Health Policies to Reduce Hazardous Alcohol Consumption in Ukraine: a Cost-Effectiveness Analysis

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Abstract

There are a number of health polices known for reducing the burden of hazardous alcohol consumption as a risk factor for disease in Ukraine. However, very little information about their potential costs, effects and cost-effectiveness at the country level is available. The objective of this analysis is to estimate costs, effect, and cost-effectiveness of these policies for Ukraine. WHO-CHOICE methodological framework and contextualization tools were employed to evaluate five interventions implemented individually and in combination. The costs were expressed in United States Dollars (discounted at a rate of 3% per year) while the effects were measured in age-weighted and discounted disability-adjusted life years (DALYs) saved. The most cost-effective intervention to implement is to increase the current taxation level by 50% (29 USD per DALY averted). The next most efficient choice would be to add a comprehensive advertising ban (69 USD per additional DALY averted), followed by the addition of brief advice in primary care and reduced access to retail outlets (391 USD per additional DALY averted). The addition of a road side breath testing would be the last most efficient choice (3279 USD per additional DALY averted). To conclude, contextualization of the WHO-CHOICE based on locally available data provides health policy makers with valuable economic evidence for the policy debate on selecting and prioritizing health interventions.

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Introduction

Hazardous alcohol consumption is a very acute social and cultural problem in Ukraine. According to recent estimates of the World Health Organization (WHO), the level of alcohol consumption is more than two times higher than the world average level and 28% higher than the average level of the WHO European Region (2014). Such a high level of alcohol consumption adversely affects sickness rate and mortality associated with alcohol. In 2010, alcohol use was the third leading risk factor for burden of disease in Ukraine, contributing to 16.4% of all healthy years of life – as measured by disability adjusted life years (DALYs) – lost which is equivalent to 4.4 million DALYs lost (Institute for Health Metrics and Evaluation 2013).

This situation prompts policy makers and health economists to find ways of reducing this public health burden. Moreover, no less important a question is at what cost it can be done. A recognized tool for guiding allocation of resources in health is cost-effectiveness analysis (CEA), which can serve politicians to prioritize health policies based on concerns of health impact and cost-effectiveness.

There are two main groups of CEA methods which can be distinguished in the academic literature: 'traditional' and 'non-traditional' methods. According to Hutubessy et al. (2001), following standard books on cost-effectiveness analysis, 'traditional' methods use an incremental approach which compares the additional cost of a studied intervention over the current mix of interventions with additional health effects. There are a number of works which applied this method, such as studies evaluating drugs for subsidizing by the government in Australia, France and other European countries (Drummond et al. 1997; le Pen 1997; Hailey 1997; Elsinga et al. 1997).

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However, these methods do not provide decision makers with economic evidence relating to the important questions like: are resources currently devoted to the health sector used in the most efficient way? What is the best use of additional resources once they are available (Hutubessy et al. 2001a)? 'Traditional' methods does not provide needed tools to find current inefficiencies in the health sector, and the results of the studies using these methods are not generalizable across different countries as they are specific to the initial point (Hutubessy et al. 2001a).

One of the most developed 'non-traditional methods' which tackles these issues is the WHO-CHOICE (CHOosing Interventions that are Cost Effective) Project that employs a broader sectoral approach by using generalized cost-effectiveness analysis framework. This framework has three main advantages over other CEA methods. First, the cost-effectiveness of the current use of resources could be estimated at the same time as the cost-effectiveness of potential future interventions (Evans et al. 2005). Second, interactions between costs and effects of interventions that are implemented simultaneously are incorporated as they would be in reality (Evans et al. 2005). And last but not least, this approach allows generating highly comparable results across specific disease analyses by means of applying standardized guidelines and tools accompanied with strict control (Chisholm and Evans 2007).[1]

This project was made for all main contributors to the global burden of disease. The starting focus of the project was creation of standardized analytical tools and reporting cost and effects for a broad range of health interventions at the level of the world sub-regions[2] (Evans et al. 2005; Murray et al. 2000). However, at the final stage, the focus moved to the implementation of the framework at the country level. Therefore, the necessary tools and

[1] Key theoretical aspects of this approach are discussed elsewhere in details (Adam et al. 2003a; Adam et al. 2003b; R. Hutubessy et al. 2003; Lauer et al. 2003).
[2] World Health Organization. Global Burden of Disease Regions used for WHO-CHOICE Analyses. http://www.who.int/choice/demography/regions/en/ (accessed on March 19, 2014).

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guidelines[3] were developed for contextualization of results at the country level (Hutubessy et al. 2003; Hutubessy et al. 2001b).

The WHO-CHOICE estimated cost, health effects of interventions targeting heavy alcohol consumption for the WHO European Region C[4] (EurC), which among other countries includes Ukraine (Chisholm et al. 2004, 782). Namely, five interventions were evaluated: brief advice in primary care, drink-driving legislation and random breath testing, taxation of alcoholic beverages, comprehensive advertising ban and reduced hours of sale in retail outlets.

These regional estimates could be used for public health decision-making in Ukraine, but employment of country-specific data would be more appropriate because different epidemiological profiles and country features of big countries like the Russian Federation have proportionally larger impact on regional results than countries with smaller population, and, as a result, they may diminish the practicality of these results for the latter countries (Popovich et al. 2011; Lekhan et al. 2010)

Country-level contextualization of the different analytical models has been carried out in such countries as the Republic of Moldova (Tirdea et al. 2011), Argentina (Rubinstein et al. 2009), Estonia (Reinap 2005; Lai et al. 2007) , Mexico (Medina-Mora et al. 2010) and Vietnam (Ha and Chisholm 2011), which generated local evidence for national policy makers and fostered policy dialogue. However, there were no such WHO-CHOICE studies with contextualization made for Ukraine. Moreover, there are no cost-effectiveness studies of alcohol control interventions in Ukraine.

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[3] World Health Organization. Cost effectiveness and strategic planning. http://www.who.int/choice/en/ (accessed on March 19, 2014).
[4] EurC countries: Belarus, Estonia, Hungary, Kazakhstan, Latvia, Lithuania, Republic of Moldova, Russian Federation, Ukraine.

The aim of this paper is to fill this research gap and implement cost-effectiveness analysis of health policies to reduce hazardous alcohol consumption in Ukraine based on local quality data. In this connection, the study shows how to apply current WHO-CHOICE tools and contextualize regional level information to the country level. The study presents a number of policy recommendations for alcohol control policies in Ukraine based on the results which take into consideration the existing epidemiological situation and interventions evaluated.

The main findings of this work can be described as follows. The most cost-effective intervention to implement is increased current taxation level by 50%. As more financing is available, the next best choice is to add a comprehensive advertising ban to this tax increase, followed by the addition of brief advice and reduced access to retail outlets. Finally, an addition of a road side breath testing is advised as the last most efficient choice.

This research consists of three chapters. Chapter 1 discusses academic and policy literature devoted to the methods of economic evaluation in health economics and explains WHO-CHOICE methodology applied in this study. Chapter 2 analyses trends in alcohol consumption, health consequence for Ukraine attributable to alcohol, and Ukrainian legislation in the field of alcohol control. Chapter 3 provides results of cost-effectiveness analysis for the studied interventions, and a number of policy recommendations based on the main findings of the thesis.

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Chapter 1. Economic evaluation in healthcare

There is an extensive academic and policy literature devoted to the methods of cost-effectiveness analysis (CEA) in the health economics. Out of all methods applied in the studies, two main groups of methods can be distinguished, 'traditional' and non-traditional' methods. The first section of this chapter reviews the literature on CEA methods, explains the main differences between traditional and non-traditional methods and introduces WHO-CHOICE (CHOosing Interventions that are Cost-Effective) methodology applied in this study. The second section describes the WHO-CHOICE methodology and consists of the following subsections: population model, epidemiology of hazardous alcohol use, assessment of intervention effects, assessment of intervention costs, calculation of cost-effectiveness and uncertainty analysis.

Most of the methods and analyses of this section are drawn from the work of Chisholm et al. (2004). This work evaluates costs, effects and cost-effectiveness of interventions being studied in this paper but at the level of subregions of the world defined by the World Health Organization. In addition, this chapter provides a detailed description of a CHOICE tool applied for alcohol policy.

1.1. Methods of cost-effectiveness analysis in healthcare.

Economic evaluation, mostly in the form of cost-effectiveness analysis (CEA), is widely used in health economics. CEA method allows comparing relative costs of two or more courses of action to achieve desired public health outcomes. In contrast to cost-benefit analysis, which expresses benefits in monetary terms, cost-effectiveness analysis measures health effects in natural indicators. The most commonly used indicators are the number of human lives saved, the number of healthy years of life gained or the number of years lost due

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to disability averted. Likewise, this method is applied in burden of disease studies to compare different interventions aimed at disease prevention and control. CEA provides tools to calculate resources needed to implement interventions and health gains achieved as a result of them. In such a way, cost-effectiveness analysis helps to link financial resources and health outcomes of interventions, which, in turn, enhances informed decision-making on health care interventions in specific settings.

Thus, CEA has an important practical value for policy makers. Namely, for budgeting purposes, policy makers need to estimate what expenditures are necessary to implement this or that particular strategy and how scarce financial resources could be allocated in the most effective way. Furthermore, cost-effectiveness analysis is increasingly becoming a popular tool for guiding policy choices in the health sector.

Reinap et al. (2005, 16) defined the main multiple conventional steps, which are described further in the text. The first step in implementation of CEA is determining the health problem of the population: (1) what the problem is; (2) why it happens; (3) when it should be changed. In addition, this step involves finding possible solutions to solve this health problem, or interventions. Namely, what the most effective and suitable tools and actions should be applied to solve the problem.

The second stage is evaluation of resources required to realize interventions. The resources are viewed from a societal perspective. According to the authors, traditional methods of CEA examine only additional costs and interventions added to current interventions. While the approach used in this study takes a broader sectoral approach which compares both current and new interventions and its costs to a situation of doing none of the existing interventions. This is the first difference between the CEA methodology applied in this study and traditional CEA methods; other differences are discussed further in the text.

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The third step is assessing health effects resulting from interventions. The following natural indicators are taken into account in this stage: rises in the number of years lived in full health, increase in the number of years lived with disease, enhancement in quality of life (life years remain unchanged). In addition, possible negative effects are considered.

And the final step is calculation of cost-effectiveness of each intervention. This usually takes the form of the cost-effectiveness ratio (CER), which is the total costs of implementing the intervention divided by the number of healthy years gained. Thus, the most cost-effective intervention is the one which has the lowest CER among all policy options.

What methods of cost-effectives analysis exist in the current economic literature? Before going into details of the CEA method applied in this study it is useful to consider various methods of cost-effectiveness analysis used in the present research. This observation will help to understand how methods are different from one another, what their limitations are and what the advantages are of CEA applied in this study.

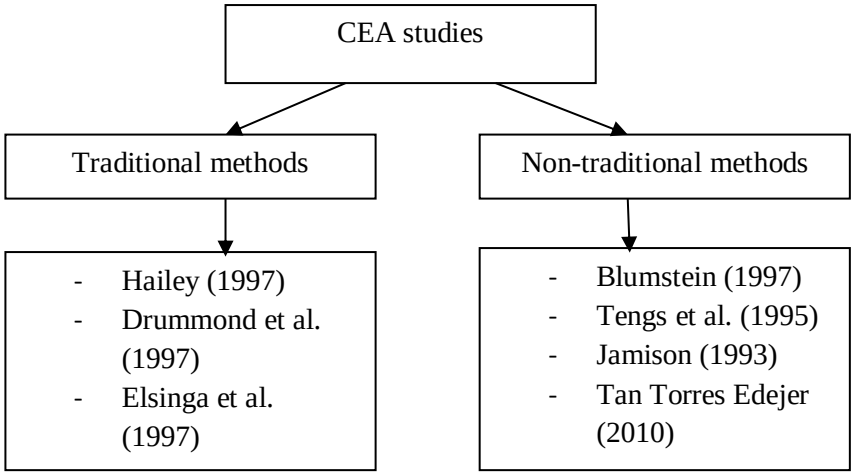

Figure 1. Classification of Literature Based on Cost-Effectiveness Studies (author's elaboration)

In the literature, CEA methods are conventionally divided into two groups: "traditional' and 'non-traditional' methods. Traditional methods are described in detail in the works of Drummond and McGuire (2001), Drummond et al. (1997), Gold et al. (1996). This

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group of CEA methods follow standard textbooks on economic evaluation and, thus, they use an incremental approach that compares additional costs of an evaluated intervention over existing interventions with additional health impacts (Hutubessy et al. 2001b). The most prominent works which applied this approach were studies evaluating and selecting drugs to be subsidized by the government in Australia, France and other European countries (Drummond, Jönsson, and Rutten 1997; le Pen 1997; Hailey 1997; Elsinga and Rutten 1997).

However, this approach does not allow finding answers to a number of important policy questions, namely are resources devoted to health care employed in the most efficient way? What is the best way to use additional resources once they become available? These methods are unable to detect current inefficiencies in the health system and, the results of these analyzes are not generalizable across settings since they are specific to the initial point (Hutubessy et al. 2001b) .

Later, to tackle the mentioned issues, other methods were devised which used broader sectoral approach by means of using a generalized CEA framework. This approach was utilized in the following studies: Oregon Health Services Commission (Blumstein 1997), Harvard Life Saving Project (Tengs et al. 1995) and the World Bank Health Sector Priorities Review (Jamison et al. 1993). According Hutubessy et al. (2001b), of these studies, only the World Bank tried to make international comparisons and inform policy-makers across different settings and disease areas. However, the authors suggest that the value of this study was rather limited due to the fact that cost-effectiveness ratios, policy conclusions made up from them, were obtained from analyses based on different methods and were carried out in dissimilar epidemiological and cost settings.

In 2006, the World Bank published the second edition of Disease Control Priorities in Developing Countries (DCP2) (Jamison et al. 2006). According to Chisholm et al., this study

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updated and drew on the earlier study, and aimed to implement general standards for economic analysis and reporting (2007). To be more specific, the results were presented for six low- and middle-income world regions determined by their geographical location. However, in spite of these standardization efforts, a level of methodological heterogeneity and inconsistency still remains which impedes strict comparisons of cost-effectiveness of disease interventions across a broad range of settings (Chisholm et al. 2007) .

