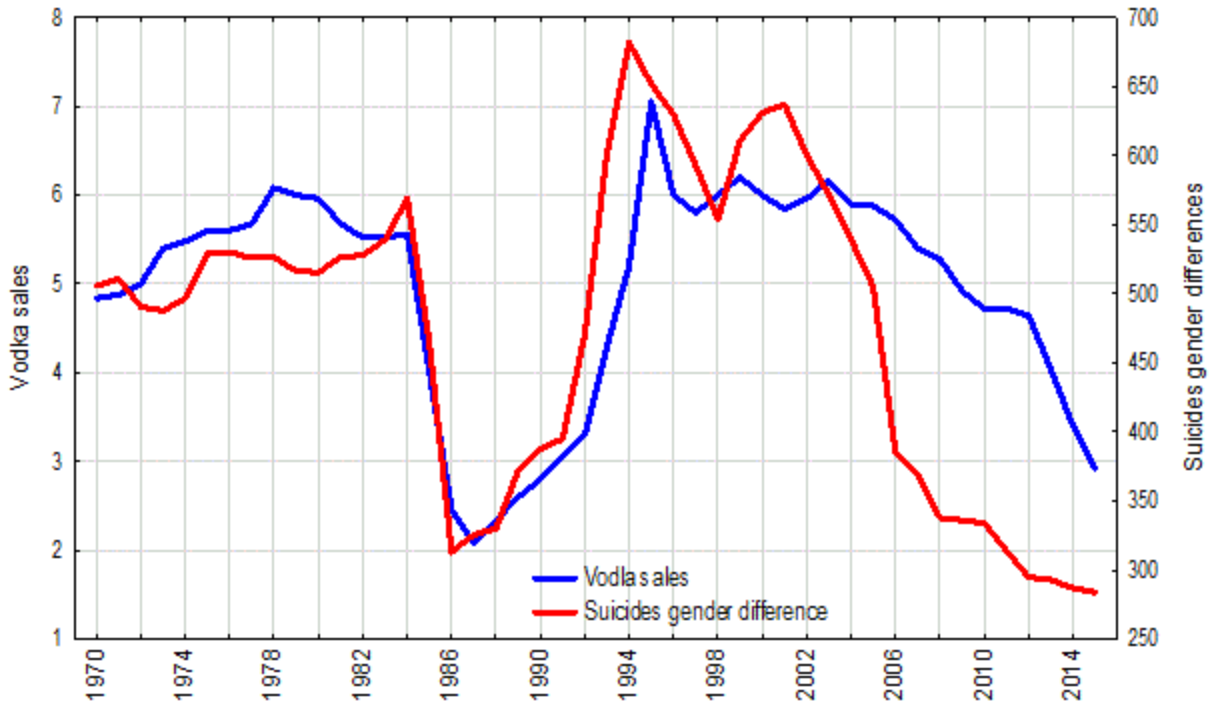

Figure 2: Trends in the gender difference in suicide rates and beverage-specific alcohol sales in Russia between 1970 and 2015.

	Vodka sale		Wine sale		Beer sale	
Lag	r	SE	r	SE	r	SE
-3	0.09	0.154	0.20	0.154	0.14	0.154
-2	0.03	0.153	0.25	0.153	0.16	0.153
-1	0.27	0.151	0.36	0.151	0.15	0.151
0	0.48	0.149	0.13	0.149	0.06	0.149
1	0.50	0.151	0.07	0.151	0.02	0.151
2	0.23	0.152	0.08	0.152	0.02	0.152
3	0.04	0.154	0.10	0.154	0.08	0.154

Table 1: Effects of beverage specific alcohol sales per capita on gender difference in suicide rates in Russia. The results of cross-correlation analysis between prewhitened time series.

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