



Costs, health effects and cost-effectiveness of alcohol and tobacco control strategies in Estonia

Taavi Lai^{a,b,*}, Jarno Habicht^c, Marge Reinap^d, Dan Chisholm^e, Rob Baltussen^{f,g}

^a Department of Public Health, University of Tartu, Estonia

^b Estonian Centre of Behavioural and Health Sciences, Estonia

^c WHO Country Office in Estonia, World Health Organization Regional Office for Europe

^d Department of Public Health, Ministry of Social Affairs, Estonia

^e Department of Health System Financing, World Health Organization

^f Institute for Medical Technology Assessment, Erasmus Medical Centre Rotterdam, The Netherlands

^g Department of Public Health, Radboud University Nijmegen Center, The Netherlands

Abstract

Objective: To assess the population-level costs, effects and cost-effectiveness of different alcohol and tobacco control strategies in Estonia.

Design: A WHO cost-effectiveness modelling framework was used to estimate the total costs and effects of interventions. Costs were assessed in Estonian Kroon (EEK) for the year 2000, while effects were expressed in disability-adjusted life years (DALYs) averted. Regional cost-effectiveness estimates for Eastern Europe, were used as baseline and were contextualised by including country-specific input data.

Results: Increased excise taxes are the most cost-effective intervention to reduce both hazardous alcohol consumption and smoking: 759 EEK (€49) and 218 EEK (€14) per DALY averted, respectively. Imposing additional advertising bans would cost 1331 EEK (€85) per DALY averted to reduce hazardous alcohol consumption and 304 EEK (€19) to reduce smoking. Compared to WHO-CHOICE regional estimates, interventions were less costly and thereby more cost-effective in Estonia.

Conclusions: Interventions in alcohol and tobacco control are cost-effective, and broad implementation of these interventions to upgrade current situation is warranted from the economic point of view. First priority is an increase in taxation, followed by advertising bans and other interventions. The differences between WHO-CHOICE regional cost-effectiveness estimates and contextualised results underline the importance of the country level analysis.

© 2007 Elsevier Ireland Ltd. All rights reserved.

Keywords: Cost-effectiveness; Health intervention; Alcohol consumption; Smoking; WHO-CHOICE; Contextualisation; Population health; Estonia

1. Introduction

1.1. Epidemiological background

Since regaining independence in 1991, Estonia has experienced a period of rapid economic transition,

* Corresponding author at: Department of Public Health, University of Tartu, Ravila 19, Tartu 50411, Estonia. Tel.: +372 7374190; fax: +372 7374192.

E-mail address: taavi.lai@ut.ee (T. Lai).

which, among other things, has had a strong effect on health behaviour. As many as 58% of all males and 26% of all females in the age group 30–59 were daily smokers in the mid-1990s [1], and this has increased since then, especially among females [2]. Smoking is also common among adolescents: 23% of all boys and 12% of all girls were daily smokers in 2002, and a rapid increase is observed among girls [3]. In addition, passive smoking also shows an increase [4].

The trend in alcohol consumption during the last decade in Estonia has been quite similar to that for smoking, except that recent increases in consumption have mainly taken place among males. Regular intake of strong alcoholic beverages and binge drinking are considered common in Estonian society: 43% of males and 10% of females were estimated to have had at least one episode of binge drinking in 2000 [5]. Another similarity with respect to changes in alcohol and tobacco consumption is the worrisome increase of hazardous alcohol consumption among the adolescent population, including girls [6].

For an in-depth analysis of this health situation, a large-scale Burden of Disease study was carried out in Estonia in 2003 [7]. Almost 400,000 years of healthy life – as measured by disability-adjusted life years (DALYs) – are lost annually by the 1.3 million people living in Estonia, with the largest share of disease burden attributable to cardiovascular diseases (~33%), cancers (~20%) and a variety of external causes (~12%) such as traffic accidents. Each of these leading contributors to disease burden is influenced by smoking, alcohol consumption or both. From a population-level perspective, it is especially noteworthy that the bulk (60%) of this burden applies to the working age population. The same study showed that smoking and hazardous alcohol consumption *each* contribute 7–8% of the total burden of disease in Estonia. Smoking alone accounts for almost 40% of the burden of disease of cardiovascular diseases and cancers [8]. It is therefore essential to target interventions toward these two behavioural health risks, since they represent promising sources of gain in population health.

