

# Accesibilidad al alcohol y mortalidad relacionada con el alcohol en Bielorrusia

## Affordability of alcohol and alcohol-related mortality in Belarus

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### Resumen

El abuso del alcohol tiene numerosas consecuencias negativas tanto sociales como para la salud. La respuesta de los consumidores a los cambios en la accesibilidad al alcohol es un problema importante de los debates sobre políticas sobre el alcohol. Los estudios realizados en varios países han demostrado una relación inversa entre los precios del alcohol y el consumo de alcohol en la población. Existen, sin embargo, dudas acerca de si el aumento del precio de alcohol a través de impuestos puede tener un efecto notorio sobre los problemas relacionados con el alcohol, de los bebedores excesivos a largo plazo pesado. El objetivo del presente estudio fue evaluar la relación entre la accesibilidad al alcohol y las tasas de mortalidad relacionadas con dicha sustancia en la Bielorrusia post-soviética. Con este propósito las tendencias en las tasas de mortalidad relacionadas con el alcohol (mortalidad por cirrosis hepática, pancreatitis, alcoholismo y psicosis alcohol) se compararon con la accesibilidad al vodka entre 1990 y 2010. El análisis de series temporales reveló que un 1% de aumento en la accesibilidad del vodka se asocia con un aumento en la mortalidad por cirrosis hepática de 0,77%, un aumento en la mortalidad por pancreatitis del 0,53% y un aumento en la mortalidad por alcoholismo y por psicosis alcohólica del 0,70%. La principal conclusión de este estudio es que la accesibilidad al alcohol es uno de los más importantes predictores de problemas relacionados con el alcohol en una población. Estos resultados proporcionan evidencia adicional de que una disminución en la accesibilidad al alcohol es una estrategia efectiva para reducir el consumo de alcohol y los problemas relacionados.

**Palabras clave:** alcohol, accesibilidad, mortalidad relacionada con el alcohol, Bielorrusia.

### Abstract

Alcohol abuse has numerous adverse health and social consequences. The consumer response to changes in alcohol affordability is an important issue on alcohol policy debates. Studies from many countries have shown an inverse relationship between alcohol prices and alcohol consumption in the population. There are, however, suggestions that increasing the price of alcohol by rising taxes may have limited effect on alcohol-related problems, associated with long-term heavy drinking. The aim of the present study was to evaluate the relationship between alcohol affordability and alcohol-related mortality rates in post-Soviet Belarus. For this purpose trends in alcohol-related mortality rates (mortality from liver cirrhosis, pancreatitis, alcoholism and alcohol psychoses) and affordability of vodka between 1990 and 2010 were compared. The time series analysis revealed that 1% increase in vodka affordability is associated with an increase in liver cirrhosis mortality of 0,77%, an increase in pancreatitis mortality of 0.53%, an increase in mortality from alcoholism and alcohol psychoses of 0,70%. The major conclusion emerging from this study is that affordability of alcohol is one of the most important predictor of alcohol-related problems in a population. These findings provide additional evidence that decreasing in affordability of alcohol is an effective strategy for reducing alcohol consumption and alcohol-related harm.

