

## Estimation of the overall level of alcohol consumption in Russia

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### Abstract

**Background:** the level of alcohol consumption by the population is an important indicator of the alcohol situation in the country, since it largely determines the level of alcohol-related problems.

**Aims:** to estimate the total level of alcohol consumption in Russia in the period from 1980 to 2015.

**Methods:** the calculation is based on a time series analysis using the autoregressive-integrated moving average (ARIMA) method using, as indicators of alcohol-related problems, the mortality rate from acute alcohol poisoning, the incidence of alcoholic psychosis and the level of violent mortality.

**Results:** the results of this study indicate sharp fluctuations in the aggregate level of alcohol consumption in Russia over the past decades, which were caused by changes in the level of availability of legal and illegal alcohol.

**Conclusions:** the presented data suggest that limiting the availability of alcohol is an effective measure in the arsenal of alcohol policy aimed at reducing the total level of alcohol consumption.

**Keywords:** alcohol consumption, estimation, Russia, 1980-2015.

### 1. INTRODUCTION

The level of alcohol consumption by the population is an important indicator of the alcohol situation in the country, since it largely determines the level of alcohol-related problems [1]. However, it is difficult to establish the real level of alcohol consumption, since part of the consumption comes from illegal sources [2]. Given the urgency of the problem, a number of researchers have attempted to assess the real level of alcohol consumption in Russia using indirect methods based on the dynamics of the level of indirect indicators of alcohol problems.

An attempt to dynamically estimate the aggregate level of consumption based on time series analysis using the autoregressive-integrated moving average (ARIMA) method using three indirect indicators of alcohol-related problems: the mortality rate from acute alcohol poisoning, mortality from external causes, and the incidence of alcoholic psychosis was made in one of the previous studies [3]. Further, the Swedish researcher T. Norstrom applied the indirect method developed by him, based on the analysis of time series using ARIMA, to estimate the level of alcohol consumption per capita aged 15 years and older in Russia for the period from 1990 to 1998. [4].

The calculation procedure consisted of several stages. First, an assessment was made of the

relationship between the dynamics of the level of alcohol consumption and the level of male mortality due to injuries and accidents in the period from 1959 to 1989. For this, the author used the estimates of the level of consumption by V. Treml (1959-1979) and A. Nemtsov (1980-1998). At the next stage, using the obtained coefficient, which reflects the relationship between the dependent and independent variables and the dynamics of male mortality due to injuries and accidents, the total level of alcohol consumption was calculated for the period from 1990 to 1998.

In a later study, A. Nemtsov and K. Shelygin estimated the total level of alcohol consumption in Russia in the period from 1956 to 2012 using the dynamics of the mortality rate from acute alcohol poisoning [5]. The basis for calculating consumption was the estimate of consumption in 1980–1992, which was obtained by averaging estimates from three independent sources: V. Treml for 1960–1992; Goskomstat for 1980–1989; A. Nemtsov for 1980–1992.

The first stage consisted in constructing an ARIMA model for the average level of alcohol consumption (l / person / year, dependent variable) according to the level of standardized mortality rates from alcohol poisoning. The model was built for the period 1980–1992 in order to determine the degree of association

between alcohol poisoning and alcohol consumption. At the second stage, on the basis of the mortality rates of men from alcohol poisoning, the resulting model was extrapolated for the period 1956–2012. Comparison of the results of assessing the overall level of alcohol consumption in Russia, obtained in three previous studies, showed their similarity, which indicates the sufficient reliability of the indirect assessment method using the ARIMA model [5].

The purpose of this study was to estimate the aggregate level of alcohol consumption in Russia during the period from 1980 to 2015.