Cost-effectiveness analysis has often been proposed as a tool for guiding resource allocation choices in health, and can be useful in identifying efficient ways of reducing the public health burden of smoking and hazardous alcohol abuse. While economic analysis is well developed in many EU member states [9,10], the

new member states have yet to develop significant capacity in this area. Partly in response to this, the World Health Organization (WHO) has initiated the WHO-CHOICE project (CHOosing Interventions that are Cost Effective; <http://www.who.int/choice>), which aims to provide information on costs, health effects and cost-effectiveness for a large set of interventions for different disease areas in epidemiologically different sub-regions of the world [11,12]. It also provides guidance and tools to contextualise results to the country level [13,14].

The WHO-CHOICE project has evaluated interventions targeting smoking and hazardous alcohol use for the Eastern-European region, including countries like Latvia, Lithuania and Russia [15–17]. These regional results could be employed to support policy making in Estonia but the use of country-specific data would be more desirable since different health system characteristics and epidemiological profiles in big countries like Russia have a disproportionate impact on regional results and hence may reduce the usability of these results for smaller populations [18,19].

1.2. Policy background

There have been rapid changes in tobacco and alcohol policy in Estonia over the last 20 years. In the late 1980s, a wide-ranging set of restrictions on access to alcohol were introduced as part of Gorbachev's *perestroika* reforms [20], only for these to be changed back to the previous legislative environment just a few years later [21], including lowering of the legal alcohol purchasing age from 21 years to the current 18 years. Tobacco prices have been gradually increasing from the mid-1990s, since when the average growth of tobacco prices in real terms has exceeded 5% per year and the legislative environment has become more and more restrictive. The ban of direct advertisement has been enforced on tobacco-related products since 1998. In addition, several access restrictions have been introduced, such as a ban in 2001 on vending machines and sales of single cigarettes [22]. Smoke-free public areas were also introduced in 2001, and further bans are now being gradually implemented since the new tobacco act came into force in 2005.

Over the past decade, the price of alcoholic products has been increased modestly when compared to prices of other goods. Access to these alcoholic products is

not regulated nation-wide, although some municipalities have applied time restrictions on sales. The current alcohol advertising regulations are partial, e.g. there is a ban on strong alcohol advertising in electronic media in the evenings but no restriction of advertising of lighter alcoholic beverages (there is also great variation between national media channels and other commercial satellite and cable TV channels with regard to the implementation of these bans). Measures against drunk-driving such as random breath tests have been widely applied and there is a no-tolerance policy for blood alcohol levels. Whether it is tobacco and alcohol consumption, personal interventions such as counselling by health care providers are not widely practiced [23].

1.3. Aim of the study

To take into account those limitations of the regional results, this paper presents the costs, health effects and cost-effectiveness of interventions to reduce smoking and hazardous alcohol use in Estonia based on locally available data. In so doing, the paper shows how to utilize existing WHO-CHOICE tools and adapt region-level information down to the national level. On the basis of its results, the paper makes a number of policy recommendations for tobacco and alcohol control in Estonia that take into account the current epidemiological patterns and interventions analysed.

2. Methods

2.1. Methodological framework

All analyses followed the standard WHO-CHOICE methodology, as described in detail elsewhere [11,24]. The results of the WHO-CHOICE regional cost-effectiveness analysis to reduce smoking and hazardous alcohol abuse are also described in detail elsewhere [16,17]. There are, however, some important features of WHO-CHOICE worth stressing here.