The next recent development was the WHO-CHOICE project (CHOosing Interventions that are Cost-Effective) (for more information see Murray et al. 2000; Adam et al. 2003; Evans et al. 2005) of the World Health Organization which was initiated in order to produce comparability and standardize the approaches used by different states. WHO-CHOICE methodology is applied in this study. This methodology, like DPC2, was aimed to make comparable databases of intervention costs and effectiveness for all main diseases in a number of world regions. And, unlike DPC2, this project managed to generate "a high degree of comparability across specific disease analyses" due to standardized guidelines and tools together with strict control (Chisholm and Evans 2007, 332).

1.2. WHO-CHOICE project: methodological framework.

As already mentioned, the analytical framework used in this paper is WHO-CHOICE developed by the WHO. The objective of this framework was to provide decision-makers with comparable evidence for forming policy on health programs and interventions which maximize health for the available resource. It was developed for all main contributors, risk factors or diseases, to the global burden of disease. Initially, this project was focused on the creation of standard analytical tools and reporting of cost-effectiveness, cost and health effects of a broad spectrum of interventions in health care at the aggregate level of sub-regions of the

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world[5] (Evans, Edejer, et al. 2005; Murray et al. 2000). However, at the final stage of the project, the focus has moved to the implementation of the framework at the country level, and, thus, it developed necessary guidelines and tools[6] to contextualize results to the level of country (Hutubessy et al. 2003; Hutubessy et al. 2001b).

This section shows how these tools and guidelines were applied in the Ukrainian context, namely it describes the population model, explains how epidemiology data was obtained, how intervention effects and costs were evaluated, how cost-effectiveness of interventions was calculated and how uncertainty analysis was carried out.

1.2.1. Population model.

WHO-CHOICE uses an epidemiological approach to the calculation of the population-level health effects of different interventions. To be more precise, two epidemiological situations are modelled over life-span (100 years) analytical timeframe: (1) the impact of a given intervention for a 10-year period (after this time, health state valuations and epidemiological rates revert to natural history values) and (2) no intervention in place to reduce heavy alcohol use (natural history). The difference between these two scenarios is population-level health effect in consequence of implementation of each specific intervention. This difference is expressed in disability-adjusted life years (DALYs[7]) averted discounted at 3% per year and age-weighted[8].

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[5] World Health Organization. Global Burden of Disease Regions used for WHO-CHOICE Analyses. http://www.who.int/choice/demography/regions/en/ (accessed on March 19, 2014).
[6] World Health Organization. Cost effectiveness and strategic planning. http://www.who.int/choice/en/ (accessed on March 19, 2014).
[7] DALYs for a disease or injury are estimated as the sum of the years lost due to disability (YLD) and the years of life lost due to premature death (YLL). YLL are estimated as multiplication of quantity of deaths at each and global standard life expectancy of the age at which death occurs. YLD for specific case in a specific time period are calculated as multiplication of quantity of incident cases in the given period and average duration of the disease and disability weight. The disability weights are used to reflects the severity of the disease on a scale from 0 (full health) to 1 (death).
[8] Age-weighting means application of age specific weights which give comparatively more importance to health gains in middle adult age as opposed to younger and older ages.

These epidemiological situations are evaluated through a multi-state transition population model (PopMod; Lauer et al. 2003) that traces the development of a population, taking into consideration births, deaths and the specified risk factor – in this study, high-risk alcohol use. Besides population structure and size, the population model employs a number of epidemiological parameters, including prevalence and incidence, remission, and cause-specific and remaining rates of mortality. For illustration, in Figure 2, a simplified 3-box population alcohol model of the generic 5-box PopMod is presented below.

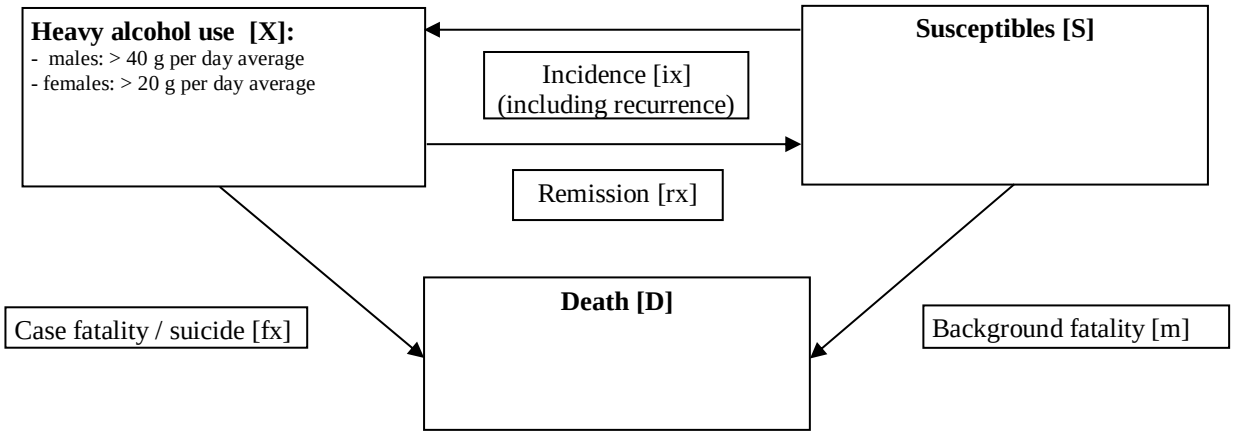

Figure 2. Model for considering the health impact of alcohol policy measures

Source: (Tirdea et al. 2011)

For this alcohol model, state X refers to hazardous alcohol consumption - defined as an average rate of drinking more than 40 g pure alcohol per day for men and more than 20 g pure alcohol per day for women (Chisholm et al. 2004). And state S refers to persons who do not answer this threshold but still remain 'at risk' of doing so in some time in the future. Susceptibles (i.e. not drinking heavy amount of alcohol at the moment) become cases at instantaneous transition rate *i* [incidence]; persons with risk factor (or index disease) go back to being susceptibles at remission rate *r*; cases are subject to the suicide or instantaneous case-fatality rate *f*; and both cases and susceptibles are subject to a general mortality rate *m*

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(alcohol manual[9]). Thus, the main parameters of interest are the prevalence and incidence of a particular risk factor, together with case fatality and rates of remission. Methods of deriving data for these model parameters are described further in the text.

1.2.2. Epidemiology of hazardous alcohol use.

As already mentioned, the risk factor of hazardous alcohol consumption in this cost-effectiveness study is defined as an average rate of drinking of more than 40 g pure alcohol per day for men and more than 20 g pure alcohol per day for women. The regional model parameters were derived with respect to this risk factor. Rates of heavy alcohol use and case fatality rates were taken from the Comparative Risk Assessment for alcohol (Chisholm et al. 2004, 783). Relative mortality risks, derived from case fatality rates, were amounted to: for males and females between 15 and 44 years, a relative risk of 2,5; for older age groups the relative risk was equal to 1,3 for males and 1,4 for females. For deriving remission rate, the reference to an average duration of 10,9 years to recovery was made (for more information see Sobell et al. 2000) (Chisholm et al. 2004).

Due to the fact that no national data on epidemiology of hazardous alcohol consumption with respect of the mentioned risk factor was available, epidemiology used in this study was derived from regional estimates. The regional estimates were conservatively adjusted to reflect changes in the context of Ukraine from the year of regional data, 2005, to 2012 based on information from directories of the indicators of incidence of narcological disorders and activities of narcological establishments made by Centre for Medical Statistics MoH Ukraine (2006; 2013).

In order to calculate disease burden, the disability level associated with the time spent as a hazardous drinker also should be specified. According to Chisholm et al., on 0-1 scale

[9] http://bc.ias.org.uk/pdfs/papers/wp6-healthimpact.pdf

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(where 1 equals full health), a disability weight or health state valuation (HSV) was derived for heavy alcohol use, a weighted average based on severity background of heavy drinkers from CRA (e. g. 55% hazardous; 45% harmful) and preference values for the mentioned health states from the disability weight study, 0,89 and 0,67 respectively (Stouthard, Essink-Bot, and Bonsel 2000) (2004).

1.2.3. Assessment of intervention effects.

At the moment, there are many economic evaluations of different interventions to cope with alcohol misuse performed but most effective ones are not always used in practice. Evaluations of a number of interventions has been carried out which has shown their effectiveness in reducing alcohol consumption, nonetheless their implementation level remains low almost in all countries and their potential effect on health at the population level has not been effectively assessed (Rehm et al. 2006). In contrast to this, some alcohol interventions without evidently established effectiveness continue to be broadly employed, e.g. education at school designed to reduce alcohol use, public information in the mass media (Rehm et al. 2006,).

Based on reviews of literature of measures to reduce alcohol abuse, WHO-CHOICE scholars included the following intervention and strategies in their analysis: brief advice in primary care, taxation of alcoholic beverages, drink-driving legislation and random breath testing, reduced hours of sale in retail outlets and comprehensive advertising ban (Chisholm et al. 2004). These interventions are discussed in detail below.

The first intervention is brief advice in primary care (or brief interventions). Brief interventions can be in the form of a physician's advice provided in primary health care; these interventions consist of a small number of education sessions and psychological consultations in order to influence the prevalence of heavy drinking by reducing disability and raising

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remission. Reviews of effectiveness of brief interventions showed an estimated 22% net decrease in alcohol consumption among heavy drinkers (Chisholm et al. 2004, 785). For this intervention, it was modelled that, in the case of applying to the total population at risk in Ukraine, it would decrease the total prevalence of heavy drinking by 40 percent, equivalent to a 15,3 percent improvement in the rate of recovery over absence of treatment. However, the effect is significantly diminished, after taking into consideration, the real-world modifiers, including treatment adherence (80 percent) and target treatment coverage rate in the population (50 percent of high-risk drinkers). In addition, an expected decrease in the number of heaviest drinkers whilst in treatment, but before recovery, caused a small improvement in the average level of disability (treated HSV was 0.855, a gain of 4.2%). In order to evaluate the null scenario in Ukraine where brief interventions are used, a current coverage level of 6% was used.

The second intervention is excise taxation on alcoholic beverages. The primary effect of the excise taxation on the incidence is expressed via reduced consumption. The effectiveness is measured in terms of price elasticity that connects the change in consumption to the rate of the price rise (see Table 1 below). Price elasticities were taken from the work of Wagenaar et al. (2009), and they were equal to -0.80 for spirits, -0.46 for beer, -0.69 for wine. The price elasticities were adjusted by one-third downwards to reflect possible reduced responsiveness to price among hazardous drinkers (Rehm et al. 2006). Both the current level of excise taxation (April, 2014) and increases to the current level (of 25% and 50%) were estimated.

Table 1 below presents the effect of taxation on alcoholic beverages on the incidence of heavy alcohol use. As we can see from the table, three tax rates, expressed as an add-on percentage of supplier price, were evaluated: the current tax rate, a 25 percent rise over the

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Table 1. Effect of excise taxation on the incidence of heavy alcohol use in Ukraine

Level of taxation	Alcohol consumption (by beverage type)[a]			Rate of taxation (by beverage type)[b]			Price increases (elasticities)[c]			Untaxed consumption[d]	Effect on incidence of heavy alcohol use[e]
	Beer	Wine	Spirits	Beer	Wine	Spirits	-0,98 Beer	-0,35 Wine	-0,68 Spirits		
Current	42%	9%	49%	11%	7%	51%	-3,1%	-2,9%	-17,9%	36%	-6,6%
Current+25%	42%	9%	49%	14%	8%	63%	-3.8%	-3,6%	-20,7%	40%	-7,3%
Current+50%	42%	9%	49%	17%	10%	76%	-4,5%	-4,2%	-23,0%	43%	-7,7%

Notes: [a,d]Source: the WHO Global Information System on Alcohol and Health, apps.who.int/gho/data/node.main.GISAH. [b]Source: the State Statistics Service of Ukraine, www.ukrstat.gov.ua; the Law of Ukraine "On Preventing Financial Disaster and Creating Conditions for Economic Growth in Ukraine". [c]Price rise due to tax (%tax/[1+%tax]) * elasticity * 2/3 (lower responsiveness among heavy drinkers). [e]Sum of (prevalence * price increase) for each beverage type * (1-%untaxed consumption).

current rate, and a 50 percent rise over the current rate. The estimated reductions in the incidence of heavy alcohol use were adjusted by current or expected level of unrecorded consumption which results from smuggling and illicit production. It was modelled to increase the expected level of unrecorded consumption by 10% with the 25% tax increase and 20% with the 50% tax increase. As can be observed from the Table, in Ukraine, where the initial level of unrecorded consumption was at a relatively low level of 36%, further tax increase has a progressive impact on incidence. Otherwise, in case of a high initial level of unrecorded consumption, further tax increase can have a regressive effect on incidence if it goes along with increase in initially high level of unrecorded consumption (and thus untaxed) (Rehm et al. 2006).

The third intervention is drink-driving legislation and random breath testing (RBT). Drink-driving laws and enforcement policies, like RBT of drivers, affects both fatal and non-fatal injuries among heavy alcohol users as well as other members of the population, including passengers and pedestrians (see Table 2). Thereby, two independent effects on alcohol traffic injuries were evaluated: (1) drink-driving laws, estimated to decrease traffic fatalities by 7% if broadly implemented within a country or, for estimation of the null scenario, a fraction of this percentage based on the present level of implementation; (2) enforcement through random breath testing that was estimated to decrease fatalities by a further 18% for the potential effect of full implementation; the effect on non-fatal injuries was

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estimated to be a little less decrease of 15% (D. Chisholm et al. 2004,). In addition, these estimated effects were applied to the proportion of years of life lost and of years lived with a disability attributable to alcohol-related traffic accidents.

