

## The Effect of Gorbachev's Anti-alcohol Campaign on Road Traffic Accidents Mortality in Belarus

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### Abstract

**Background:** The former Soviet republic Belarus has one of the highest road traffic fatality rates due to drunk driving, poor road conditions, and an out-dated vehicle fleet.

**Aim:** The aim of the present paper was to analyse the trends in BAC-positive and BAC-negative road traffic accidents mortality in Belarus in relation to aggregate-level alcohol consumption.

**Method:** Trends in aggregate alcohol consumption and BAC-positive and BAC-negative road traffic accidents mortality rates from 1979 to 2007 were analysed in order to assess bivariate relationship between the two time series.

**Results:** The outcome indicated statistically significant cross-correlation between alcohol consumption levels and number of BAC-positive fatal road traffic accidents at zero ( $r=0.42$ ;  $SE=0.20$ ) and at first lag ( $r=0.57$ ;  $SE=0.20$ ). At the same time, there was no relation between alcohol consumption level and BAC-negative fatal road traffic accidents.

**Conclusion:** This study suggests that the overall level of alcohol consumption is an important determinant of alcohol-related road traffic accidents mortality rates.

**Keywords:** Road traffic accidents mortality; Alcohol consumption; Time series analysis

### Introduction

Road traffic injuries are the eight leading cause of death globally, and the leading cause of death for children and young adults [1]. According to prognosis, the worldwide road traffic injuries rank among the causes of death will climb to the fifth place by 2030, resulting in an estimated 2.4 million fatalities each year [2]. It is estimated that in the European Union 1.3 million road traffic accidents occur each year, resulting in 1.7 million injuries and over 40,000 deaths annually [3]. The direct and indirect costs of these accidents sums up to 160 billion euro, equal to 2% of the gross national product of the EU [1].

Alcohol has been identified as one of the most significant risk factors for road traffic crashes in many developed and developing countries of the world [4]. Alcohol attributable fractions of the mortality from road traffic accidents vary widely from country to country. Babor and colleagues concluded that, in high income countries, around 20% of drivers fatally injured in road traffic accidents have a blood alcohol concentration (BAC) above the legal limit, with higher rates in low and middle-income countries [4]. According to the European Commission estimates 25% of all road deaths across the EU are alcohol-related [3].

Natural experiments, such as sudden and large changes in alcohol consumption level, provide an opportunity to test the efficacy of policy

attempts to reduce the rate of alcohol-related problems in the population. Gorbachev's anti-alcohol campaign in the former Soviet Union is the most well-known natural experiment in the field of alcohol policy [5]. In May 1985 Gorbachev launched the anti-alcohol campaign which was design to tackle alcohol-related problems in the Soviet Union by raising the price for vodka, restricting the sale by amount and time of day, closing vodka distilleries and destroying vineyards [6].

Gorbachev's anti-alcohol campaign did produce a number of positive effects, such as a decline in alcohol consumption, a drop in alcohol-related mortality including alcohol-related fatal road traffic accidents [5]. The campaign also precipitated a spike in the production of moonshine (samogon) and decline in state revenues, which fuelled inflation. For all these reasons, the campaign was formally abandoned in 1988 [6]. Thirty years later, speaking on the anniversary of the start of the anti-alcohol campaign, Gorbachev acknowledges that his campaign was a mistake, stressing that it should had been gradual and relentless.

The former Soviet republic Belarus ranks among the world's heaviest drinking countries with an annual official consumption rate more than 12 litres of pure alcohol per capita [7]. Belarus has one of the highest road traffic fatality rates due to drunk driving, poor road conditions, and an out-dated vehicle fleet [8]. Each year, approximately 2,000 Belarusians die in road accidents [8].

The aim of the present paper was to analyze the trends in BAC-positive and BAC-negative road traffic accidents mortality in Belarus between 1979 and 2007 in relation to aggregate-level alcohol

consumption. The underlying hypothesis is that alcohol-restricting policies during Gorbachev's anti-alcohol campaign could play a role in limiting alcohol-related road traffic accidents mortality.

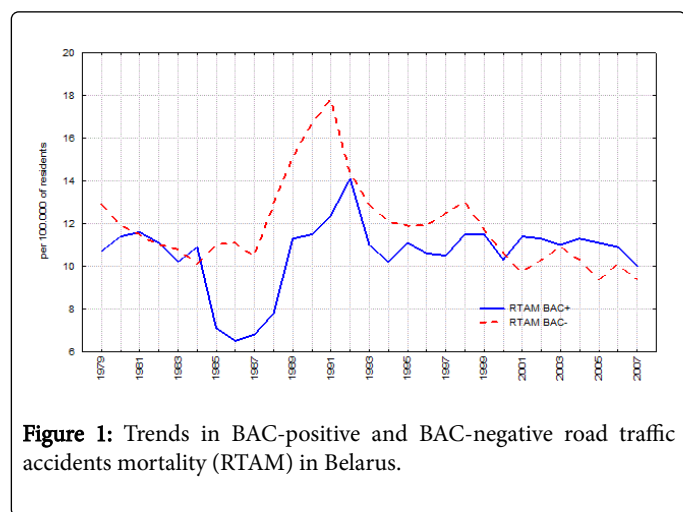
## Material and Methods

The data on road traffic accidents mortality used in this paper were based on autopsy reports from Bureau of Forensic Medicine. In Belarus, virtually all (99.1%) violent deaths undergo forensic autopsies, which include blood alcohol concentration (BAC) inspection. BAC in samples collected by forensic pathologists during the medical autopsies was assessed by gas chromatography and reported per million (0/00). BAC over 0.50/00 was termed 'inebriation' and denoted as 'BAC-positive'. The overall level of alcohol consumption in Belarus has been estimated using the indirect method [8].

