

EPIDEMIOLOGY

Alcohol-Related Injuries and Alcohol Control Policy in Lithuania: Effect of the Year of Sobriety, 2008

Skirmante Sauliune*, Jadvyga Petrauskiene and Ramune Kalediene

Department of Health Management, Faculty of Public Health, Lithuanian University of Health Sciences, A. Mickeviciaus str. 9, LT-44307 Kaunas, Lithuania

*Corresponding author: Tel.: +370-687-24996; Fax: +370-37-327325; E-mail: smante@centras.lt

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Abstract — Aims: To evaluate the changes in mortality and the years of potential life lost (YPLL) due to alcohol-related injuries, as well as the impact of alcohol-related injuries on life expectancy during the period of the implementation of comprehensive alcohol control policy in Lithuania. **Methods:** Data on deaths from injuries (ICD-10 codes V01-Y98) of the able-bodied population (aged 15–64 years) during 2006–2009 were obtained from the Lithuanian Department of Statistics. Age-standardized rates of alcohol-related mortality and YPLL per 100,000 population due to injuries and the impact of alcohol-related injuries on life expectancy were calculated. The results of forensic autopsies were the basis for the alcohol-attributable fraction. **Results:** The age-standardized YPLL/100,000 of the able-bodied population due to alcohol-related injuries was 2285.6 (4067.5 for males and 573.6 for females) in 2009. In 2009, YPLL/100,000 due to alcohol-related injuries declined by 16.3%, while due to alcohol-related traffic accidents by 51.2% when compared with 2006. However, YPLL/100,000 due to alcohol-related suicides increased among males. A 15 to 64-year-old decedent lost an average of 21.2 years of life due to alcohol-related injuries (21.6 years on average per male and 19.1 per female). The impact of alcohol-related injuries on life expectancy decreased from 1.14 years (1.86 for males and 0.34 for females) in 2006 to 0.97 years (1.62 for males and 0.26 for females) in 2009. **Conclusion:** The positive changes in YPLL due to alcohol-related injuries and the impact of alcohol-related injuries on life expectancy indicate successful implementation of evidence-based alcohol control measures.

INTRODUCTION

One of the major factors associated with the burden of premature deaths and avoidable diseases globally is alcohol consumption; and alcohol consumption can respond strongly to control measures. Alcohol use is causally linked with over 60 disease or trauma types and with numerous social or other problems in a population (Rehm *et al.*, 2003). It causes roughly 4% of all deaths and 5% of the burden of disease worldwide affecting younger age groups most, mainly due to injuries caused by alcohol (Rehm *et al.*, 2009). Alcohol-related mortality can be divided into two large groups: mortality from alcohol-related diseases (natural causes) and mortality from alcohol-related injuries or adverse effects (external causes) (Oyen *et al.*, 2007). This paper focuses on alcohol-related injury deaths, particularly traffic accidents and suicides, the most common types of injuries. Injuries are the third leading cause of death, and under age 45, the leading cause of death in Lithuania (Health of the Lithuanian population and health care activity in 2006, 2007). Mortality from external causes, especially from traffic accidents and suicides, is substantially higher in Lithuania than it is in other countries of Europe (WHO, European Health for All Database—HFA-DB, 2008). Thereby this grave public health problem requires special attention by investigating possible causes, including the detrimental effects of alcohol use.

That an increase in male accident mortality accompanies a 1 l increase in per capita alcohol consumption has been well established. Such an increase in male mortality is four times larger than it is in female mortality, and this ratio is fairly stable across drinking cultures (Skog, 2001). The most notable rises in alcohol-related morbidity and mortality of the Lithuanian population were registered in 2001 and 2005. The greatest influence for such trends was the uncontrolled increase in alcohol consumption over the last decade (Grabauskas *et al.*, 2009). The amount of officially recorded

pure alcohol consumption rose from 9.3 l per capita in 1999 to 14.3 l per capita in 2007. Since then, alcohol consumption started to decline and, in 2009, it fell to 10.8 l per capita (Lithuanian Department of Statistics).