Table 2. Effects of drink-driving legislation and RBT enforcement for Ukraine

Gender	Attributable fraction		Full enforcement		
	Deaths due to traffic accidents[a]	Traffic deaths due to alcohol use[b]	Averted traffic deaths (DD law +RBT)[c]	Deaths avertable by DD/RBT[d]	Nonfatal traffic injury multiplier[e]
Male	1,4%	47%	7%+18%	-0,22%	1,178
Female	0,4%	21%	7%+18%	-0,03%	1,381

Notes: DD = drink-driving; RBT = random breath testing. [a]Source: the State Statistics Service of Ukraine, www.ukrcensus.gov.ua. [b]Source: Comparative Risk Assessment for Alcohol (Rehm *et al.*, 2004). [c]Source: (Peek-Asa, 1999; Schults *et al.*, 2001). [d]Calculation: = traffic deaths as a proportion of all deaths * alcohol-related traffic deaths as a proportion of all traffic deaths * avertable traffic deaths. [e]Source: the Institute for Health Metrics and Evaluation, www.healthdata.org.

The fourth intervention is reduced hours of sale in retail outlets. Physical availability of alcohol can be significantly reduced via prohibition and rationing, but it is very challenging to implement and sustain these measures. A more moderate measure is to reduce sale of alcoholic beverages among retail outlets (e.g. no sales for off-premise drinking for 24-hour period at the weekend), which have resulted in reduction of alcohol use and related harm in Scandinavia (Chisholm et al. 2004). Based on these results, a modest decrease of 3.0% in the incidence of heavy consumption and 4.0% in alcohol-related traffic accidents was modelled for the subregion EurC, to which Ukraine belongs.

The fifth intervention is a comprehensive advertising ban which consists of advertising on television, via radio and billboards. The public policy interest in the effect of alcohol advertising ban is increasing. However, it should be noted that available econometric studies show little effect of this intervention on consumption, even for a comprehensive ban. This can be explained by ongoing presence of other marketing strategies for alcohol, including sponsorship and product placement. For this intervention and this setting, the potential effect was considered by modelling a 4 percent reduction in the incidence of heavy alcohol use (Saffer and Dave 2002; Chisholm et al. 2004).

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1.2.4. Assessment of intervention costs.

There are two main groups of costs covered in this analysis: (1) patient-level costs, including costs of primary care visits; (2) program-level costs needed for running intervention involving costs of administration, media, and training. WHO-CHOICE uses an ingredients approach in collecting data rather than a total expenditures approach. Cost of each input to an intervention is multiplication of its quantities used and its price (or value). The components of total resource inputs used in interventions are discussed further in the text.

Patient-level costs include resource inputs used in the implementation of a given intervention (*e.g.* costs of drugs, laboratory tests, outpatient visits, and inpatient days at hospital). In this study, these inputs are relevant only to brief advice in primary care. An average rate of care visits was assessed for the intervention itself, plus an additional 0.33 outpatient visits (20% multiplied by 1.67 visits) and 0.25 inpatient days (5% multiplied by 5 days) (Fleming et al. 2000; Chisholm et al. 2004). These patient-level resource inputs were applied to the 50% of prevalent heavy alcohol users in receipt of brief advice in primary care in year 1 (and because the durable effect is modelled over 10 years) as well as in year 6; and to 50 percent of incidence cases in years 2-5 and 7-10 (Chisholm et al. 2004). Regarding unit costs, the costs per outpatient visit and costs per bed day were taken from the WHO estimates for Ukraine (available on www.who.int/choice/country/ukr/cost/en). Prices of drugs were obtained from the catalogues of prices from firms operating on the market of Ukraine and, then, a middle level price was selected.

Program-level costs involves resource inputs used in the production process of intervention at a level above that of patient or healthcare institution, including central planning, administrative functions, also inputs needed for preventive measures, including enforcement of drink-driving laws by traffic policemen (Johns, Baltussen, and Hutubessy

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2003; Chisholm et al. 2004). According to Chisholm, the estimates of resource quantities required for interventions were received from costing experts from the appropriate world region and validated against literature. The final estimated quantities of required inputs were derived to implement each intervention for the period of 10 years at the national, provincial and district levels with respect to the predominant features of the subregion – *e.g.* stability and efficiency of tax systems, etc (2004).

The unit costs of program-level resource inputs were collected from two main sources. Data for personnel costs were taken from the statistical compilation "Wages by Occupational Groups in 2012" (State Statistics Service of Ukraine 2013). Other program-level data, such as media operational costs, vehicle operating costs, utility prices, rental prices, capital costs of building, prices of office equipment and furniture, office supplies and materials were taken from the study of the Agency of Industrial Marketing consulting company (Shchyrin, Krolevetska, and Prokopova 2014). In this study, for small items which can be bought by wholesale, such as office supplies and materials, the lowest locally listed price was selected. For larger items, the mid-level price was chosen to represent a "typical" price on the Ukrainian market.

Initially, costs were calculated in the local currency units, Hryvnias, but it was decided to convert[10] them to and present results in US Dollars due to the high volatility of the Ukrainian Hryvnia against the US Dollar observed during January-April 2014.[11]

1.2.5. Calculation of cost-effectiveness.

When calculating cost-effectiveness it was considered what would occur from now on if all resources can be reallocated. In other words, cost-effectiveness of each individual

[10] Official exchange rate of Ukrainian Hryvnia against the US Dollar was obtained from the National Bank of Ukraine (as of April 1, 2014)
[11] *Source*: the National Bank of Ukraine, www.bank.gov.ua.

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intervention and its combinations with others were estimated against the null situation, in which none of the studied interventions was realized. This is expressed in the average cost-effectiveness ratio which is the total costs of executing the policy (relative to the null scenario), divided by the number of health years gained (again compared to doing nothing). In addition, incremental cost-effectiveness ratios for interventions which lie on the cost-effectiveness expansion path or efficiency frontier (this concept is described in detail in Chapter 3) were calculated.

Cost-effectiveness of health interventions was classified according to recommendations from the Commission on Macroeconomics and Health (CMH) (WHO Commission on Macroeconomics and Health 2001). Thus, the WHO-CHOICE considers an intervention as "cost-effective" when it produces one DALY for less than three times gross domestic product (GDP) per capita, and as "very cost-effective" when it produce one DALY for less than the GDP per capita. In 2013, the GDP per capita in Ukraine was 31 984 Ukrainians Hryvnias (UAH) or 4,002 United States Dollars (USD).[12]

1.2.6. Uncertainty analysis.

National-level estimation of interventions effects and costs are essentially imbued with a certain extent of uncertainty, in regard to both analytical choices (such as the usage of discounting) and data. One-way sensitivity analysis was performed to assess the impact of removing discounting and age weights on baseline results. Then, to estimate the impact of alternative assumptions on effects and costs on cost-effectiveness of interventions, the best and worst case scenarios were produced. These scenarios integrated upper and lower ranges of total intervention costs (+ / - 15% of their baseline values) and effectiveness (+ / - 15% of their baseline values). Afterwards, this data was entered into the MCleague software (Adam et

[12] *Source*: State Statistics Service of Ukraine, www.ukrstat.gov.ua

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al. 2003b) which undertakes a probabilistic uncertainty analysis applying Monte Carlo simulation.

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Chapter 2. Current alcohol situation in Ukraine.

Despite the fact that the trend in alcohol consumption during 2003-2010 was downward, the level of alcohol consumption still remains very high. In 2008-2010, alcohol consumption in Ukraine was more than 2 times higher than the world average level and 28% higher than an average level of the WHO European Region. Another similarity with regard to changes in alcohol consumption is the insignificant decrease of the percentage of teenagers of 15-16 years age who had at least one alcoholic drink during 2003-2011.

Moreover, the recent Global Burden of Disease revealed that alcohol use represents one of the major risk factors for burden of disease in Ukraine (Institute for Health Metrics and Evaluation 2013). This chapter is devoted to the analysis of the current alcohol situation in Ukraine. It includes the following sections: trends in alcohol consumption in Ukraine, alcohol-attributable health consequences for Ukraine. The last section presents the legislation in the field of alcohol control in Ukraine.

2.1. Trends in alcohol consumption in Ukraine.

The alcohol problem is a burning problem for Ukraine due to the high level of alcohol consumption which, in turn, increases the sickness rate and mortality associated with alcohol. According to the estimates of the WHO, in 2008-2010, an average level of alcohol per capita consumption among adult people (15 years and elder) in Ukraine was 13,9 liters which was more than 2 times higher than the world average level and by 28% higher than an average level of the WHO European Region of 10,9 liters (see Table 3). However, it is worth pointing out that alcohol per capita consumption of Ukrainians decreased by 3% from its level in 2003-2005.

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Table 3. Alcohol per capita consumption at age 15+ years in the selected countries, in liters of pure alcohol

Country/Region	Average consumption in 2003-2005 yrs.			Average consumption in 2008-2010 yrs.		
	Recorded cons., liters	Unrecorded cons., liters	Total cons., liters	Recorded cons.	Unrecorded cons.	Total cons.
Ukraine	6,8	7,5	14,3	8,9	5,0	13,9
Hungary	13,1	4,0	17,1	11,3	2,0	13,3
Republic of Moldova	3,8	10	13,8	6,3	10,5	16,8
Russian Federation	11,4	4,7	16,1	11,5	3,6	15,1
Poland	9,3	3,7	13,0	10,9	1,6	12,5
WHO European Region[13]	9,5	2,7	12,2	9,0	1,9	10,9
World	4,3	1,8	6,1	4,7	1,5	6,2

Source: World Health Organization, 2014. Global status report on alcohol and health.
Luxembourg: World Health Organization; the Global Information System on Alcohol and Health, www.who.int.

Figure 3 below shows recorded alcohol per capita consumption of pure alcohol among people aged 15 years and elder by beverage type. As can be observed, the general trend was upward up to 2008, and then changed direction. Over the studied period, Ukrainians preferred spirits to other types of alcoholic beverages, whose share in the total number of recorded per capita consumption was 48% in 2010. The second most preferred beverage was beer having 40% share in 2010.

In addition to level of consumption, WHO measures complementary Pattern of Drinking Score (PDS) indicator, which reflects the pattern of consumption rather than level of consumption. This indicator is related to alcohol-attributable burden of disease, and the higher its score, the larger the burden of disease attributable to alcohol in groups of people with the

[13] WHO European Region consists of the following member states: Albania, Andorra, Armenia, Austria, Azerbaijan, Belarus, Belgium, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Georgia, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Kazakhstan, Kyrgyzstan, Latvia, Lithuania, Luxembourg, Malta, Monaco, Montenegro, Netherlands, Norway, Poland, Portugal, Republic of Moldova, Romania, Russian Federation, San Marino, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Tajikistan, the former Yugoslav Republic of Macedonia, Turkey, Turkmenistan, Ukraine, United Kingdom of Great Britain, Uzbekistan.

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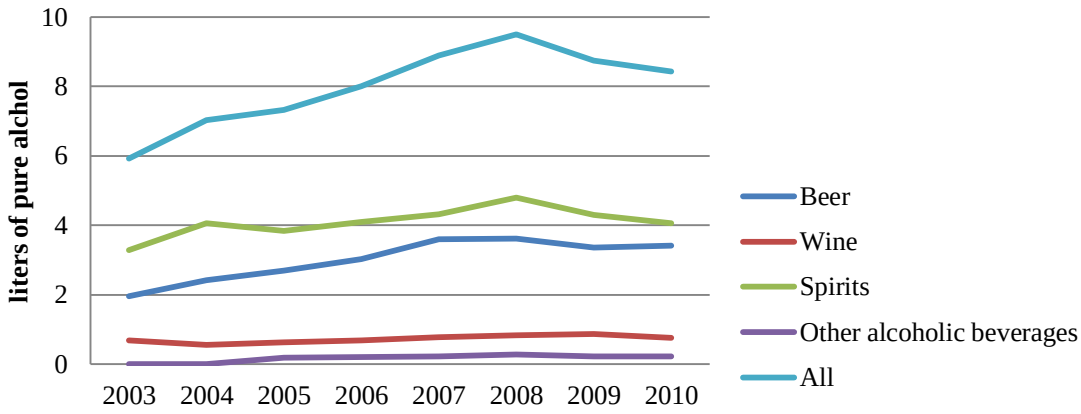

Figure 3. Recorded alcohol per capita consumption (15 +), in liters of pure alcohol, 2003 - 2010 yrs.

Source: the Global Information System on Alcohol and Health, www.who.int.

same level of consumption. Thus, Ukraine was attributed the highest score, which means its pattern of drinking is the most risky on the PDS scale (World Health Organization 2014).

This section is continued with the presentation of two studies, the Multiple Indicator Cluster Survey and The European School Survey Project on Alcohol and Other Drugs. Analyzing alcohol consumption across specific population groups in Ukraine, these studies provide some valuable insights into alcohol consumption patterns in Ukraine.

2.1.1. Multiple Indicator Cluster Survey

In 2012, the Multiple Indicator Cluster Survey (MICS), international household survey initiative, was held which was carried out by the State Statistics Service of Ukraine in collaboration with the United Nations Children's Fund (State Statistics Service of Ukraine and Ukrainian Center for Social Reforms 2013). The aim of the survey was to research the situation of children, women and households as a whole in Ukraine. The study population included all non-institutional households in Ukraine and people who lived there except persons residing close to Chornobyl accident area.

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The survey involved 4 types of questionnaire: (1) a household questionnaire for collection of information about all its members who live in a household, about household itself and residence; (2) a questionnaire for men, according to which a male between 15 and 49 years old from every second household in a cluster was surveyed; (3) a questionnaire for females, according to which all women between 15 and 49 years old who lived in a household were surveyed; (4) a questionnaire about children under 5 years old and their mother or person who looked after a child who lived in the household.

The MICS is constructed on probability stratified two-stage sample design. The main stratification was based on geographical regions and within regions on 3 types of locations: cities, towns and rural areas. In total, 12,459 households were selected for participation in the examination, 11,321 were surveyed, and the indicator of answers was 95.4%. There were 8,006 females and 3,620 males who agreed to participate and gave full answers, and 4,379 questionnaires were completed for children under 5 years old. The overall indicators of answers which were calculated for interviews of women and men between 15 and 49 years old equal to 92.7% and 90.2%, respectively, and 94.9% - for children under 5 years old.

According to the results of the survey, shown in Table 4, 48.4 % of women (15-49 years) answered that they consumed (at least one portion) of alcohol during the last 30 days (month). The probability that women consumed alcohol during the last 30 days increases with age: from 26.8% for young women of 15-19 years of age to 58.2% for women aged 40-44.