**Key words:** alcohol, affordability, alcohol-related mortality, Belarus.

Alcohol makes a large contribution to the difference in mortality observed between the East and West parts of Europe (Bobak & Marmot, 1996; Anderson & Baumberg, 2006; Moskalewicz, Razvodovsky & Wieczorek, 2009). In particular, its effects on health seem to have been especially acute in the countries of the former Soviet Union where it has recently been identified as one of the most important factors underpinning the alarming rise in mortality that has occurred in the post-communist period (Rehm, Taylor & Patra, 2006; Stickley, Leinsalu, Andreew, Razvodovsky, Vagero, & McKee, 2007; Rehm, Sulkowska, Manczuk, Boffeta, Powles, Popova & Zatonski, 2007; Norström & Razvodovsky, 2010; Razvodovsky, 2012). Until 1991 Belarus (Byelorussia) was one of the republics of the Soviet Union and was among those republics with the highest levels of alcohol consumption per capita. Like a number of other former Soviet countries, Belarus has experienced a demographic crisis in the post-Soviet period. During recent decades, all-cause mortality in Belarus has risen from 10.7 per 100.000 in 1990 to 14.5 per 100.000 in 2010 (Razvodovsky, 2012). The combination of a falling birth rate in conjunction with a steeply climbing death rate resulted in a reduction of 707.700 people (i.e. 7%) in the population total between 1990 and 2011 (Razvodovsky, 2012). Indirect evidence suggests that binge drinking played a crucial role in the mortality crisis in the post-Soviet Belarus (Razvodovsky, 2012).

The level of alcohol consumption in Belarus is one of the highest in the world, with an annual per capita sales rate of 13.3 litres of pure alcohol per capita in 2011, while expert's estimates show a figure as high as 17 litres (Razvodovsky, 2012). The increase in the death rate in Belarus was accompanied by a rapid growth in sales of vodka, while the episodic heavy or binge drinking pattern of consumption strong spirits that is commonplace has also been linked to an increased level of alcohol-related mortality (Razvodovsky, 2000, 2003). As for indications of harmful drinking pattern, even though the market share of wine and beer has increased during recent years, vodka still account over 50% of pure alcohol consumption (Razvodovsky, 2012). The high level of alcohol consumption recorded in Belarus has been linked to a number of public health problems, including high alcohol-related mortality rate (Razvodovsky &, Stickley, 2007; Stickley & Razvodovsky, 2009).

Alcohol control policies in Belarus underwent dramatic changes during the latest tree decades, ranging from tough restrictions in the mid-1980s, to a liberalization of the alcohol policy after repealing alcohol monopoly, resulting in the dramatic increase in the affordability of alcohol following the collapse of the Soviet Union in 1991. The fall in the relative price of alcohol in the early 1990s have resulted from a sharp drop in the price of vodka relative to those of other goods as the government fails to tax alcohol effectively. Despite the fact that sharp growth in alcohol consumption was responsible for the mortality crisis in the early 1990s, alcohol control policy has been de-prioritized by the Belarusian government. The ruling regime focused their attention on economic problems and underestimated the scale of social and public health problems caused by excessive alcohol consumption. As

a growing public awareness of adverse health consequences of harmful drinking was arising, by the end of 1990s the authorities openly admitted that excessive mass drunkenness posed a series threat to society and multiple measures were adopted to strengthen government control of the alcohol market. The first major action to strengthen the alcohol policy since the early 1990s were introduction in June 1998 Law N. 193-3 "On State Regulation of the Production and Sale of Alcohol Products" defined the procedure for licensing the production, wholesale and retail trade, and import/export of alcohol. It also stipulated the establishment of quotas for the production, export, and import of alcohol products, as well as state regulation of alcohol prices. Several other pieces of legislation were adopted to regulate the alcohol market, including labeling policies, authenticity controls, and licensing stipulations. In addition to these legislative acts, in August 2000 a Counsel of Ministries of Belarus adopted a "National program of action against drunkenness and alcoholism for 2000-2005". It was a comprehensive alcohol policy document to coordinate actions against harmful alcohol consumption in Belarus. The main emphasis was placed upon education and public awareness on alcohol-related problems associated with harmful drinking. Alcohol policy has been strengthened in other areas as well, especially in tackling consumption of noncommercial alcohol. As part of the cross-sector work it was established a special task force (Interdisciplinary Council on Tackling Alcohol-Related Problems) that consist of specialists of different organizations.