The Lithuanian Health Programme (1998) stated that a 25% reduction of alcohol consumption by 2010 was its main strategy relevant to alcohol control. Notwithstanding, economic and commercial arguments in the decision-making process were counteracting implementation of a balanced health policy in the country; thereby the health interests of the Lithuanian population were neglected (Grabauskas *et al.*, 2009). Several obstacles stood in the way of successful implementation of the alcohol control policy in Lithuania prior to 2007. For one, the alcohol control law changed several times, liberalizing alcohol control. Nevertheless, problems related to alcohol consumption were increasing, which raised awareness both among health politicians and in the society-at-large. One step was to declare 2008 as the Year of Sobriety. Most of the positive changes appeared in the State's alcohol policy in 2007–2008. Advertising of alcohol was strictly regulated despite the great opposition by the alcohol industry. Additionally, other decisions included the lessening of alcohol accessibility by the public, controlling drunk driving, curtailing illegal alcohol imports and sales and other measures. Excise taxes on alcohol increased (~20% for strong alcohol drinks and ~10% for low alcohol drinks), and time limits restricted alcohol sales. Non-governmental organizations (NGOs) took a proactive part in the campaign against alcohol. The Baltic Tobacco and Alcohol Control Coalition, which unites Estonian, Latvian and Lithuanian NGOs, were founded in November of 2008 (Veryga, 2009a).

The aim of the study

To evaluate the changes in mortality and the years of potential life lost (YPLL) due to alcohol-related injuries, as well

as the impact of alcohol-related injuries on life expectancy during the period of the implementation of comprehensive alcohol control policy in Lithuania.

METHODS

The analyses for this study were based on data for the entire country. The 2006–2009 computerized database of the Lithuanian Department of Statistics provided information on deaths where injuries are recorded as the underlying cause (for males and females separately as well as for the total population). Records of all established cases of injuries (ICD-10 codes V01–Y99) served as the basis for this study. Traffic accidents (ICD-10 codes V01–V99) and suicides (ICD-10 codes X60–X84) taken separately received special attention, since these are the most common external causes of death in Lithuania. Only individuals aged 15–64 years were included in this study because alcohol consumption is rather rare in younger ages. Furthermore, the social significance of alcohol-related injury deaths can be best captured by investigating the able-bodied population.

The impact of alcohol-related injuries on the life expectancy of the population aged 15–64 years was calculated using cause-elimination life tables. YPLL of the population aged 15–64 years were estimated by the application of following formula (Gardner and Sanborn, 1990):

$$YPLL = \sum_{i=0}^{65} d_i(65 - i),$$

where d_i is the number of deaths in the age group i and i the age at death.

Three types of YPLL rates were calculated: (a) YPLL due to alcohol-related injuries in absolute numbers, (b) age-standardized (using European standard population) rates of YPLL per 100,000 population due to alcohol-related injuries and (c) average number of YPLL per decedent and its 95% confidence intervals (CIs) due to alcohol-related injuries. YPLL were calculated for all injuries in total, and then traffic accidents and suicides were separated out. YPLL due to all alcohol-related injuries were calculated summarizing YPLL due to all single types of injuries, which are presented in Table 1.

Alcohol-related YPLL due to all major types of injuries were estimated using the alcohol-attributable fraction (AAF), which was based on the results of the study conducted on Lithuanian forensic autopsies performed during 2003–2005 (Benošis and Žukauskas, 2008). Meanwhile, AAF for other injuries was approximated according to alcohol-related deaths from all injuries during 1985–2008 (Benošis, 2010) (Table 1). According to the Code of Criminal Procedure of Lithuania, forensic autopsies are regularly performed in every case of an external cause of death. This includes a measurement of blood alcohol concentration. Forensic autopsies were not performed on merely 0.1–0.5% of the decedents due to different types of injuries in Lithuania. However, ~10% of the autopsies were performed after a longer period after death when a measurement of blood alcohol concentration was inappropriate. Alcohol intoxication was taken into consideration in cases where blood alcohol concentration was above 0.04%. An estimated 60% of all forensic autopsy cases conducted on persons aged 15–64 years with alcohol intoxication showed severe alcohol intoxication, with the blood alcohol concentration above 0.25% (Benošis, 2004).