Although the prevalence of alcohol consumption during the last month is almost the same across types of settlements, there is a significant difference among regions. In particular, the lowest level of alcohol consumption by women is observed in the Southern region, 41.9%. The Central region differs from others because of the highest level of alcohol consumption by women which constitutes 61%.

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Despite observed differences in the level of alcohol consumption in the last month by region and age, the proportion of those who had never drunk a single portion of alcohol showed even higher variation. On average, only 9.3% of women answered that they never consumed any alcohol. 27.5% of women aged 15-19 never drunk a single portion of alcohol; the percentage declines to 8.5% among females aged 20-24, remaining nearly even until 49 years age. In addition, the proportion of those women who never had a single portion of alcohol differs by area: in rural areas it is 2 times larger than in cities and towns, 13.7% and 7.8%, respectively.

The first trial of alcohol among women in Ukraine typically happens before the age of 20, including 5.2% those who had at least one portion of alcohol before the age of 15. The first experience of alcohol use before the age of 15 is more usual for females living in the Western region of Ukraine.

2.1.2. The European School Survey Project on Alcohol and Other Drugs.

In 2011, Ukraine participated in the European School Survey Project on Alcohol and Other Drugs (Balakirieva et al. 2011). This survey was conducted in 414 educational establishments and represents 15-17 years age group who study in secondary schools (9 – 11 grades), vocational schools (1- 3 years after basic secondary education and 1 year after complete secondary education), higher education institution of I – II levels of accreditation (1-3 years after basic secondary education and 1 year after complete secondary education) and III – IV levels of accreditation (1 year). The total number of people aged 15-17 who participated in the survey were 7,702 pupils/students, and 7,512 respondents were included in the data array (among them – 4,157 girls and 3,355 boys).

The first type of questions included in the survey was related to the consumption of alcohol during life. Table 5 shows distribution of answers on alcohol consumption

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Table 4. Alcohol use among women in Ukraine, 2012

	Percentage of women who:		
	Never had one portion of alcohol	Tried at least one portion of alcohol before age 15	Had at least one portion of alcohol on or more days during the last 30 days
Age			
15-19	27.5	10.6	26.8
20-24	8.5	7.5	47.7
25-29	8.7	7.4	45.6
30-34	7.0	4.0	50.9
35-39	7.2	4.1	52.6
40-44	6.5	2.5	58.2
45-49	6.6	2.1	49.4
Region			
North[14]	9.6	2.6	50.3
West[15]	13.2	8.9	51.0
Centre[16]	7.1	2.7	61.0
East[17]	6.6	4.5	44.0
South[18]	10.0	5.1	41.9
Area			
Urban	7.8	5.3	48.5
Rural	13.7	4.7	48.3
All settlements	9.3	5.2	48.4

Source: (State Statistics Service of Ukraine and Ukrainian Center for Social Reforms 2013)

[14] North - Kyiv City, Kyiv Oblast, Zhytomyr Oblast, Sumy Oblast, Chernihiv Oblast.
[15] West - Ivano-Frankivsk Oblast, Khmelnytskyy Oblast, Chernivtsi Oblast, Lviv Oblast, Rivne Oblast, Ternopil Oblast, Volyn Oblast, Zakarpattya Oblast.
[16] Centre - Cherkassy Oblast, Poltava Oblast, Kirovograd Oblast, Vinnytsya Oblast.
[17] East - Dnipropetrovsk Oblast, Donetsk oblast, Zaporizhzhya Oblast, Luhansk Oblast, Kharkiv Oblast.
[18] South - Crimean AR, Sevastopol City, Odesa Oblast, Mykolayiv Oblast, Kherson Oblast.

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during life. Results of the research show that 86.6% of young people aged 15-17 had at least one drink of alcohol (among boys – 85.8%, among girls – 87.2 %). The alcohol consumption is more prevalent in cities and towns rather than rural areas.

Table 5. Distribution of answers on alcohol consumption.

	Among all respondents			By type of settlement		
	Boys	Girls	Together	Oblast Center (also Kyiv and Simferopol)	Other town	Village
No answer	2,7	3,1	2,9	2	3,2	3,3
Never consumed alcohol	11,5	9,7	10,5	8,9	9,1	14,9
Consumed at least one drink of alcohol	85,8	87,2	86,6	89,1	87,6	81,8

Source: Balakireva et al., 2011

The next type of questions was related to the consumption of alcohol during the last 12 months. According to the results of the survey, the prevalence of alcohol consumption during the last 12 months among young people aged 15-17 was 78.1%. The largest part of girls, 79.6%, and 76.2% of boys informed that they consumed alcohol during this period.

The largest group of respondents among boys and girls was the group of people who had 1-2 drinks of alcohol during the last 12 months – 18.7% and 20.9%, respectively. This tells us about episodic consumption, predominantly during celebrations. However, the situation is very different when it comes to more frequent consumption, 40 and more times, during this period: 11.8% of boys and 6.3% of girls (see Figure 4 below).

The results of the survey allow analyzing prevalence of alcohol consumption by young people of 15-16 years in dynamics over the last 15 years. The analysis indicates that the peak of prevalence was observed in 2007 when more than 90% of respondents informed about their experience of alcohol consumption (Figure 5). The data of the last survey showed small but

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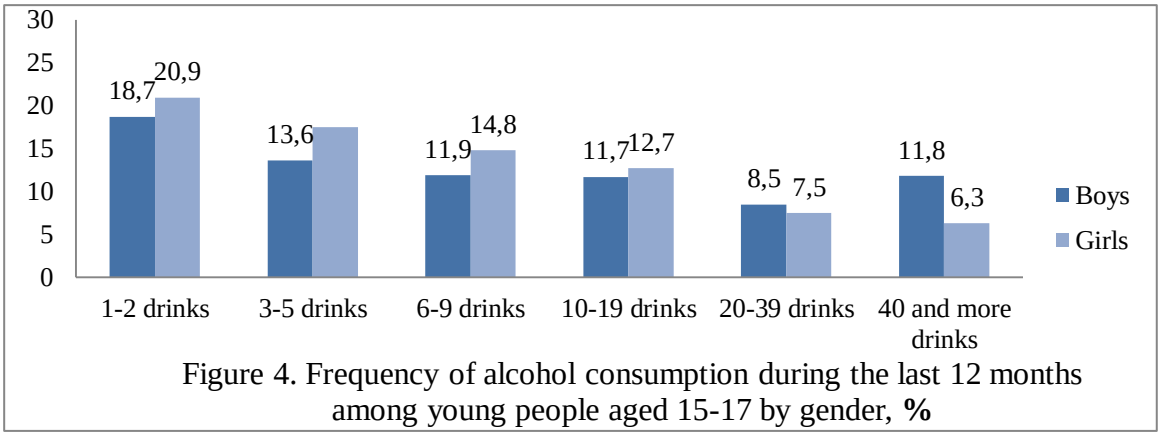

Figure 4. Frequency of alcohol consumption during the last 12 months among young people aged 15-17 by gender, **%**

Source: Balakireva et al., 2011

statistically significant decrease of this indicator. In 2011, this indicator is the smallest for all this time. In addition, the slight dominance in attraction of girls to alcohol consumption indicates that girls keep up with boys in getting experience of alcohol consumption.

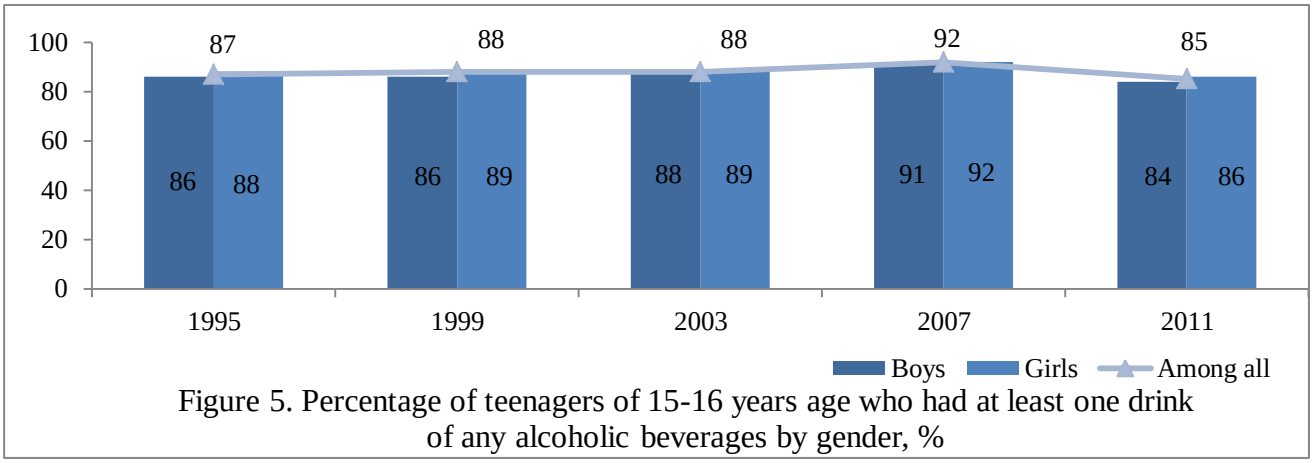

Figure 5. Percentage of teenagers of 15-16 years age who had at least one drink of any alcoholic beverages by gender, %

Source: Balakireva et al., 2011

2.2. Alcohol-attributable health consequences for Ukraine.

The negative impact of heavy alcohol consumption on public health is expressed by the indicators burden of disease and mortality. Burden of disease is defined as the difference between existent health status and ideal situation, according to which every person lives to an old age without any disease or disability (World Health Organization, 2014).

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The burden of disease is measured in DALYs (Disability Adjusted Life Years) or healthy years of life lost. DALY combines in one estimate the time lived with disability (YLD i.e. Years Lived with Disability) for incident cases of the disease or injury and time lost due to premature death (YLL i.e. Years of Life Lost). Thus, unlike traditional measures of health effects, DALY combines health losses due to both mortality and morbidity.

This section consists of two parts. The first shows an aggregate health effect of alcohol consumption drawn from the burden of disease attributable to alcohol use in Ukraine. The second part provides analysis of incidence and prevalence rates of mental and behavior disorders caused by alcohol consumption.

2.2.1. Aggregate health impact of alcohol consumption.

Alcohol has a negative impact on more than 60 types of disease and injury but it can also diminish the risk of diabetes, stroke and coronary heart disease. Figure 7 shows the proportion of burden of disease and all deaths attributable to alcohol consumption in Ukraine. This is also known as alcohol-attributable fraction (AAF). AAF quantifies the impact of alcohol as a risk factor on deaths or diseases (World Health Organization, 2014). It can be interpreted as net contribution of alcohol consumption to the health status of Ukraine.

As can be seen from Figure 6, alcohol has a high impact on many disease and injury outcomes. Besides neurological disorders and digestive diseases (excluding cirrhosis), which are defined as being fully attributable to alcohol, a number of other diseases and injuries have high AAF based on DALYs. These are cirrhosis of the liver with the AAF of 95%; transport injuries - 94%; self-harm and interpersonal violence – 86%; unintentional injuries other than transport injuries – 83%; diarrhea, lower respiratory infections, meningitis and other common infectious diseases – 79%; mental and behavior disorders – 62%. Apart from the mentioned diseases and causes alcohol is related to many others with relatively lower AAF.

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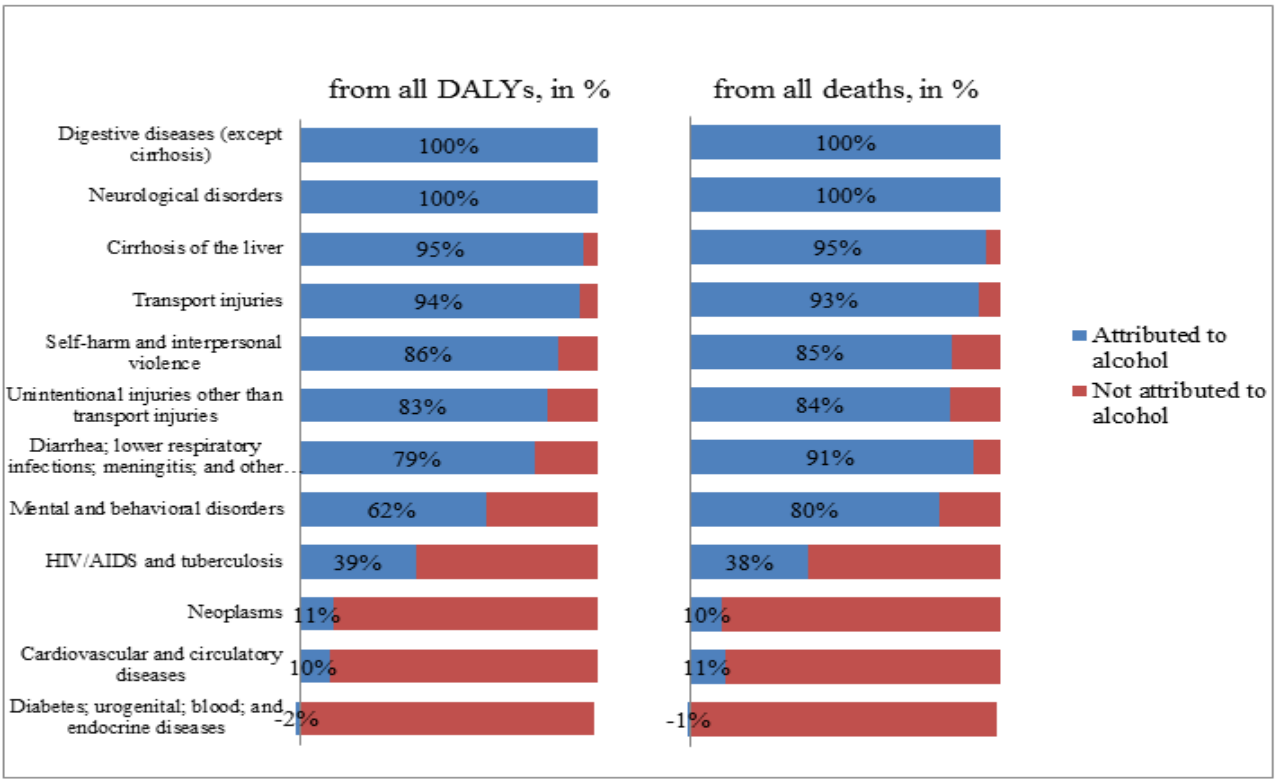

Figure 6. Alcohol-attributable fraction for selected causes of disease, injury and death, 2010

Source: the Institute for Health Metrics and Evaluation, www.healthdata.org

Note: for diabetes; urogenital; blood; and endocrine diseases the AAF was negative implying that, overall, that alcohol use beneficially affects this category of diseases.