## 2. MATERIALS AND METHODS

The aggregate level of alcohol consumption in Russia in the period from 1980 to 2015 was estimated using the ARIMA method based on the dynamics of the level of three indirect indicators of the level of alcohol-related problems - the mortality rate from acute alcohol poisoning, the incidence of alcohol psychosis, and the level of violent mortality. The level of indicators used (per 100.000 of population) is a reliable proxy indicator of alcohol-related problems in society, closely correlating with the level of alcohol consumption [6]. The level of alcohol consumption is presented in liters of absolute alcohol per capita. The level of unregistered alcohol consumption was calculated as the difference between the total level of alcohol consumption and the level of official sale. The source of all data used in this work is Rosstat.

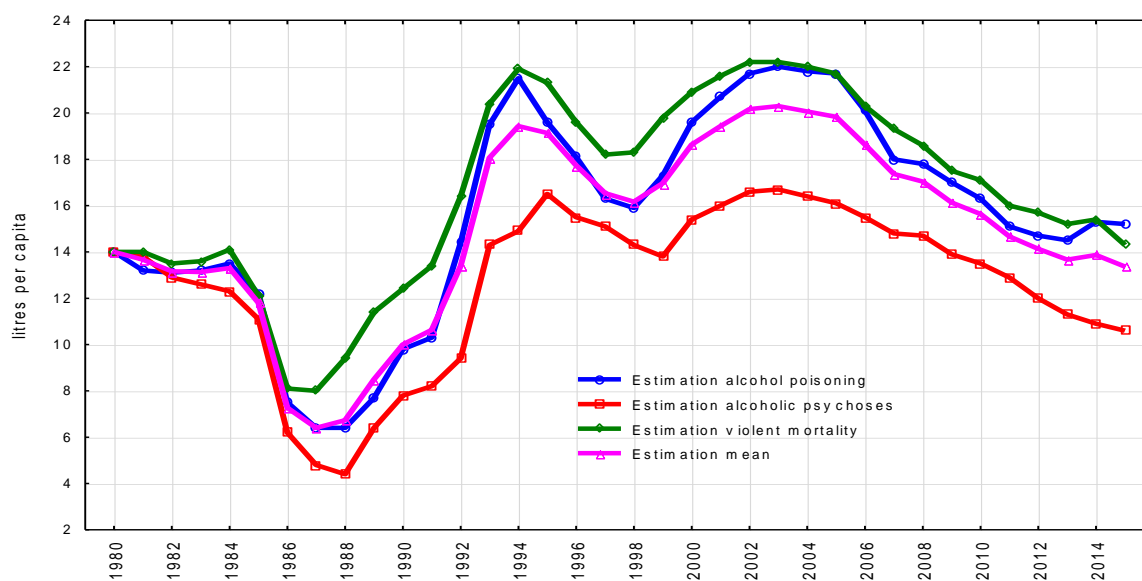
To assess the influence of the level of alcohol sales on the level of acute alcohol poisoning,

ARIMA was used, a model (0,1,0) with a logarithmic transformation of the dependent variable to ensure the stationarity of the time series. Statistical analysis was performed using the software package "Statistica 12. StatSoft".

## 3. RESULTS AND DISCUSSION

Figure 1 shows the dynamics of the aggregate level of alcohol consumption in Russia, calculated using three indirect indicators of the level of alcohol-related problems, as well as the dynamics of the overall level of alcohol consumption calculated using these indicators. The graphical data indicate that the highest estimated level of real alcohol consumption was obtained when using the level of violent mortality as an indicator of alcohol problems, and the lowest when using the incidence of alcohol psychosis.