RESULTS

There were 4131 cases of death due to all types of injuries registered among the population aged 15–64 years in 2006 (males—3358 or 81.3% and females—773 or 18.7%) in Lithuania, a country with a population of 3.3 million. Of these deaths, 3078 were due to alcohol-related injuries (males—2595 and females—483). In 2009, there were 3206 registered cases of death due to injuries (males—2668 or 83.2% and females—38 or 16.8%). Of these 2495 (males—2141 and females—354) were alcohol-related injury deaths.

Age-standardized mortality rates from all injuries, including those from alcohol-related injuries, for the 15–64-year-old population declined both among males and among females throughout 2006–2009 (Table 2). Mortality from traffic accidents displayed the most notable decline. However, suicide rates had a tendency to increase among males while, among females, it remained rather stable.

An analysis and presentation of YPLL, especially for the able-bodied population, can well illustrate the burden of alcohol-related injury mortality for the society. The 15–64-year-old population of Lithuania had 64,548 YPLL

Table 1. AAFs for external causes of death of the 15- to 64-year-old Lithuanian population

ICD-10 code	Cause of death	Alcohol-attributable fraction		
		Males	Females	All
V01–V99	Traffic accidents	0.622	0.522	0.604
W65–W74	Drowning	0.798	0.852	0.809
X00–X09	Fires	0.889	0.750	0.878
X31	Freezing	0.726	0.726	0.726
X45	Accidental alcohol poisoning	1	1	1
X60–X84	Self-inflicted injuries	0.676	0.374	0.629
X85–Y09	Homicides	0.710	0.667	0.698
Y15	Ethanol and methanol toxicity, undetermined intent	1	1	1
W20–W64 W75–W99 X10–X30 X32–X44 X46–X59 Y10–Y14 Y16–Y89	Other injuries	0.619	0.502	0.565

Table 2. Age-standardized mortality from injuries of 15- to 64-year-old Lithuanian population

Cause of death	Year	Males		Females		All	
		Mortality/ 100,000	Alcohol-related mortality/ 100,00	Mortality/ 100,000	Alcohol-related mortality/ 100,00	Mortality/ 100,000	Alcohol-related mortality/ 100,00
All injuries	2006	314.2	231.5	64.6	40.3	182.0	132.7
	2007	313.8	220.7	59.2	60.3	179.5	121.4
	2008	285.4	192.8	58.2	36.1	165.4	111.9
	2009	248.1	192.0	44.9	29.8	140.8	108.4
Traffic accidents	2006	49.8	30.9	14.3	18.7	31.4	18.7
	2007	50.9	31.6	11.0	18.2	30.3	18.2
	2008	33.5	20.8	8.4	12.3	20.5	12.3
	2009	26.9	16.6	5.3	9.5	15.7	9.5
Suicides	2006	64.2	41.9	10.8	3.9	36.1	22.3
	2007	65.5	42.9	8.8	3.3	35.8	22.5
	2008	71.5	47.6	10.6	3.9	39.8	25.1
	2009	73.4	48.6	10.3	3.9	40.3	25.5

Table 3. Age-standardized YPLL of 15- to 64-year-old Lithuanian population due to alcohol-related injuries

Cause of death	Year	YPLL/100,000		
		Males	Females	All
All injuries	2006	4869.6	779.2	2772.5
	2007	4524.3	671.8	2554.3
	2008	3999.9	646.1	2284.9
	2009	4067.5	573.6	2285.6
Traffic accidents	2006	826.1	197.6	509.9
	2007	834.7	144.1	487.5
	2008	550.3	111.1	329.8
	2009	425.4	74.1	248.6
Suicides	2006	932.5	83.3	498.9
	2007	1011.3	72.4	534.8
	2008	1133.8	88.7	603.9
	2009	1092.0	85.8	580.2