Figure 7 shows distribution of burden of disease and injury by risk factors. The leading risks for burden of disease in Ukraine as measured in DALYs are dietary risks – 12492,7 DALYs per 100000 population or 21,1% of all Ukrainian DALYs; high blood pressure – 10796,6 DALYs or 18,2%; alcohol use – 9719,9 DALYs or 16,4%; tobacco smoking – 5858,35 DALYs or 9,9%; high body-mass index – 5147,14 or 8,7%. Thus, alcohol consumption is the third leading risk for burden of disease in Ukraine which is responsible for 16,4% of all DALYs.

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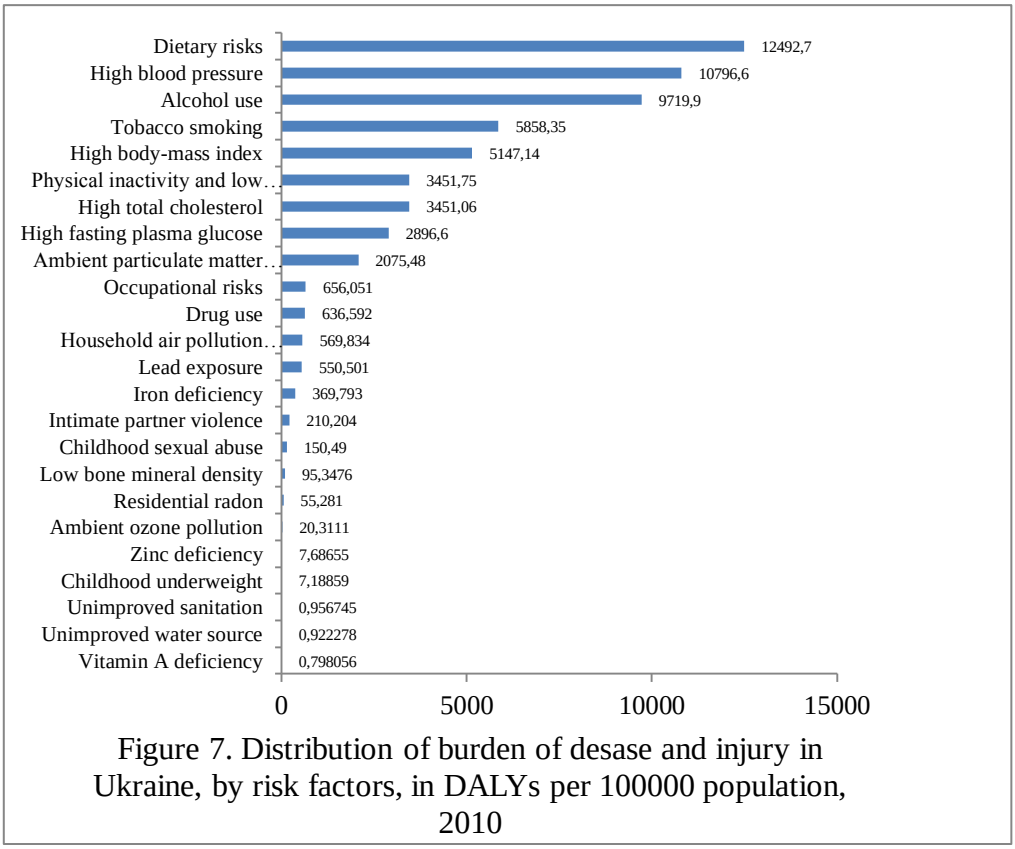

Figure 7. Distribution of burden of desase and injury in Ukraine, by risk factors, in DALYs per 100000 population, 2010

Source: the Institute for Health Metrics and Evaluation, www.healthdata.org

2.2.2. Incidence and prevalence rates of mental and behavior disorders caused by alcohol consumption.

One of the indicators of the state of the alcohol problem in the country is the incidence and the prevalence of mental and behavioral disorders resulting from alcohol consumption. 128,297 people were registered in all medical establishments of Ukraine which received for the first time in their life a diagnosis of mental and behavioral disorders caused by alcohol consumption in 2012. Of this amount, 88410 were under prophylactic supervision (194.85 per 100,000 population), 39,887 were under regular medical check-up (87.9 per 100,000 population), including 3,834 people having delirium tremens and psychotic disorders (8.45 per 100 000 population), 35,894 people with dependence syndrome (79.1 per 100,000 population) and 158 with amnestic syndrome, residual and remote psychotic disorders (0.35 per 100,000 population). (Center of Medical Statistics of the Ministry of Health 2013).

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Figure 8 shows that, starting from 2009, the incidence rate of new cases of mental disorders by all nosological forms per 100,000 population has been decreasing. The overall incidence rate decreased by 12.9% compared to 2009 level, including people with acute alcoholic psychosis – by 10.9%; people with dependence syndrome – by 13.7%. This clearly indicates that alcohol consumption in Ukraine is decreasing because alcohol psychoses and alcohol dependence syndromes are health states which cannot be hidden.

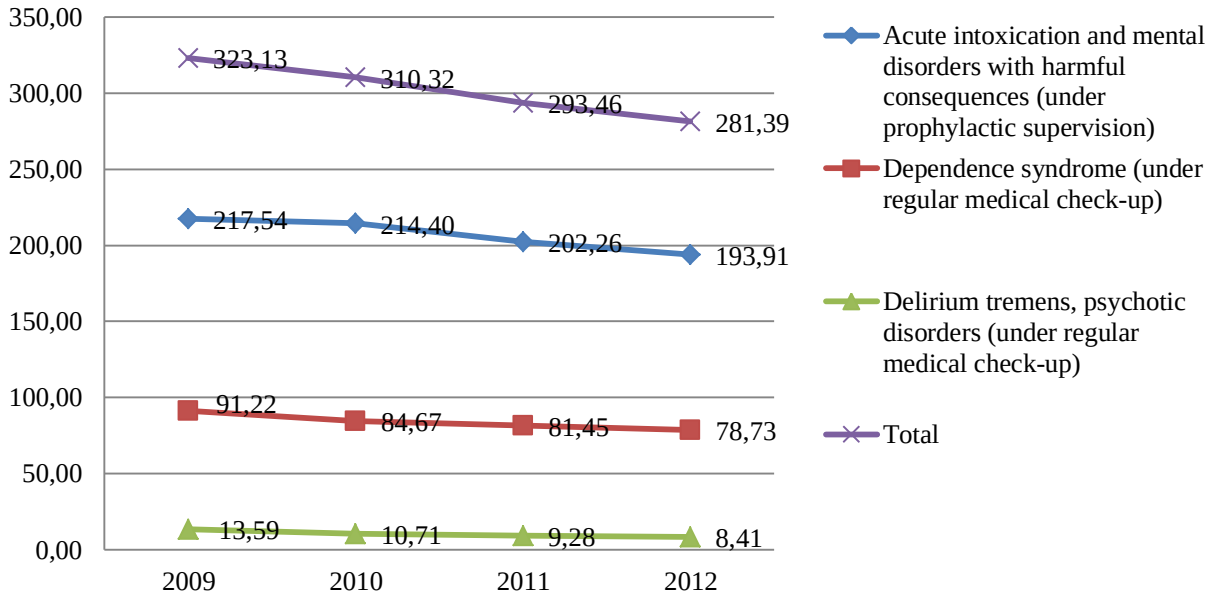

Figure 8. Incidence rate of new cases of mental and behavior disorders caused by alcohol consumption by nosological forms, 2009-2012 yrs., per 100 000 population

Source: Center of Medical Statistics of the Ministry of Health of Ukraine 2013; Viievskyi et al. 2012.

As of January 1, 2013, there were 751,670 patients (or 1656.66 per 100,000 population) registered in medical establishments in Ukraine with the diagnosis of mental and behavior disorder caused by alcohol consumption. Of this amount, 164,540 were under prophylactic supervision (362.64 per 100,000 population) and 587,130 (1294.02 per 100,000 population) under regular medical check-up, including 574,823 (1266.89 per 100,000 population) patients having dependence syndrome, 6,625 (14.6 per 100,000 population) people having delirium tremens and psychotic disorders, 5,682 (12.52 per 100,000 population) with amnestic

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syndrome, residual and remote psychotic disorders (Center of Medical Statistics of the Ministry of Health, 2013).

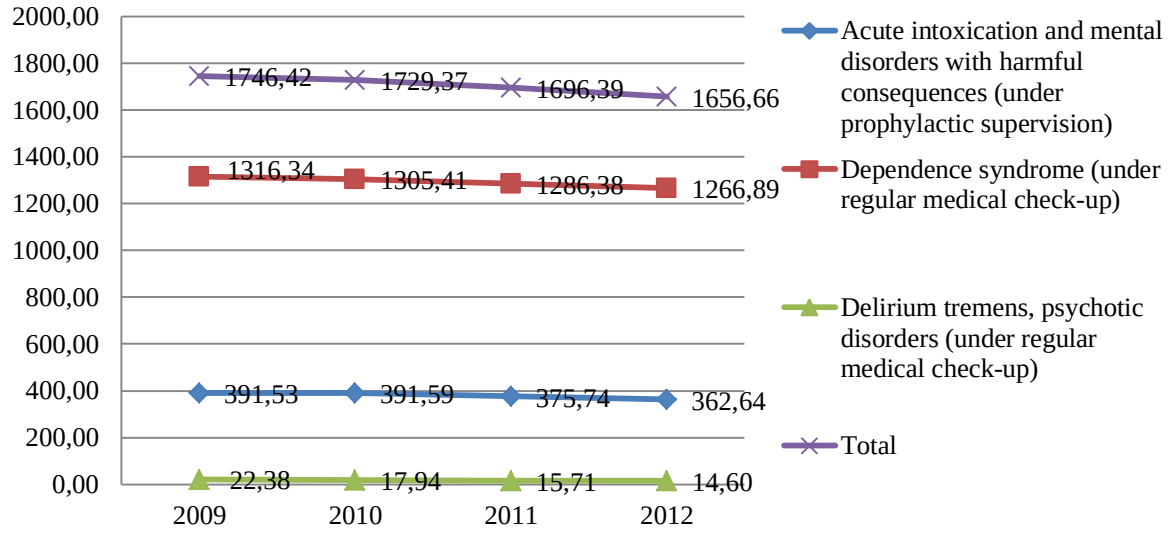

Figure 9. Prevalence rate of mental and behavior disorders caused by alcohol consumption by nosological forms, 2009-2012 yrs., per 100 000 population

Source: Center of Medical Statistics of the Ministry of Health of Ukraine 2013; Viievskyi et al. 2012.

As can be observed from Figure 9, the prevalence rate of mental and behavior disorders per 100,000 population gradually declines across almost all types of mental disorders. Over the 2009-2012 period, the overall prevalence rate of mental and behavior disorders declined by 5.1%; prevalence rate of dependence syndrome declined by 3.8%; decrease in the prevalence rate of acute intoxication and mental disorders with harmful consequences was 7.4%. In addition, the significant drop in the prevalence rate of mental disorders was observed among people with delirium tremens and psychotic disorders – 34.8%.

2.3. Ukrainian legislation in the field of alcohol control.

In Ukraine, consumption, selling, advertising, and taxation of alcoholic drinks are regulated by a number of normative acts. This section is devoted to presentation of the

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Ukrainian legislation in the field of alcohol control, and consists of the following parts: limits on selling alcoholic beverages, advertising of alcohol in Ukraine, taxation of alcoholic drinks Limitations on consumption of alcoholic beverages, drink-driving legislation and its enforcement.

2.3.1. Limits on selling alcoholic drinks.

Nowadays, one of the main problems is consumption of alcohol by children and teenagers aged 18 years and younger. Despite the fact that the sale of alcoholic beverages is prohibited to children, there is no criminal liability for this wrongdoing, only administrative responsibility. According to 156 article of the Code of Ukraine on Administrative Offences Violation, [19] selling beer (except non-alcohol beer), alcohol, low-alcohol beverages in premises or on the territories prohibited by law, or other places defined by the decision of the respective local authority as places where retail trade of these goods is prohibited, also trading through vending machines or via under-age people, and selling of alcohol to a person under 18 years old are punishable by a fine of 30 to 100 non-taxable minimum incomes (510 – 1,700 UAH) on an employee of the enterprise. In addition, hand-to-hand selling is punishable by a fine of 30 to 100 non-taxable minimum incomes (510 – 1,700 UAH) with confiscation of trade items.

In addition, the 15-3 article of the Law of Ukraine "On State Regulation of Production and Turnover of Ethyl Alcohol, Cognac and Fruit, Alcoholic beverages and Tobacco Products" also prohibits selling of beer (except non-alcoholic), alcohol, low-alcohol drinks, and table wine to persons under 18 years old. In case of breaching this law, the business entity is punished by a fine of 6,800 UAH and its license for conducting retail trade of alcoholic beverages is to be cancelled.

[19] Code of Ukraine from December 07, 1984 № 8073-X

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The sale of alcohol is prohibited in a number places: premises and territory of educational establishments, health care establishments except restaurants located in the sanatorium; in the premises of specialized trade organizations and in the departments of universal trade organizations which perform trading of goods for children or sporting goods; from vending machines; on the shelves of self-service (except alcohol, low-alcohol beverages, table wines, beer) (the Law of Ukraine "On State Regulation of Production and Turnover of Ethyl Alcohol, Cognac and Fruit, Alcoholic beverages and Tobacco Products").