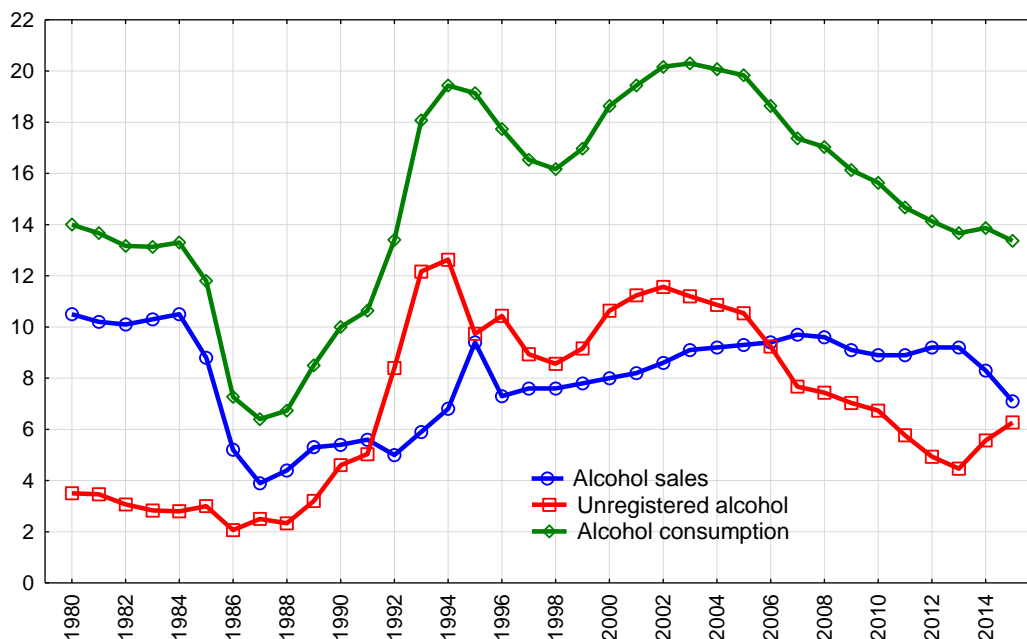
The results of the assessment showed that during the period under review, the total level of alcohol consumption was subject to significant fluctuations (Figure 1). This indicator fell sharply (by 2.1 times (from 13.3 to 6.4 liters) in the period from 1984 to 1987; it significantly increased (by 65.6% (from 6.4 to 10.6 liters) in period from 1987 to 1991; increased sharply (by 83.0% (from 10.6 to 19.4 liters) in the period from 1991 to 1994; significantly decreased (by 16.5% (from 19.4 to 16.2 liters) in the period from 1994 to 1998; significantly increased (by 25.3%) in the period from 1998 to 2003, reaching its peak (20.3 liters) for the entire period under consideration; after which it began to decrease.



**Figure 1.** The dynamics of the aggregate level of alcohol consumption, assessed using various indirect indicators of alcohol problems in the period from 1980 to 2015

The level of unregistered alcohol consumption increased significantly (by 2.2 times (from 2.3 to 5.0 liters) in the period from 1988 to 1991; it increased sharply (by 2.5 times (from 5.0 to 12.6 liters) ) in the period from 1991 to 1994; significantly decreased (by 31.7% (from 12.6 to 8.6 liters) in the period from 1994 to 1998;