(males—55,264 and females—9284) due to alcohol-related injuries in 2006. YPLL due to alcohol-related injuries of the 15–64-year-old Lithuanian population declined in 2009 to 52,972 years (males—46,208 and females—6764). The age-standardized YPLL/100,000 due to alcohol-related injuries for the able-bodied population was 2772.5 in 2006 (Table 3). A remarkable decline of 16.3% in YPLL/100,000 was estimated throughout the study period, and it reached 2285.6/100,000 in 2009. Alcohol-related traffic accidents showed the most considerable decline (by 51.2%) in YPLL/100,000. However, YPLL/100,000 due to alcohol-related suicides showed a tendency to increase by 16.3% (among males while, among females, it remained rather stable). The age-standardized rate of YPLL/100,000 due to alcohol-related injuries differed by gender. Differences were estimated for all alcohol-related injuries, as well as for the two major external causes of death—traffic accidents and suicides. The YPLL/100,000 among males was seven times higher than it was among females for all alcohol-related injuries, nearly six times for alcohol-related traffic accidents and nearly 13 times higher for alcohol-related suicides in 2009.

The further analysis undertaken was to identify the average number of YPLL lost by one decedent (aged between 15 and 64 years) due to alcohol-related injuries

(Table 4). The estimate was that, on average, one decedent lost 21.2 years of potential life due to alcohol-related injuries in Lithuania in 2009. The highest estimated number of YPLL per decedent was for alcohol-related traffic accidents. The reason is that the population of Lithuania tends to die from alcohol-related traffic accidents at a young age, which increased the number of YPLL. On average a male lost more years of potential life than a female due to alcohol-related injuries. However, there was no change in the average number of YPLL per decedent during the study period.

The analysis revealed that alcohol-related fatal injuries shortened the life expectancy of the 15- to 64-year-old population of Lithuania by ~1.14 years in 2006 (Table 5). Alcohol-related injuries shortened life expectancy for males more than for females. The impact of alcohol-related injuries on life expectancy declined over the study period and, in 2009, such injuries shortened the life expectancy of the 15- to 64-year-old population by 0.97 years.

DISCUSSION

Several methodological issues must be noted. Only part of the specific causes of death related to alcohol consumption, such as alcohol poisoning, can be wholly attributed to alcohol. Alcohol is just one potential cause of many other health outcomes, including injuries. Therefore, AAF must be applied to assess the impact of alcohol on mortality. Literature provides quite rough AAFs mainly based on models from Western countries, which can differ significantly from the real situation in Lithuania. Therefore, the results of Lithuanian forensic autopsies provide the basis for the evaluation of the AAF for this study. It is important to note that an underestimate of AAF based on forensic autopsies could be possible due to cases that were not included, when a forensic autopsy was not performed and when the blood alcohol level was not evaluated because too long time had elapsed between death and autopsy. Furthermore, certain cases for example, when a drunk driver kills a sober pedestrian, were not included in the study. On the other hand, as for all non-experimental research, the issue of causality remains unresolved: a discussion is only possible if the

Table 4. Average number of YPLL of one decedent (15- to 64-year-old) due to alcohol-related injuries in Lithuania

Cause of death	Year	YPLL (95% CI) lost by one decedent		
		Males	Females	All
All injuries	2006	21.29 (21.27; 21.31)	19.22 (19.10; 19.34)	20.97 (20.95; 20.99)
	2007	21.74 (21.72; 21.76)	18.31 (18.17; 18.45)	21.20 (21.18; 21.22)
	2008	21.03 (20.99; 21.07)	18.07 (17.93; 18.21)	20.54 (20.52; 20.56)
	2009	21.58 (21.56; 21.60)	19.13 (19.01; 19.25)	21.23 (21.21; 21.25)
Traffic accidents	2006	28.13 (27.97; 28.29)	26.56 (26.02; 27.10)	27.81 (27.69; 27.93)
	2007	27.84 (27.68; 28.00)	25.06 (24.36; 25.76)	27.39 (27.25; 27.53)
	2008	27.77 (27.53; 28.01)	25.48 (24.58; 26.38)	27.35 (27.15; 27.55)
	2009	26.84 (26.68; 27.00)	26.57 (26.04; 27.10)	26.80 (26.68; 26.92)
Suicides	2006	22.85 (22.71; 22.99)	20.58 (19.82; 21.34)	22.64 (22.52; 22.76)
	2007	24.17 (24.05; 24.29)	21.73 (20.83; 22.63)	23.98 (23.86; 24.10)
	2008	24.59 (24.47; 24.71)	22.29 (21.43; 23.05)	24.40 (24.30; 24.50)
	2009	23.10 (22.96; 23.24)	21.98 (21.25; 22.70)	23.01 (22.89; 23.13)