The statistical analysis was performed using the package "Statistica". In order to reduce the risk of obtaining a spurious relation between two variables that have common trends, the trends should be removed by means of a differencing procedure:  $\nabla x_t = x_t - x_{t-1}$ . This means analyzing annual changes rather than raw data [9]. The process of removing systematic variation within time series prior to the examination of potential causal relationships is referred to as "prewhitening". A further step entails the inspection of the cross-correlation function in order to estimate the association between the two prewhitened time series. We used this method to estimate the relationship between the time series aggregate alcohol consumption and BAC-positive and BAC-negative road traffic accidents mortality rates in this paper.

## Results

In all 155616 deaths from traffic accidents were examined with respect to the autopsy reports between 1979 and 2007. Alcohol in blood was found in 36.9% victims of road traffic accidents mortality for the whole period, with the minimum figure 27.7% in 2007 and maximum 44.0% in 1996. The graphical evidence suggests that the temporal pattern of BAC-positive and BAC-negative road traffic accident deaths differ markedly (Figure 1).



**Figure 1:** Trends in BAC-positive and BAC-negative road traffic accidents mortality (RTAM) in Belarus.

In particular, alcohol-related road traffic accidents mortality was more affected by the restriction of alcohol availability during anti-alcohol campaign: Between 1984 and 1986 the number of BAC-positive road traffic accident deaths shrank by 40.4%, while the

number of BAC-negative deaths increased by 14.3%. Aggregate alcohol consumption fell by 49.2% between 1984 and 1986 (from 13.0-6.6 litres per capita). BAC-negative road traffic accidents mortality increased dramatically in the early 1990s reaching its peak in 1991, and then dropped sharply. There was also spike in the BAC-positive road traffic accidents mortality in 1992, and then it reverted to the pre-campaign level.

After pre-whitening the cross-correlations between alcohol consumption and fatal road traffic accidents time series were inspected. The outcome indicated statistically significant cross-correlation between alcohol consumption level and number of BAC-positive fatal road traffic accidents at zero ( $r=0.42$ ;  $SE=0.20$ ) and at first lag ( $r=0.57$ ;  $SE=0.20$ ). At the same time, there was no relation between alcohol consumption level and BAC-negative fatal road traffic accidents (Table 1).

Lag	BAC-positive		BAC-negative	
	r	SE	r	SE
-3	-0.290	0.213	-0.323	0.213
-2	-0.101	0.209	0.051	0.209
-1	-0.153	0.204	-0.063	0.204
0	0.421	0.200	-0.012	0.200
1	0.569	0.204	-0.018	0.204
2	0.055	0.209	0.217	0.209
3	0.233	0.213	0.212	0.213

**Table 1:** Effects of alcohol consumption per capita on road traffic accidents mortality rates in Belarus. The results of cross-correlation analysis between prewhitened time series.

## Discussion

This is the first study of the association between aggregate alcohol consumption and alcohol-related road traffic accidents mortality rates in Belarus. According to the results of present study there was a positive and statistically significant effect of per capita alcohol consumption on alcohol-related road traffic accidents mortality rates. Findings from this study add to those from prior studies of the association between alcohol consumption and alcohol-related road traffic accidents mortality [3,4,10].

It seems obvious that sudden decline in road traffic accidents mortality rates between 1984 and 1986 appears to be entirely due to anti-alcohol campaign that significantly reduced alcohol consumption by limiting its manufacture and availability [6]. Indeed, a reduction in the per capita consumption of alcohol by 49.2% between 1984 and 1986 was accompanied by a decrease in the number of BAC-positive fatal road traffic accidents by 40.4%.

The collapse of the former Soviet Union and the initial moves to establish a market economy resulted in the newly independent country experiencing a severe economic crisis [5]. Given the evidence that the number of road casualties is related to economic development [9] it would be logical to assume that downward trend in the BAC-negative road traffic accidents mortality in the 1990s is related to economic recession.

In conclusion, this study suggests that the overall level of alcohol consumption is an important determinant of alcohol-related road traffic accidents mortality rates. These findings indicate that alcohol-restricting policies could play a role in limiting alcohol-related road traffic accidents mortality in countries where rates of both alcohol consumption and traffic fatalities are high. However, alcohol-restricting policies may need to be accompanied by efforts to reduce unrecorded alcohol consumption.

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