Because alcohol abuse has numerous adverse health and social consequences, the consumer response to changes in alcohol affordability is an important issue of alcohol policy debates. Over the past several decades a numerous of papers have been published that examined the impact of the affordability of alcohol on alcohol consumption (Ornstein, 1980; Grossman, Coate & Arluck, 1987; Chaloupka, Saffer & Grossman, 1993; Chaloupka, Grossman & Saffer, 2002; Norstrom, 2005; Fogarty, 2006). Studies from many countries have shown an inverse relationship between alcohol prices and alcohol drinking and concluded that affordability of alcohol is one of the most important predictor of alcohol consumption in a population (Manning & Blumberg, 1995; Selvanathan & Selvanathan, 2005; Andrienko & Nemtsov, 2005; Trollidal & Ponicki, 2005; Rabinovich, Brutscher, Tiessen & Reding, 2009; Wagenaar, Salois & Komro, 2009; Osterberg, 2011; Hunt, Rabinovich & Baunberg, 2011).

Several studies evaluated the effects of changes in a price or taxes on various outcomes related to harmful alcohol consumption, including liver cirrhosis mortality, known to be specifically attributed to long-term alcohol abuse (Osterberg, 1995; Purshouse, Meier, Brennan, Taylor & Rafia, 2010). Although most of these studies indicate a consistent relationship between higher prices and lower cirrhosis mortality, there are substantial differences in the estimated elasticity which ranged from -0.001 to -0.90 (Chaloupka, Grossman & Saffer, 2002). Grossman et al. (1998) has concluded that a 10-percent increase in the price of alcohol would reduce cirrhosis mortality by 8.3 to 12.8%. A recent systematic review of studies examining the effects of alcohol

prices and taxes on alcohol-related morbidity and mortality yields meta-estimates  $-0.347$  for liver cirrhosis and other alcohol-related outcomes (Wagenaar, Todler & Komro, 2010). It was also suggested that doubling the alcohol taxes would reduce alcohol-related mortality by an average of 35%. Cook and Tauchen (1982) highlighted that increases in the excise taxes on distilled spirits would significantly reduce mortality from liver cirrhosis: a 1\$ increase in the distilled spirits tax was estimated to lower cirrhosis death rate by 5.4 to 10.8 percent. Similarly, Ponicki and Gruenewald (2006) reported that liver cirrhosis mortality rate was significantly related to taxes on distilled spirits, but not to taxation of wine and beer. The authors concluded that this is not an artifact given that the heavy drinkers prefer spirits as the lowest-cost form of ethanol. Collectively, this research evidence showed clearly that alcohol prices were significantly and inversely related to alcohol-related morbidity and mortality. There are, however, suggestions that increasing the price of alcohol by rising taxes may have limited effect on alcohol-related problems, associated with long-term heavy drinking, including liver cirrhosis mortality (Sloan, Reilly & Schenzler, 1994; Bielinska-Kwapisz & Mielecka-Kubien, 2011).

Against this background, it would be interesting to evaluate the relationship between alcohol affordability and alcohol-related mortality rates in post-Soviet Belarus. With this purpose trends in alcohol-related mortality rates (mortality from liver cirrhosis, pancreatitis, alcoholism and alcohol psychoses) and affordability of vodka between 1980 and 2010 were compared.

## Method

Alcohol is a risk factor for many diseases, however, aggregate-level studies has focused traditionally on such consequences of long-term alcohol abuse as mortality from liver cirrhosis, pancreatitis, alcoholism and alcoholic psychoses (Norström & Ramstedt, 2005). Liver cirrhosis mortality is a classical indicator of harmful drinking in a population (Rehm, et al., 2010). The findings from many countries, including countries of Eastern Europe suggest that population drinking and deaths rate from liver cirrhosis are positively related phenomena (Ramstedt, 2001; Razvodovsky, 2002). The number of liver cirrhosis deaths in Belarus is comparatively high and a large fraction (about 50%) of mortality is associated with heavy drinking (Razvodovsky, 2012). Excessive alcohol consumption is a major risk factor for acute and chronic pancreatitis (Norström & Ramstedt, 2005). Epidemiological evidence indicates that the relative risk of chronic pancreatitis increases in a linear fashion as a function of mean daily alcohol consumption (Corrao, Bagnardi, Zambone & Arico, 1999). Pancreatitis mortality rate is widely used as an indicator of alcohol-related problems in a population (Ramstedt, 2004). The rationale for using deaths from alcoholism and alcohol psychoses is obvious: mortality from these reasons is direct psycho-biological consequence of long-term excessive drinking (Corrao, et al., 1999).