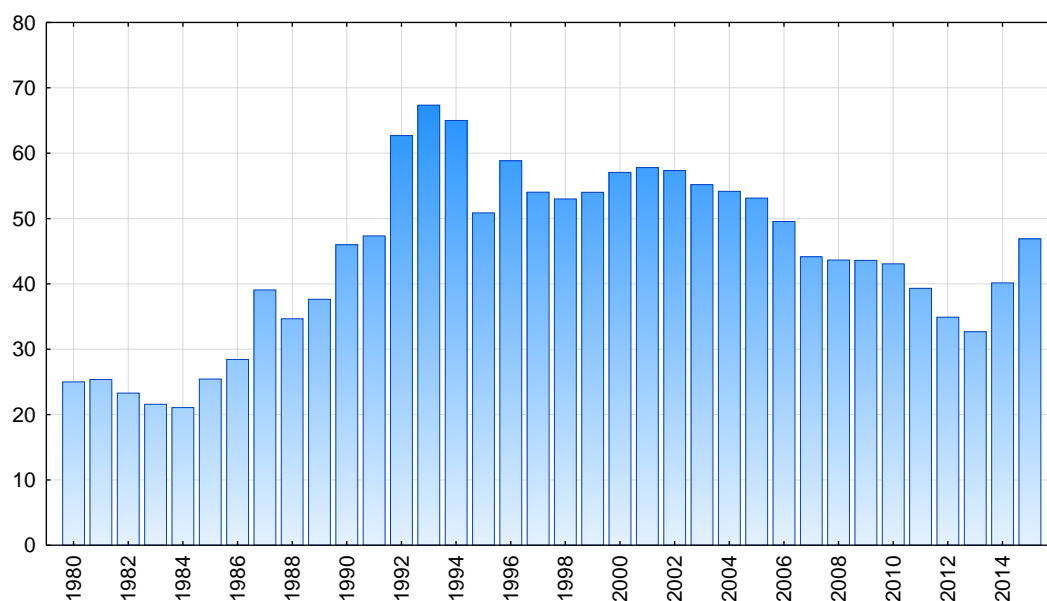
significantly increased (by 34.9% (from 8, 6 to 11.6 liters) in the period from 1998 to 2002; sharply decreased (2.6 times (from 11.6 to 4.5 liters) in the period from 2002 to 2013; then increased again (by 40 , 0% (from 4.5 to 6.3 liters) in the period from 2013 to 2015 (Figure 2).



**Figure 2.** Dynamics of the aggregate level of alcohol consumption, the level of alcohol sales, as well as the level of consumption of unregistered alcohol in Russia in the period from 1980 to 2015

The share of unregistered alcohol in the consumption structure during the period under review fluctuated significantly (Figure 3). The minimum level of this indicator was in 1984 (21.1%), and the maximum - in 1993 (67.3%). A significant increase (from 21.1 to 39.1%) of this indicator was noted in the period from 1984

to 1987. Having reached its peak in 1993, the share of unregistered alcohol began to decline, reaching in 2013 the minimum indicator for the entire post-Soviet period - 32.7%. However, in the last two years of the period under review, this indicator has grown significantly.



**Figure 3.** Dynamics of the share of unregistered alcohol in the structure of alcohol consumption in Russia in the period from 1980 to 2015

Analysis of the graphical data suggests that the dynamics of the levels of total alcohol consumption, consumption of unregistered alcohol and the share of unregistered alcohol in the consumption structure in the period under review was quite similar. This fact indicates that sharp fluctuations in the general level of alcohol consumption were mainly due to changes in the level of consumption of unregistered alcohol.

It is necessary to analyze the reasons for the sharp fluctuations in the total level of alcohol consumption in the period under review in the context of specific socio-economic and political events. It is obvious that the sharp decline in the aggregate level of alcohol consumption in the mid-1980s was associated with the limitation of the physical and economic availability of alcohol in the framework of the Gorbachev's anti-alcohol campaign [6]. The opposite situation took place in the early 1990s, when the abolition of the state alcohol monopoly led to a sharp increase in the availability of alcohol, primarily vodka [7]. The decline in the aggregate level of alcohol consumption after 2005, which occurred mainly due to a decrease in the level of consumption of unregistered alcohol, is associated with the adoption of anti-alcohol laws that strengthened control over the alcohol market, which led to a decrease in the physical and economic availability of alcohol [8, 9]. An alarming trend in the last few years of the period under review, requiring urgent targeted measures, is the increase in the level of consumption of unregistered alcohol.

Thus, the results of this study indicate sharp fluctuations in the total level of alcohol consumption in Russia over the past decades, due to changes in the level of availability of both recorded and unrecorded alcohol. The

presented data suggest that limiting the availability of alcohol is an effective measure in the arsenal of alcohol policy aimed at reducing the total level of alcohol consumption.

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**Citation:** Razvodovsky Y.E, *Estimation of the overall level of alcohol consumption in Russia*. *ARC Journal of Addiction*. 2020; 4(2): 39-42.

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