Table 5. The impact of injuries and alcohol-related injuries on life expectancy for the 15- to 64-year-old Lithuanian population

Year	Years of life expectancy lost					
	Males		Females		All	
	All injuries	Alcohol-related injuries	All injuries	Alcohol-related injuries	All injuries	Alcohol-related injuries
2006	2.41	1.86	0.56	0.34	1.53	1.14
2007	2.48	1.70	0.48	0.29	1.54	1.04
2008	2.23	1.54	0.48	0.28	1.40	0.94
2009	2.03	1.62	0.39	0.26	1.24	0.97
Change (%) during 2006–2009	–16%	–13%	–30%	–24%	–19%	–15%

factor associated with a fatality was alcohol intoxication prior to death in all cases.

It has been shown that the volume of consumption as well as the patterns of drinking, especially irregular bouts of heavy drinking, determine fatal injuries (Cherpitel, 1993). The relationship of alcohol consumption and injury mortality is strongest in the cultures of northern Europe with traditions of drinking spirits and weakest in the wine cultures of southern Europe (Skog, 2001). The drinking pattern in Lithuania, binge drinking and a high rate of consuming low-quality home-distilled spirits, explains the high rates of alcohol-related injuries as well as contributing to the demographic and social inequalities in alcohol-related injury mortality. Inequalities in mortality of the population aged 30–74 years strongly relate to the prevalence of smoking and alcohol abuse in the European region (Mackenbach *et al.*, 2007). Excessive alcohol consumption can explain the mortality differences of 20% between the males and 5% between the females of Eastern and Western European countries (Rehm *et al.*, 2007). The study by Skog (2001) conducted in 14 European countries disclosed that 45% of all accidental deaths among 15- to 69-year-old males are alcohol-related in northern Europe, 40% in southern Europe and 35% in central Europe. In Lithuania, according to forensic autopsies data, the proportion of alcohol-related injuries was lowest in 1987–1988 at around 46%, whereas in 1985, it had been 54.4%. The fact obviously demonstrates the effectiveness of the Gorbachev's 1985–1987 anti-alcohol campaign in the former USSR. Prices of alcohol were raised, and their sales were restricted in amount and time of the day. People who

were caught drunk either at work or in public places were prosecuted (Benošis, 2004). However, in 2005, alcohol-related injuries comprised 64.2% and they declined only to 59.8% in 2008 (Benošis, 2010).

The evidence shows that policies regulating the alcohol marketing environment (particularly its price, availability and advertising) are highly effective in reducing alcohol-related harm (Anderson *et al.*, 2009). School-based education does not reduce alcohol-related harm, although public information and education-type programs do play a role in providing information and in increasing attention and acceptance of political and public agendas on alcohol (Anderson *et al.*, 2009). The major policy developments and implementations during 2007–2009 in Lithuania involved various measures: banning daytime TV and radio commercials of alcohol from 6 a.m. till 11 p.m., raising the excise tax on alcohol, eliminating tax reductions for small brewers and cider makers, reducing the selling time for alcohol by prohibiting sales from 10 p.m. till 8 a.m., introducing stricter control of drunk driving and others. Another effort was naming 2008 the Year of Sobriety and promoting it by all available means. [Indeed, alcohol advertisements and alcohol sales from kiosks will be completely banned in 2012 (Alcohol control legislation)]. The recorded amount of pure alcohol consumption has declined in Lithuania in recent years (Lithuanian Department of Statistics). The results of this study suggest that alcohol plays a very substantial role in traffic accidents—YPLL due to alcohol-related traffic accidents declined during the policy development period of alcohol control in Lithuania. During the period of 2006–2009, the absolute number of traffic

accidents, number of injured persons and number of traffic accident deaths involving alcohol declined by more than two times (Lithuanian Department of Statistics), and the age-standardized mortality rate from traffic accidents declined from 23.5/100,000 in 2006 to 11.4/100,000 in 2009 in Lithuania (WHO, European Health for All Database—HFA-DB, 2008). The consequences for drunk driving in 2008 were an increased fine as well as confiscation of the driving license. Additionally, this 2008 law authorized confiscation of the vehicle (~800 cars are confiscated each year) and even administrative arrests. Permissible alcohol concentration in the blood of novice drivers went down from 0.04 to 0.02% (Veryga et al., 2009b).