The data on liver cirrhosis mortality (ICD-10 code K 70), pancreatitis mortality (ICD-10 codes K 85.2; K 86.0; K 86.1), alcoholism and alcohol psychoses mortality (ICD-10 codes F 10.0-F 10.1; F 10.3-F 10.9) rates per 100.000 of residents are taken from the national statistical agency. Here we specify the number of litres of vodka the average salary could buy as the affordability of alcohol. The data on average salary and price of vodka are taken from the national statistical agency. The fact that 60-70% of all alcohol in Belarus is consumed in the form of spirits (vodka) may justify that vodka affordability is a valid proxy for alcohol affordability in this country (Razvodovsky, 2012). To examine the relation between vodka affordability and alcohol-related mortality regression analysis was performed using the statistical package "Statistica".

## Results

During the last two decades, the level of recorded alcohol consumption in Belarus rose dramatically. Starting with a relatively low level of 5,7 litres of pure alcohol per capita in 1990, the level increased 2,2 times by 2010 when the official figures of consumption peaked at 12,3 litres. In the period from 1990 to 2010 the liver cirrhosis mortality rate in Belarus increased 4.9 times (from 6.6 to 32.0 per 10.000 of the population). The trends in affordability of vodka and liver cirrhosis mortality rate are displayed in Figure 1. As can be seen, there is linear upward trend in the two time series. A Spearman correlation analysis suggests a strong association between the two variables ( $r=0.90$ ;  $p<0.000$ ). Therefore, a linear regression model was applied in the further analysis. The relationship between the affordability of vodka and liver cirrhosis mortality is described by the linear regression equation  $y = 4,8 + 0,33*x$ , where  $y$  – liver cirrhosis mortality;  $x$  – affordability of vodka. The linear regression model describes 88% of the total dispersion of the dependent variable and is characterized by its high validity ( $p<0.000$ ). Consequently, we should expect that the increase in vodka affordability would result in the growth in the liver cirrhosis mortality rate. This case can be described by the elasticity coefficient which derived from the following equation:  $E = B_1 \cdot x / y = 0,72$  (which means a 0.77% increase in liver cirrhosis mortality rate following a 1% increase in affordability of vodka).

According to official statistics the pancreatitis mortality rate increased 3.2 times (from 20. to 6.29 per 10.000 of the population) in Belarus from 1990 to 2010. As can be seen from Figure 2, trends in the affordability of vodka and in the pancreatitis mortality rate follow each other across the 1990-2010 time series. A Spearman correlation analysis suggest the high degree of covariation between the two variables ( $r=0.83$ ;  $p<0.000$ ). The relationship between the affordability of vodka and the pancreatitis mortality rates is described by the linear regression equation  $y = 1.74 + 0.061*x$ . The linear regression model describes 80% of the total dispersion of the dependent variable and is characterized by its high validity ( $p<0.000$ ). The elasticity coefficient is 0.53 which means a