There is a provision in the law in the rules of retail trading which allows local authorities to restrict the trading of beer and alcoholic drinks, but the Law of Ukraine "On State Regulation of Production and Turnover of Ethyl Alcohol, Cognac and Fruit, Alcoholic beverages and Tobacco Products" does not authorize local authorities to impose restrictions on the trading of beer and alcoholic beverages except on public holidays and events (Viievskyi et al. 2012). However, in 2009-2011, there were cases when local governments prohibited the trading of alcohol at night time such as by the authorities of Ivano-Frankivsk, Cherkasy, Uzhhorod, Lviv, Lutsk; trading of alcohol within 100 meters of child care centers, medical and educational establishments in Donets'k, Alushta; in kiosks and pavilions which had an area of less than 40 square meters in Kyiv. Due to the lack of clearly defined legal rules, the experience of the mentioned cities did not spread to the national level. According to the Ukrainian Confederation of Commerce and Industry, Ukrainians courts sustain almost all claims of entrepreneurs for alcohol trade limitations imposed by local authorities (Viievskyi et al. 2012).

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2.3.2. Advertising of alcohol in Ukraine.

On September 16, 2012 the Law of Ukraine "On amendments to some legislative acts of Ukraine regarding the prohibition of advertising, sponsorship and promotion of tobacco

products"[20] came into force. In connection with taking force of mentioned law, the Cabinet of Ministers of Ukraine (CMU) issued the Resolution "On Amendments to Section 4 of the Procedure of Imposing Fees for Violation of Legislation on Advertising". The Resolution provides some advertising prohibitions on tobacco products and alcoholic beverages.

Namely, the Resolution defines a number of cases when penalties are imposed on the advertiser due to violation of alcohol advertising law, or intellectual property rights. There are a number of prohibitions related to the channels of advertisement. It is prohibited (1) to place advertisements of alcoholic products, trademarks for goods and services in the printed media (except specialized publications); (2) to advertise through events of an advertising nature (except specialized exhibition of alcoholic beverage events); (3) to advertise by means of outdoor advertising; (4) on the internal and external surfaces of public service vehicles and subways; alcohol advertising is prohibited on the radio and television from 6 a.m. to 11 p.m.

In addition, it is outlawed (5) to place advertisements of alcoholic products, trademarks for goods and services, in areas located closer than 300 meters of direct visibility to the area of preschools, secondary schools and other educational establishments where minors are studying. The Resolution prohibits (6) advertising of alcoholic beverages, trademarks for goods and services, thorough activities of giveaway distribution, including for marketing researches and tasting; (7) sending messages by post, e-mail, on mobile phones, distribution of videodiscs, video materials, compact disks, computer and other games.

There are different penalties imposed for the message the advertisement is featuring. These cases include imposition of penalties (1) on an advertiser who provides unreliable information to a producer of an advertisement needed for its production; (2) for illustration of alcohol consumption process with involvement of persons under 18 years old as photo models to an advertisement; (3) for absence of warning text about harm caused by alcohol

[20] Law of Ukraine from September 22, 2011 No 3778-VI.

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consumption or its falling short of legislation requirements; (4) for placement of information in alcohol advertisements which directly or indirectly express a popular personality's approval for consumption of beer and beverages, based on beer; (5) for giving the impression that alcohol consumption is helping to solve personal problems or that most people drink alcoholic beverages.

2.3.3. Taxation of alcoholic beverages.

In Ukraine, the State Tax Service of Ukraine issues licenses for production and sale of alcoholic beverages. According to the "On Amendments to the Tax Code of Ukraine and the State Tax Service in Connection with Administrative Reform",[21] the State Tax Service of Ukraine has the following functions: to issue licenses for production of spirit and alcoholic beverages, wholesale trade of spirit, wholesale and retail trade of alcoholic beverages; to control production and turnover of spirits, alcoholic beverages and provide industry coordination; to work towards prevention of illegal production and turnover of alcoholic beverages; to control compliance of established minimum wholesale and retail prices by business entities.

Alcohol products in Ukraine are taxed during their production process and selling. There is an annual payment for a license for the production of alcoholic beverages which is 780 UAH. The license for wholesale trade of alcohol costs 500 000 UAH per year. The fee for retail trade license is 8000 UAH per year for each separate electronic control cash register in towns, 500 UAH – in villages; 780 UAH per year for each trade place (the Law of Ukraine "On State Regulation of Production and Turnover of Ethyl Alcohol, Cognac and Fruit, Alcoholic beverages and Tobacco Products"). This license is given for 5 years.

There are a number of grounds which allow local authorities to cancel a retail trade license. One of the most common grounds for revocation of a license is selling alcohol to

[21] Law of Ukraine from July 5, 2012 No 5083-VI.

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minors. A license can be also cancelled due to selling alcohol in inappropriate places, non-payment of regular fees for a license during 30 days from the moment of its suspension, and based on the own statement of a business entity (the Law of Ukraine "On State Regulation of Production and Turnover of Ethyl Alcohol, Cognac and Fruit, Alcoholic beverages and Tobacco Products").

In 2014, the Law of Ukraine "On Preventing Financial Disaster and Creating Conditions for Economic Growth in Ukraine"[22] increased tax rates on ethyl alcohol and other alcoholic distillates, beer and alcoholic beverages. The excise tax on beer made from malt increased by 42.5% to 1.24 UAH per liter from its 2012 level of 0.87 UAH per liter. The excise on vermouth and fortified wines increased from 2.86 UAH per liter to 3.58 UAH per liter, on sparkling wine from 4.16 UAH to 5.2 UAH per liter. Excise tax on spirit, spirit distillates increased from 56,42 UAH per liter of 100% spirit. The excise tax changes come into force from May 1, 2014 for beer and spirits and alcoholic beverages – from September 1, 2014. In addition, this law fixed value added tax on alcohol at 20%, and income tax rate at 18%.

The Law of Ukraine "On Amendments to the Tax Code of Ukraine on the Revision of Certain Taxes and Fees"[23] doubled penalties for business entities with regard to storage, production, transportation and realization of falsified alcohol products and products without excise duty stamp of established order or with falsified excise duty stamps. Thus, the penalty for these violations is 200 per cent of cost of good but is not lower than 8,500 UAH. Accordingly, the former penalty was 100 per cent of cost of good and not lower than 1,700 UAH.

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[22] Law of Ukraine from April 10, 2014 № 1200-VII.
[23] Law of Ukraine from November 20, 2012 № 5503-VI.

2.3.4. Limitations on consumption of alcoholic beverages.

The Law of Ukraine "On Amendments to Certain Legislative Acts of Ukraine Regarding the Limitation of Consumption and Sale of Beer and Soft Drinks"[24] established a ban on the consumption of (excluding non-alcohol), alcoholic and soft drinks in public places. To be more precise, the prohibition applies to education and training establishments, health care facilities, public transport (including transport of international traffic), underground passages, bus stops, cultural establishments, indoor sports centers (excluding in plastic container), elevators and public telephone, children playgrounds, athletic fields, premises of local governments and state governments, and other government agencies. According to articles 175 and 178 of the Code of Ukraine on Administrative Offences Violation[25], consumption of alcohol in forbidden places is punishable by an administrative sanction in the form of a warning or fee.

2.3.5. Drink-driving legislation and its enforcement.

According to the legislation of Ukraine (see the Law of Ukraine "On Road Traffic",[26] article 266 of the Code of Ukraine on Administrative Offences Violation, the resolution of the Cabinet of Ministers of Ukraine "About Approval of the Procedure for the Direction of Transport Drivers for Carrying Out Survey for the Purpose of Identification of the Condition of Alcoholic, Narcotic or Other Intoxication or Stay under the Influence of the Medicines Reducing Attention and Speed of Reaction, and Carrying out Such Survey"[27], the Order of the Ministry of Internal Affairs of Ukraine (MIA), Ministry of Health of Ukraine (MHU) "About Approval of the Instruction about Identification at Transport Drivers of Signs of Alcoholic, Narcotic or Other Intoxication or Stay under the Influence of the Medicines Reducing

[24] Law of Ukraine from January 01,2010 № 1824-VI.
[25] Code of Ukraine from December 07, 1984 № 8073-X
[26] Law of Ukraine from June 30, 1993 No. 3353-XII
[27] Resolution of the CMU from 12/17/2008 to N 1103

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Attention and Speed of Reaction"[28]), it is stipulated that a driver is to be surveyed for the purpose of identification of signs of alcoholic intoxication in case an authorized person of the Traffic Police has grounds to think, based on the signs of this condition, that the driver stays under the influence of alcohol. In addition, another case when Traffic Police have grounds and, actually, are obliged to survey for the purpose of identification of signs of alcoholic intoxication is if a driver is a participant of a road accident which caused injuries to other people.

The mentioned Order of the MIA and MHU stipulates that the indicator of alcohol concentration in blood should not exceed 0.2 per mille. In addition, the Order stipulates that traffic policeman carry out such a survey using special technical means, alcohol testers, which show concentration of alcohol in blood through breath-testing. In addition, additional testing on the concentration of alcohol in blood is made through medical examination by experts in narcology. According to Article 130 of the Code of Ukraine on Administrative Offences Violation, administrative violation of driving a vehicle under the condition of alcohol intoxication is punishable by a penalty amounting from 150 to 200 non-taxable minimum incomes or disqualification from driving a vehicle for a period from one to two years, or public works for a period from 40 to 50 hours, or administrative arrest for a period from 7 to 10 days.

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[28] Order of MIA and MHU from September 9, 2009 No. 400/666

Chapter 3. Results of cost-effectiveness analysis for alcohol control policies.

This chapter presents the results of cost-effectiveness analysis performed for five interventions: increased taxation level, reduced access to retail outlets, comprehensive advertising ban, brief advice in primary care and roadside breath testing. These results also include cost-effectiveness of a number of combinations of studied interventions.

The first section of this chapter starts with the presentation of effectiveness of individual interventions. The second section shows population-level effects of individual interventions. Average and incremental cost-effectiveness of interventions implemented individually and in combination are described in the third section. Uncertainty analysis is shown in the fourth section. The final section is devoted to policy implications of the main findings of the study.

3.1.Population-level effects of individual interventions.

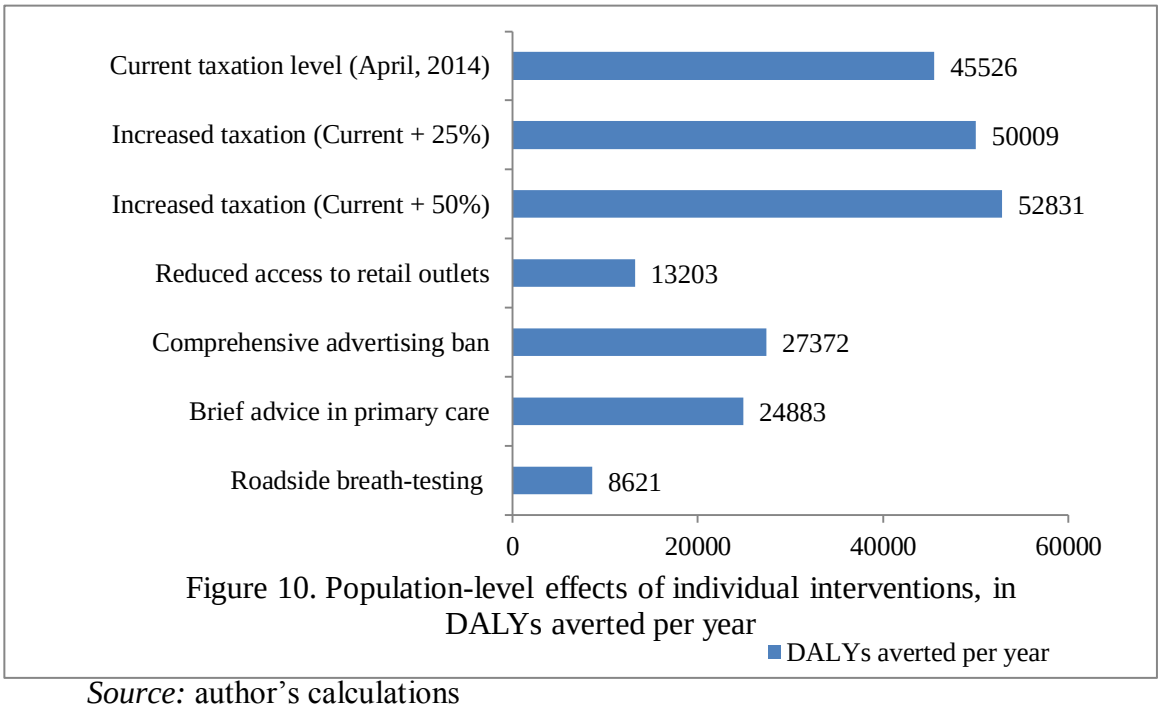

Figure 10. Population-level effects of individual interventions, in DALYs averted per year

Source: author's calculations

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Figure 10 above shows the comparative effects of individual alcohol interventions per year with respect to age-weighted and discounted DALYs saved. From all studied individual interventions, the most effective intervention is increasing the current (April, 2014) taxation level by 50%, which allows saving 52,831 DALYs every year a during 10-year period. The next most effective intervention is a comprehensive advertising ban which averts 27,372 DALYs per year, followed by brief advice in primary care saving 24,883 DALYs annually, and reduced access to retail outlets averting 13,203 annually. The least effective intervention is the road breath-testing which saves 8,621 DALYs annually.