Nonetheless, the results of this study disclosed an increase in YPLL due to alcohol-related suicides despite the successful implementation of the anti-alcohol policy in Lithuania. Furthermore, the suicide rate tended to increase during 2006–2009 and it remained among the highest in Europe (31.5/100,000 in 2009) (WHO, European Health for All Database – HFA-DB, 2008). Multiple socio-cultural and environmental factors influence suicide rates; therefore epidemiological studies from different countries on the association between alcohol use and suicide provide quite inconsistent results. The association between alcohol consumption and suicide rates has been analyzed in 13 nations of the world; in 10 of the 13, suicide rates positively associated with per capita consumption of alcohol (Lester, 2000). Previous studies by the Wassermann–Värnik research group focused on a sharp decrease in suicide rates in the former USSR during the initial years of Gorbachev's *perestroika* (restructuring) from 1985, when a major anti-alcohol campaign started (Värnik et al., 1998a). The measures put in operation during *perestroika* helped to achieve drops in the suicide rates by ~40% for males and 18% for females in the Slavic and Baltic regions from 1984 to 1986–1988 (Värnik et al., 1998b). However, the suicide rate in Hungary declined by >30% during 1984–1998, and this happened despite a 25% rise in alcohol dependence rates and a 6-fold increase in unemployment (Rihmer et al., 2001). Meanwhile, Portugal has a fairly low suicide rate and, at the same time, its per capita alcohol consumption is among the highest in Europe (Lester, 1995). One suggestion is that Lithuania's increasing YPLL due to alcohol-related suicide might be affected by the economic recession and large rises in unemployment followed by increased psychological distress and alcohol abuse among depressed persons, which did not reflect the reduced alcohol availability and anti-alcohol campaign. Our hypothesis could be supported by the evidence from 26 European Union countries (1970–2007) suggesting that, for every 1% increase in unemployment, there is an 0.79% rise in suicides at ages younger than 65 years. Furthermore, unemployment also significantly associates with deaths from alcohol abuse (Stuckler et al., 2009).

Lately, promising changes are being observed in the field of accidents related to alcohol use. Nevertheless, the development and implementation of the alcohol policy in Lithuania might face a considerably difficult process associated mainly with resistance by the alcohol industry. High community participation and involvement of the sectors other than the formal health sectors would assure sustainability of the strategies related to alcohol control. If the current positive trend remains stable, a continuing decline in alcohol-

related mortality could be expected. Since injuries account for a large proportion of mortality due to problem drinking, further studies are warranted to evaluate the effect of preventive measures (e.g. restricted accessibility and advertising of alcohol, effectiveness of anti-alcohol educational programs) on alcohol-related injuries and to present evidence-based information on the effectiveness of alcohol control measures and health outcomes.

CONCLUSIONS

Age-standardized mortality rates from alcohol-related injuries and YPLL, especially due to alcohol-related traffic accidents, declined among the 15- to 64-year-old population of Lithuania during 2006–2009. The impact of alcohol-related injuries on life expectancy also decreased. Nevertheless, the YPLL due to alcohol-related suicides increased among males throughout the study period. The average number of YPLL by one 15- to 64-year-old decedent due to alcohol-related injuries was 21.2 years in 2009 and remained at a rather high level. The positive changes indicate successful implementation of evidence-based alcohol control measures, which are likely to result in significant improvements in the health of Lithuania's population. Known effective and cost-effective programs to reduce levels of drinking should, therefore, be implemented, which may, in turn, lead to even more significant reduction of the alcohol-attributable burden of injury.

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