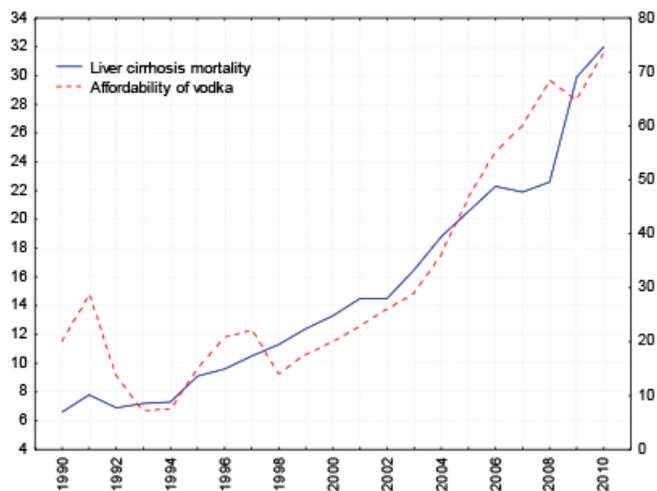


Figure 1. Trends in vodka affordability and liver cirrhosis mortality in Belarus between 1990 and 2010.

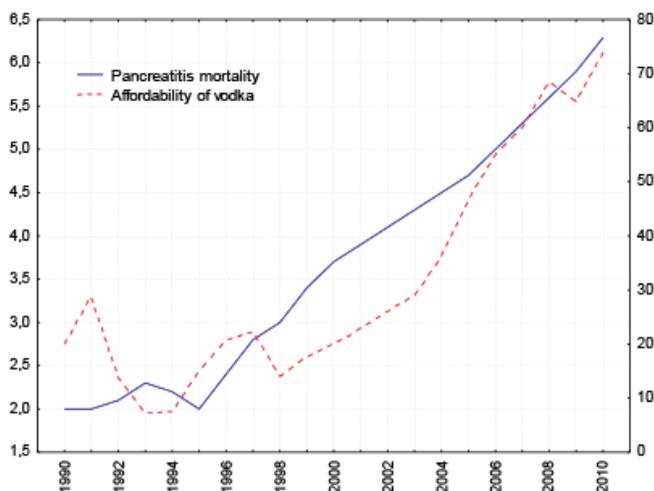


Figure 2. Trends in vodka affordability and pancreatitis mortality in Belarus between 1990 and 2010.

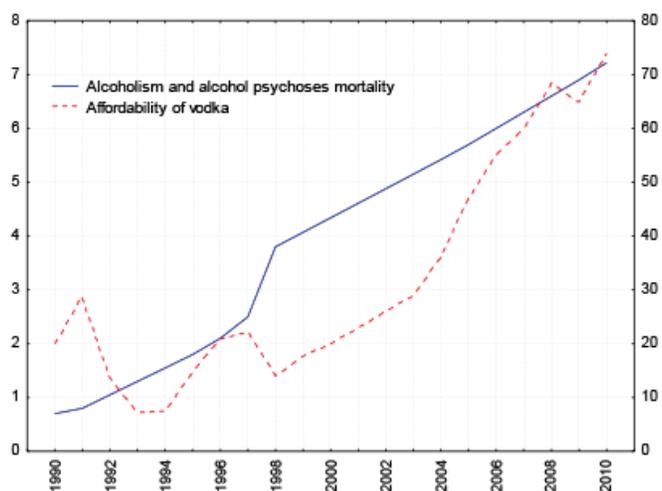


Figure 3. Trends in vodka affordability and mortality from alcoholism and alcohol psychoses in Belarus between 1990 and 2010.

0.53% increase in the prevalence of pancreatitis mortality rate following a 1% increase in affordability of vodka.

In the period from 1990 to 2010 the mortality rate from alcoholism and alcohol psychoses in Belarus increased 10.3 times (from 0.7 to 7.2 per 10,000 of the population). The graphical evidence suggests that the pattern for vodka affordability and alcohol sale in Belarus has been rather similar over time (Figure 3). A Spearman correlation analysis suggests a rather strong association between the two variables ( $r=0.84; p<0.000$ ). Therefore, a linear regression model was applied in the further analysis. The relationship between the affordability of vodka and pancreatitis mortality rate is described by the linear regression equation  $y = 1.18 + 0.086x$ . The linear regression model describes 70% of the total dispersion of the dependent variable and is characterized by its high validity ( $p<0.000$ ). The elasticity coefficient is 0.70 which means a 0.70% increase in the mortality from alcoholism and alcohol psychoses rate following a 1% increase in affordability of vodka.