3.2. Population-level costs of individual interventions.

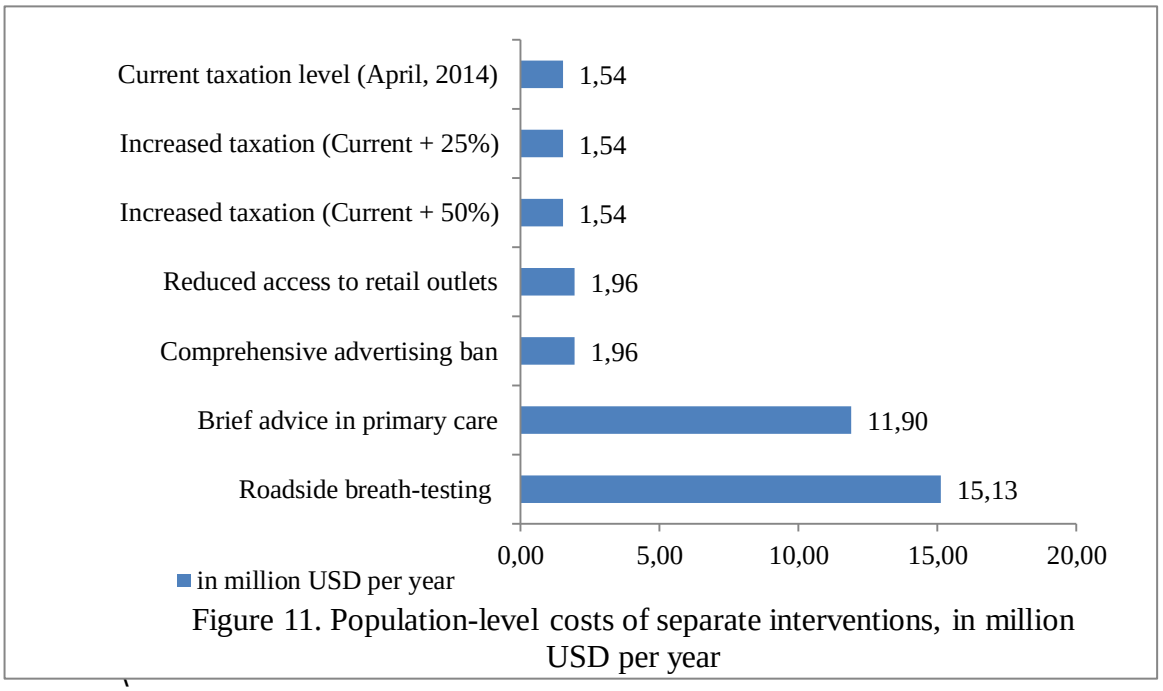

Figure 11. Population-level costs of separate interventions, in million USD per year

Source: author's calculations

Annual costs of individual interventions are presented in Figure 11. Roadside breath-testing and brief advice in primary case are the most expensive interventions to implement, 15.13 and 11.90 million USD per year, respectively. The comparatively high annual cost of enforcement of drink-driving laws via roadside breath-testing is explained by the high involvement of human resources, equipment and vehicles. Implementation of brief advice

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interventions is costly in patient level costs in the intervention provision – 11.26 million USD; training primary care providers – 0.38 million USD; and screening costs – 0.26 million USD. Regarding the other three alcohol policies, restricted access to sales outlets (1.96 million USD), comprehensive advertising ban (1.96 million USD) and taxation (1.54 million USD), their costs are associated with administration and legislation activities and enforcement of laws after they are passed.

3.3. Cost-effectiveness of alcohol policy measures in Ukraine.

Table 6 combines costs and effects data for a number of policy options for the prevention and reduction of hazardous alcohol use in Ukraine. These options cover both individual interventions and their combinations which are listed in the first column. The second column provides estimates of total costs per year presented in US Dollars; the third column shows health effects with regard to age weighted and discounted DALYs saved. The last two columns provide average and incremental cost-effectiveness ratios. According to the Commission on Macroeconomics and Health, all interventions and their combinations can be classified as "very cost-effective" since each of them produce one DALY for less than the GDP per capita which was 4002 USD in 2013.

According to the Table, among individual interventions, in preventing harm related to alcohol, the best use of available resources is implementation of increased taxation by 50% since it is comparatively cheap to implement and has large health effects on the population with the cost-effectiveness ratio of 29 US Dollars per DALY saved. Reduced access to retail outlets and a comprehensive advertising ban are also projected to be highly cost-effective measure which CER equals to 149 and 72, respectively. In comparison to other measures, brief advice intervention can have a big impact on population health, 24,483 DALYs saved annually, but it is relatively expensive to implement. As a result, it is not that as cost-effective

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Table 6. Cost, effects and cost-effectiveness of individual health interventions and their combinations in Ukraine.

Alcohol interventions	Annual cost, US Dollars	DALYs saved per year	Average CER (US Dollars per DALY saved)	Incremental CER (US Dollars per DALY saved)
Current situation	10 230 493	52926	193	Dominated
Current taxation (April, 2014)	1 539 448	45526	34	Dominated
Increased taxation (Current + 25%)	1 539 448	50009	31	Dominated
Increased taxation (Current + 50%)	1 539 448	52831	29	29
Reduced access to retail outlets	1 962 469	13203	149	Dominated
Comprehensive advertising ban	1 962 469	27372	72	Dominated
Brief advice in primary care	11 902 541	24883	478	Dominated
Roadside breath-testing	15 127 291	8621	1 755	Dominated
Combination 1: Increased tax and scaled-up RBT	15 833 402	60223	263	Dominated
Combination 2: Increased tax and Advertising Ban	3 326 821	78599	42	69
Combination 3: Increased tax and Brief advice	13 126 702	76159	172	Dominated
Combination 4: Increased tax + Ad Ban + Brief advice	14 653 108	101933	144	Dominated
Combination 5: Increased tax + Brief Advice + Ad ban + Reduced access	16 517 453	112374	147	391
Combination 6: Increased tax + Brief Advice + Ad ban + Reduced access + scaled-up RBT	30 888 380	116757	265	3 279

Source: author's calculations

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(CER equals to 478) as the previously mentioned interventions. A relatively least cost-effective intervention is road breath-testing with the average CER of 1,807 US dollars per DALY averted.

Since WHO-CHOICE framework incorporate interactions between costs and effects of interventions implemented simultaneously, it is useful to consider the cost-effectiveness of different combinations of interventions. If combinations considered, the most cost-effective combination is one consisting of increased taxation intervention and advertising ban. If implemented simultaneously, these interventions allow economizing 1.7 million US Dollars on total costs and have combined CER ratio of 42 US Dollars per DALY saved. The 3, 4, 5 combinations have approximately the same CER ranging from 144 to 172 US Dollars per DALY averted. After this combination follows the combination of increased taxation and scaled-up roadside breath-testing which have the CER of 263 US Dollars per DALY averted. And the relatively least cost-effective strategy is combination which involves all studied interventions with the CER equals to 265 US Dollars per DAILY averted while the level of healthy years gained is the highest among all possible strategies.

Figure 12 below plots total health effects and total costs of each individual intervention and combined interventions for a period of 10 years based on point estimates. The blue line, the expansion path, plots the rising costs of averting an extra DALY as cost-effectiveness of interventions decreases (as the slope of the line becomes steeper, so the costs per DALY averted increase). This line connects the most cost-effective alcohol policies which would be selected to obtain greatest health effect given growing levels of available resources. Thus, interventions located on the left of this are relatively more expensive and/or less effective. Along the line, initially goes single interventions and then their combinations. The most cost-effective individual and combined interventions are those that occur on the points of the blue line when its slope becomes steeper.

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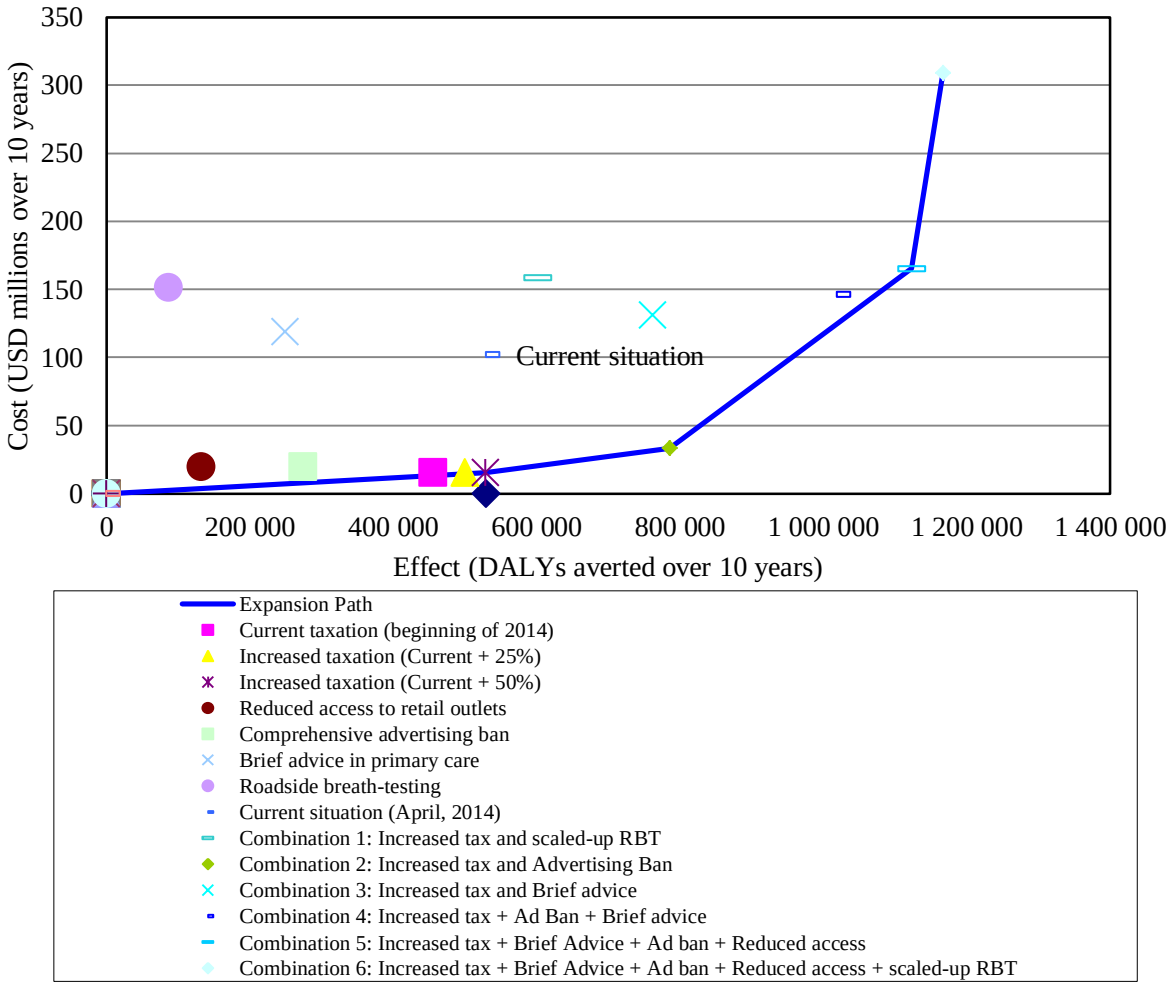

Figure 12. Cost-effectiveness of interventions and selection order in accordance with incremental CER (author's elaboration)

Source: author's calculations

The first point where the slope of the line becomes steeper is increasing taxation by 50%, and, as a result, it is the most cost-effective strategy at the budget level of 15.4 million USD over 10 years. The second point where the slope of the line becomes steeper is the policy option which combines increased tax and comprehensive advertising ban at the budget level of 33.3 million USD. If more resources became available, the combination 5 of increased tax, brief interventions for heavy drinkers, comprehensive advertising ban and reduced access to retail outlets should be implemented at the budget level of 165.2 million USD; and combination 6 of increased taxation, brief interventions, and comprehensive

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advertising ban, reduced access to retail outlets and scaled-up road breath-testing which represents all interventions of this study – at the budget level of 308.9 million USD annually.

It is worth pointing out that the current mix of interventions does not lie on the expansion path which indicates that room for improvement exists in terms of cost-effectiveness and more DALY can be saved by reallocating current resources. In addition, incremental and average CER for the most-cost-effective interventions are demonstrated in Figure 13.

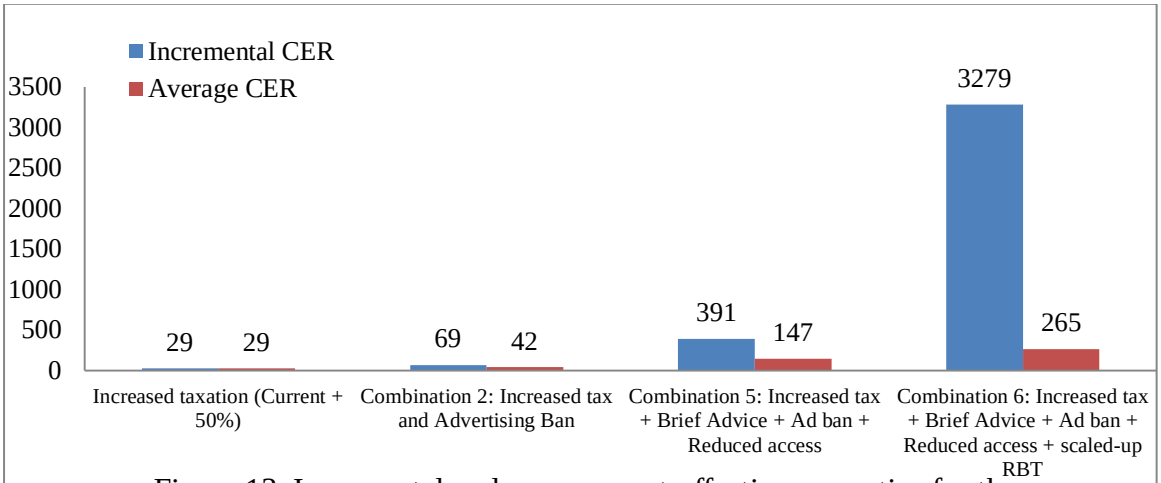

Figure 13. Incremental and average cost-effectiveness ratios for the most efficient alcohol interventions.

Source: author's calculations

Thus, the most cost-effective intervention among all studied interventions is increased taxation by 50% (29 USD per DALYs saved). The next best choice would be to add an advertising ban to this tax increase with an incremental cost-effectiveness ratio of 69 USD per DALY saved additionally, followed by the addition of brief advice in primary care and reduced access to retail outlets (391 USD per additional DALY averted). A full combination of increasing taxation, comprehensive advertising ban, brief advice in primary care, reduced access to retail outlets, road side breath testing was evaluated to have an incremental cost-effectiveness ratio of 3,279 USD per additional DALY averted.

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3.4. Uncertainty analysis.

The results of the sensitivity analysis are presented in Table 7. As can be seen all interventions remain "very cost-effective" under all presented conditions. Usage of unadjusted DALYs (without age weighting and discounting) increase total effectiveness by 48% of all interventions and their combinations, and, thus, alter average CERs for the interventions downward by 28%. In addition, under unadjusted DALYs, the rank order of cost-effectiveness changed in one case – reduced access to retail outlets intervention moved up by one place relegating combination 5 to the eighth position. In the best case scenario, total costs were lower by 15% and total effects 15% higher than base case results, by this means decreasing the average cost per unit of health outcome for all interventions and their combinations by 23%. In contrast, in the worst case scenario, the average cost per DALY averted increased by 30%. Under both scenarios the rank order of interventions did not change.