First, all interventions are evaluated against a ‘do nothing’ counterfactual: all interventions are compared to a situation where no interventions exist, which importantly enables the evaluation of current as well as new interventions. In addition, interventions are evaluated both in isolation and in combination with

each other [24]. Second, the time-period of intervention implementation is 10 years but the model-population is followed for 100 years to record all possible effects of the intervention [24,25]. Third, intervention effects are expressed in disability-adjusted life years (DALYs) averted – which can be seen as the inverse of healthy years of life gained – and are discounted at a rate of 3% (age-weights, which give greater value to healthy years lived by people in middle-age and less to old and young people, were not employed in this analysis). Fourth, cost calculations are made using an ‘ingredients’ approach in which the quantities of resource needed to start up and maintain intervention programmes are quantified separately from their respective prices or unit costs. Intervention costs derived in this way are discounted (at a rate of 3%) and are presented in Estonian Kroons (€1 is equivalent to 15.6 EEK).

The contextualisation process was carried out using the automated WHO-CHOICE tools which are available through the project website (<http://www.who.int/choice/en>). These tools are explicitly developed to contextualise regional results to the country level, and guide data collection and analysis, where validated national information was available.

2.2. Data

Data on health behaviour and prevalence of health risks originated from a major postal health survey carried out in the Estonian general adult population in 2002 [26]. Mortality data (by gender and 1-year age groups) were derived from a mortality registry of the Estonian Statistical Office [26,27], while morbidity-related rates (e.g. incidence and prevalence of smoking-related diseases like ischemic heart disease, cerebrovascular disease and chronic obstructive pulmonary disease) were based on a review of the scientific literature [4,26,28–31]. Disability weights used for DALY calculation originate from the Estonian burden of disease study [7].

All patient-related costs (such as the cost of a hospital outpatient attendance) were calculated using data from an Estonian Health Insurance Fund database, while the cost of nicotine gum was calculated from the drug price lists of local wholesale companies [32,33]. Programme costs, i.e. resources needed for administration and enforcement of the intervention, plus training of the personnel or media coverage, were

acquired from the Ministry of Social Affairs, the governing body responsible for public health intervention administration and supervision in Estonia. With the exception of brief physician advice for heavy drinkers and nicotine replacement therapy for smokers, the cost of interventions are solely made up of programme costs. Throughout the analysis the societal perspective was used in cost calculations. Hence, the increased tax revenues and other financial transfers were not taken into account as these resources are still there in the population while the location of those was changed.

2.3. Estimating the impact of interventions

2.3.1. Alcohol control

This analysis considers five intervention strategies capable of reducing the burden of heavy alcohol use—together with associated combinations [16,34,35]: excise tax on alcoholic beverages; reduced access to alcoholic beverage retail outlets; a comprehensive advertising ban (TV, radio and billboards) on alcoholic products; roadside breath-testing for blood-alcohol content in motor vehicle driver; and brief interventions involving counselling to at-risk drinkers by a primary care physician. Derivation of effect sizes are only briefly described here (and summarised in Table 1), with a more detailed description provided elsewhere [16].

Excise taxation on alcoholic beverages primarily affects the incidence of drinking via reduced consumption, with effects measured in terms of price elasticity (estimated to be -0.4 to -0.5 for spirits and beer, respectively, and -1.2 for wine) [34,36; Estonian Institute of Economic Research, personal communication], which relates the change in consumption to the size of the price increase. Both the current rate of excise tax, i.e. taxation level of 2004 when the study was initiated, as well as increases to the current rate (of 25% and 50%) were evaluated, adjusted for observed or expected level of unrecorded use [23; Estonian Institute of Economic Research, personal communication] (taken as a close proxy measure for untaxed consumption).

Evidence from Scandinavia and elsewhere [37,38], has shown the potential impact of advertising bans and reduced access on the incidence of hazardous drinking and harmful alcohol-related consequences such as road traffic accidents to be approximately 3%; lack of local data led to the reliance on prior regional estimates (see Table 1). Counselling in primary care on the other hand is intended to reduce disability and, principally, reduce the time spent with the condition. Evidence from trials indicates that brief interventions improve the rate of recovery by 15–20% [16,34] for the covered population. However, after taking into account real-world effect modifiers, including treatment adherence (70%) and target coverage in the population (25%

Table 1

Population-level effectiveness of interventions for reducing hazardous alcohol consumption (change in % compared to null-situation)^a