## Discussion

In spite of extensive evidence that raising alcohol prices reduces alcohol consumption, the real price of alcoholic beverages is decreasing over the last decades in many countries, resulting in increases in the affordability of alcoholic beverages (Rabinovich et al., 2009; Gordon & Anderson, 2011). The affordability of alcohol in Belarus has increased significantly since the early 1990s: the average salary in 1993 could buy 7.3 litres of vodka compared with 73.9 litres in 2010. The increase in affordability of alcohol was driven mainly by an increase in real disposable income as average income rose faster than nominal alcohol prices and by changes in the relative price of alcohol. In the early 1990s vodka became much more affordable because of a dramatic drop in its relative price, when price liberalization caused most prices to soar, but the nominal price of vodka rose much more slowly. In recent decade the affordability of vodka surge one again, mostly because of the growth of real income as the economy recovered.

The results from time series analysis suggest a close aggregate-level association between alcohol affordability and liver cirrhosis mortality, pancreatitis mortality, alcoholism and alcohol psychoses mortality, and most important, replicate previous findings from other settings indicating that alcohol-related mortality is closely related to prices on distilled spirits (Gruenewald & Ponicki, 2006). Furthermore, these outcomes are in agreement to the regional-level findings by Treisman (2010) who reported negative association between regional crude death rates and vodka prices between 1993 and 2005 in neighboring Russia. He argues that it was purely the political populism which put limits to vodka prices and caused the increase consumption of vodka and alcohol-related mortality rates. It seems to be the case in post-Soviet Belarus, where the government is often blamed of stimulating consumption of "opium of the masses" as a source of stable revenue to the budget.

It should be emphasized that the results suggest a fairly quick response of alcohol-related mortality rates to changes in alcohol affordability. The instantaneous response in mortality rates from chronic alcohol-related diseases seem quite surprising when considering the long latency period at the individual level.

The reasonable explanation from this seeming inconsistency has been suggested by Norström and Skog (2001). They argue that in a population there exists a reservoir of heavy drinkers who are near the critical threshold-value for a dying from chronic alcohol-related consequences. In case when these high risk individuals increase alcohol consumption during a given year, they will exceed the threshold value and die from alcohol-related diseases. This is the reason why the immediate impact on chronic alcohol related mortality can be registered from marked changes in aggregate consumption.

It was suggested that there may be variations in the extent to which different population groups respond to changes in alcohol price (Coate & Grossman, 1988; Cook & Moore, 1993; Ponicki et al., 1997; Chaloupka, Grossman & Saffer, 2002; Fogarty, 2006; Elder et al., 2010). It is reasonable to assume that heavy drinkers might be particularly sensitive to reduction in affordability of alcohol because: (i) they consume nearly 80% of all alcohol, (ii) they spend a great amount of budget on alcohol, (iii) they usually have a low income. Indeed, some studies reported that heavy drinkers are sensitive to price changes (Meier et al., 2008; Meier, Purshouse & Brennan, 2009; Black, Gill & Chick, 2010). In the review of the studies that focused on the response of heavy drinkers to changes in price Wagenaar and colleagues (2010) concluded that heavy drinkers do modify their consumption behavior when prices change. The mean elasticity by across the studies included in the review was  $-0,28$ . In contrast, several authors reported that heavy drinkers may be unresponsive to price, or, at list, less responsive than moderate drinkers (Cook et al., 2011). The results from present analysis suggest a close aggregate-level link between vodka affordability and alcohol-related mortality and support the idea that low affordability of alcohol is associated with reduction in binge drinking and that the effect of pricing policy would be greater on harmful drinkers.