Table 7. Outcomes of sensitivity analysis on average cost-effectiveness ratio.

Intervention / combination of interventions	Age weighted, discounted	No age weight, undiscounted	Worst-case scenario	Best-case scenario
Current taxation (April, 2014)	34	23	46	25
Increased taxation (Current + 25%)	31	21	42	23
Increased taxation (Current + 50%)	29	20	39	22
Reduced access to retail outlets	149	101	201	110

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Intervention / combination of interventions	Age weighted, discounted	No age weight, undiscounted	Worst-case scenario	Best-case scenario
Comprehensive advertising ban	72	49	97	53
Brief advice in primary care	478	354	647	354
Roadside breath-testing	1 755	969	2 374	1 297
Combination 1: Increased tax and scaled-up RBT	263	174	356	194
Combination 2: Increased tax and Advertising Ban	42	29	57	31
Combination 3: Increased tax and Brief advice	172	121	233	127
Combination 4: Increased tax + Ad Ban + Brief advice	144	100	194	106
Combination 5: Increased tax + Brief Advice + Ad ban + Reduced access	147	102	199	109
Combination 6: Increased tax + Brief Advice + Ad ban + Reduced access + scaled-up RBT	265	181	358	196

Source: author's calculations

Afterwards, these data ranges were entered into probabilistic sensitivity analysis which revealed the uncertainty around point estimates. Figure 14 provides a cloud graph for each individual intervention and combined intervention policies in Ukraine showing a very wide range of possible point estimates for the expansion path and areas of overlap between uncertainty intervals. Thus, there is a lot of uncertainty around choice of alcohol control

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policies. One of the solutions is to use a stochastic league table made by the MCLeague software. Figure 15 presents the probability that an individual or combined intervention would be chosen to achieve maximum health effect at a given level of available budget resources, making a stochastic budget expansion path. Numbers of interventions shown in the expansion path of Figure 15 correspond to the numeration of interventions and their combinations of Figure 14.

According to Figure 15, at the budget level of 29 million USD and less over 10 years an intervention of increased current taxation level by 50% is selected with a probability ranging from 0.25 to 0.44 of being most cost-effective. As the budget available rises to the level of 149 million USD, combination 2 of increased taxation and advertising ban is selected in a range of 0.5-0.96 probability of being most cost-effective. At the budget level range of 164 – 194 million USD, combination 4 of increased taxation, advertising ban and brief advice is chosen in a range of 0.39-0.49 probability of being most cost-effective. If budget available over 10 years is between 209 and 389 million USD, combination 5 is selected in a range of 0.45-0.64 probability of being most cost-effective. At the budget level of 404-449 million USD, combination 6 is selected with a probability ranging from 0.43 to 0.47 of being most cost-effective.

3.5. Policy implications.

This cost-effectiveness analysis has two main implications for the policy debate on alcohol control policies in Ukraine. First, it is worth pointing out that the current mix of interventions does not lie on the budget expansion path. This means that current budget spending could be used more efficiently and more DALYs could be averted by using resource re-allocation for increasing levels of taxation on alcoholic beverages, enhancing enforcement and coverage levels of existing interventions.

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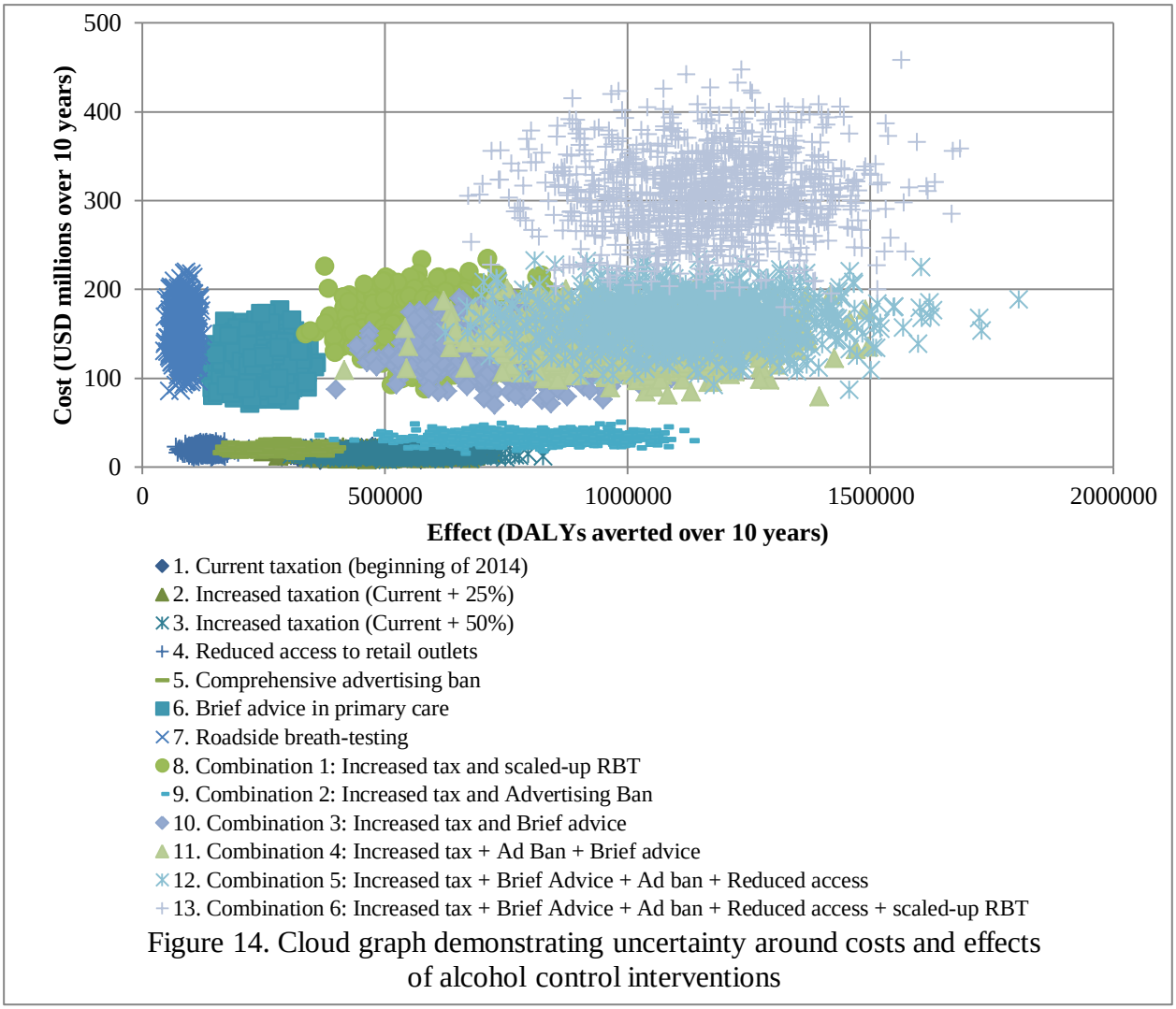

Figure 14. Cloud graph demonstrating uncertainty around costs and effects of alcohol control interventions

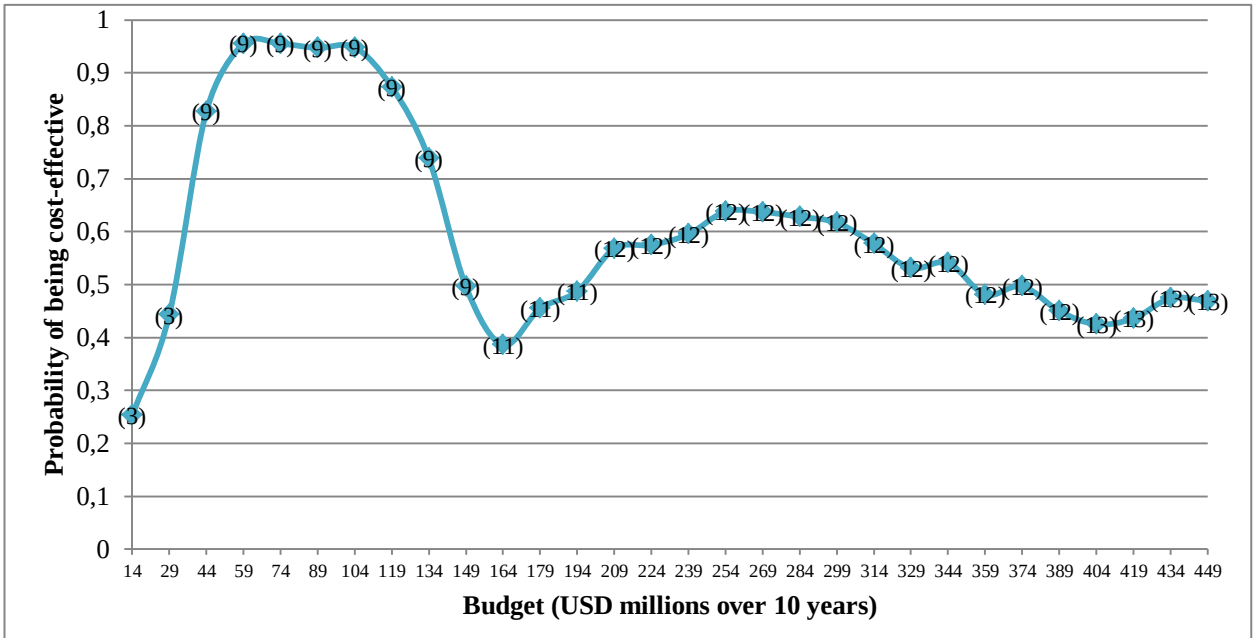

Figure 15. Stochastic budget expansion path

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Second, the findings of this analysis provide policy makers with economic evidence on what health policies can be implemented to reduce harmful alcohol consumption in Ukraine, which polices are the most cost-effective and how they should be prioritized if additional financing is available. The most cost-effective policy to be chosen is increasing taxation of alcoholic beverages by 50% compared to the level of April, 2014 which can avert 528,306 DALYs over 10 years with the required budget of 15.4 million USD for this period. As more financing is available, less efficient interventions can be added into the mix of implemented interventions. Thus, health polices which combine different interventions should be selected in the following order, depending on availability of financing:

1) policy combining increased taxation and comprehensive advertising ban which can avert 785,985 DALYs over 10 years at the budget level of 33.3 million USD;
2) policy combining increased taxation, brief advice in primary care, comprehensive advertising ban, and reduced access to retail outlets that can save 1,123,739 DALYs over 10 years at the budget level of 165.2 million USD;
3) policy combining increased taxation, brief advice in primary care, comprehensive advertising ban, reduced access to retail outlets, scaled-up road breath-testing. This policy option, which represents all studied interventions, can avert 1,167,566 DALYs at the budget level of 308.9 million USD.

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Conclusion

Results of the analysis show that all studied interventions and their combinations are "very cost-effective". According to the WHO's Commission on Macroeconomics and Health, an intervention that produces one DALY for less than GDP per capita are considered as "very cost-effective". Therefore, merely from a cost-effectiveness point of view, all studied interventions and their combinations can be advised in the context of Ukraine. However, it should be noted that cost-effectiveness information is only one consideration in decision-making in health. It would be useful also to determine the role of different interventions to other socially important goals, e.g. protection of the vulnerable, or empowerment of the disadvantaged.

In current Ukrainian settings, the most cost-effective policy option for reducing hazardous alcohol consumption is increased taxation on alcoholic beverages (29 US Dollars per DALY averted). Since consumers responds to price changes of alcoholic beverages, increased excise taxation or other taxes on alcoholic beverages can effectively increase prices to strengthen the tendency of decreasing alcohol consumption in Ukraine. Of all interventions, taxation has the highest health impact and requires the lowest level of resources needed for its implementation. Even after allowing for an estimated increase of 20% in smuggling or illicit production, increasing taxation from its current level remains a favorable policy option for public health.

Adding a comprehensive advertising ban to the tax intervention would be the next most efficient choice (69 USD per additional DALY averted), followed by the addition of brief advice in primary care and reduced access to retail outlets (391 USD per additional DALY averted). A full combination of increasing taxation, comprehensive advertising ban, brief advice in primary care, reduced access to retail outlets, road side breath testing was

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evaluated to have an incremental cost-effectiveness ratio of 3,279 USD per additional DALY averted.

Uncertainty analysis was implemented which showed the effect of uncertainty on the interpretation of the results. It was checked how changes in analytical choices (discounting and age-weighting) and data would impact relative order of cost-effectiveness. Under unadjusted DALYs (without age weighting and discounting), rank order of cost-effectiveness changed in one case - reduced access to retail outlets moved up by one place relegating combination 5 to eighth position. Under worst and best case scenarios, rank order of interventions and their combinations did not change. In addition, probabilistic, multivariate sensitivity analysis showed that combination 4 of increased taxation, comprehensive advertising ban, and brief advice in primary care has the possibility to be included into the budget expansion path.

This study has several limitations which are related to the quality of the input data. First, no national data on epidemiology of hazardous alcohol consumption with respect to the studied risk factor of hazardous alcohol use was available. This is why regional estimates of disease epidemiology were adjusted to reflect the situation in Ukraine. Second, while there was much of local data on costs used, there was no information available on country-specific effectiveness of studied interventions in Ukraine, and effectiveness estimates were obtained from international literature.

The results are consistent with estimates of Chisholm et al. (2004) for the WHO European Region C, which includes Ukraine, but better reflect the Ukrainian context. The rank order of most cost-effective among individual interventions for Ukraine was changed in one case – comprehensive advertising moved up by one place relegating reduced access to retail outlets to fifth position. After adjusting price levels of different studies to make them

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comparable, average cost-effectiveness ratios for Ukraine were shown to be significantly lower than regional estimates mostly due to lower costs, except for the intervention of roadside breath testing. Breath testing is more expensive in Ukraine in terms of unit cost per DALY averted. These differences emphasize the importance of using country-specific data to support formation of national alcohol control policy.

Thus, contextualization has improved applicability of WHO-CHOICE results for health decision-making at the country level. This process gave valuable insights into current interventions to reduce hazardous alcohol consumption in Ukraine and showed cost-effective steps which should be taken to reduce the burden of disease caused by alcohol consumption.

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