Before concluding, it is necessary to address some potential limitations of the study that may have affected the outcome. In particular, it must be recognized that unrecorded alcohol comprises a considerable portion of overall alcohol consumption in Belarus (Razvodovsky, 2008). Substantial cuts in production and sales, combined with increase in prices of alcoholic beverages during the anti-alcohol campaign, resulted in the growth of samogon consumption (Razvodovsky, 2008). The same is true for the transitional period after the collapse of the Soviet Union. Following the repeal of the state alcohol monopoly in 1992, the alcohol market became highly fragmented, and the country was flooded by a wave of homemade, counterfeit and imported alcohol of low quality (Razvodovsky, 2012). According to experts' estimates, in 1990s the level of undocumented alcohol consumption was comparable to the level of recorded consumption (Razvodovsky, 2008). After reaching its peak in 1997, the level of unrecorded alcohol consumption declined gradually,

which was associated with the increase in government control over the illicit market (Razvodovsky, 2012). Another reason of decreasing consumption of non-commercial alcohol in Belarus in the recent years might be a rising individual income as it was highlighted that high income results in lower consumption of samogon (Andrienko & Nemtsov, 2005). An estimated level of undocumented alcohol consumption in 2010 was 3,3 litres per capita (26,8 % of official sale or 21,2 % of total consumption) (Razvodovsky, 2012).

Further, it is important to acknowledge that alcohol affordability is just one factor that may affect alcohol consumption and alcohol-related harm and that may be the multiple confounders in this association including social and cultural variables. In particular, high prevalence of viral hepatitis in Belarus, explained by increasing injecting drug users' population may be potential reason of growing number of liver cirrhosis deaths (Razvodovsky, Vinitzkaya & Lelevitz, 2011). The current analysis also does not take into account surrogate alcohol, which may have more detrimental effects on health as its consumption has been linked to considerable liver damage (McKee et al., 2005). The potential problem with the influence of confounding factors is clearly illustrated by the Hungarian case, a country where both per capita consumption and liver cirrhosis mortality are high, but where is no a statistically significant aggregate-level association between these variables (Ramstedt, 2001). Some experts even argue that the very high liver cirrhosis mortality rate in this country may be linked with consumption of homemade spirits which contain hepatotoxic aliphatic alcohols (Szucs et al., 2005). Therefore, additional confounding variables which may relate to alcohol-related mortality (availability of treatment, prevalence of virus hepatitis, nutritional factors) should be included into analysis.

The results from this study suggest positive, statistically significant aggregate-level association between vodka affordability and three indicators of alcohol-related harm: liver cirrhosis mortality, pancreatitis mortality and mortality from alcoholism and alcohol psychoses. More specifically, the time series analysis revealed that 1% increase in vodka affordability is associated with an increase in liver cirrhosis mortality of 0,77%, an increase in pancreatitis mortality of 0.53%, an increase in mortality from alcoholism and alcohol psychoses of 0,70%. These outcomes are consistent with previous findings suggesting a significant association between alcohol affordability and alcohol-related mortality. The major conclusion emerging from this study is that affordability of alcohol is one of the most important predictor of alcohol-related problems in a population. These findings provide additional evidence that decreasing in affordability of alcohol is an effective strategy for reducing alcohol consumption and alcohol-related harm. The main reason for the growth of alcohol-related mortality in Belarus during the recent decades was the liberalization of the alcohol policy and increase in the affordability of alcohol. Hence, to prevent a further growth of alcohol affordability, increases of alcohol prices seems to be one of the priority options of alcohol control policy in Belarus. It should be emphasized, however, that any attempt to decrease of alcohol affordability requires a degree of flexibility to tackle the problem of noncommercial alcohol. Other policy

options include the reduction of the density of alcohol outlets, advertising ban that span all types of alcoholic beverages, separating of alcoholic beverages from other goods in retail stores and implementation of brief intervention in primary health care. It seems clear that all of these policy options should be implemented, because without a comprehensive alcohol policy the rate of alcohol-related problems in Belarus will grow further.

### Conflict of interest

None declared

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