Intervention	General population	Heavy alcohol users			
	Residual mortality ^b	Incidence ^c	Remission	Case-fatality ^d	Disability
Main target of intervention					
Current scenario	-1.1%	-7.1%		-0.9%	
Current taxation		-7.1%			
Increased taxation (25%)		-7.9%			
Increased taxation (50%)		-8.9%			
Roadside breath-testing	-1.9%			-1.7%	
Reduced access to retail outlets	-0.2%	-2.5%		-0.1%	
Advertising ban		-3.0%			
Brief advice in primary care			2.4%		-0.8%

^a Primary targets of interventions are depicted. Both primary and secondary effectiveness (e.g. changes of remission, case fatality and disability) are followed up using population model for 100 years of which the intervention is applied for the first 10 years.

^b Residual (or background) mortality is the general rate of mortality minus the cause-specific rate of mortality.

^c Incidence of heavy alcohol use—No. of new alcohol users with heavy consumption, e.g. people taking up heavy alcohol use for the first time.

^d Case fatality is the rate of death among people who already have a condition.

of hazardous drinkers), population-level remission was estimated to be 2.4% better than untreated natural history rates.

Drink-driving laws and reinforcement influence fatal and non-fatal traffic injuries, both among hazardous alcohol users and other sub-groups of the population (passengers, pedestrians). Enforcement via random breath testing (RBT) is estimated to reduce fatalities by 18% and non-fatal injuries by 15% if fully implemented [39].

2.3.2. Tobacco control

In most countries some form of government action, including taxes and legislation, has been enacted to control tobacco consumption. Countries that have adopted comprehensive tobacco control programmes involving a mix of interventions including a ban on tobacco advertising, strong warnings on packages, controls on the use of tobacco in indoor locations, high taxes on tobacco products, and health education and smoking cessation programmes have had considerable success. The costs and effects of each of these strategies have been assessed at the regional level [17] and were also considered here (see Table 2 for an overview of effects). All smoking interventions analysed are targeted against incidence and prevalence of smoking, which results in decreased incidence of tobacco related diseases like ischemic heart disease (IHD), chronic obstructive pulmonary disease (COPD) and stroke.

Taxation increases the price to the consumer of tobacco products, leading to a decrease in consumption. The effect of price changes on consumption is estimated from information about price elasticities of demand for tobacco products, which in the Estonian

context [40] reveals that for every 10% real rise in price due to tobacco taxes, tobacco consumption generally falls by 3.4%, with decreases relatively larger for young smokers (4.25%). Both the current level of tax, i.e. taxation level of 2004 when the study was initiated (equivalent to 49% of retail price) and an increased rate (60%) were assessed.

Concerning comprehensive advertising bans, the evidence for a significant effect on consumption is somewhat stronger than for alcohol (a 5% drop in incidence of smoking, i.e. number of new smokers, was modelled). For clean indoor air laws, estimates were taken from a systematic review [41], which showed a 29% drop in consumption where such laws had been rigorously enforced; assuming that 35% of all smoking currently occurs in indoor public places, this leads to a potential decrease of 5% in the incidence of smoking among male smokers, and 2.4% among female smokers.

Nicotine replacement therapy (NRT) was estimated to reduce the incidence of smoking by 6% [42], applied to 50% of adult smokers aged 15–59 years.

2.4. Validation of data and intervention effectiveness

The entire set of interventions and associated input parameters were evaluated by a group of Estonian experts on epidemiology, statistics, public health and economics. Covered topics included available evidence, validity of evidence and best approach for contextualisation. Some minor changes were proposed by the group and introduced into the input data to improve the representation of the current

Table 2
Population-level effects of interventions for smoking related burden of disease (change in % compared to null-situation)^a

Intervention	General population (residual mortality ^d)	IHD ^b and COPD ^c (incidence)	Cerebro-vascular disease (incidence)
Current situation (%)	–7.0	–13.6	–6.1
Tax (increased rate) (%)	–8.3	–15.9	–7.3
Clean indoor air law enforcement (%)	–4.3	–8.7	–3.7
Nicotine replacement therapy (%)	–5.4	–8.3	–3.4

^a Primary targets of interventions are depicted. Both primary and secondary effectiveness (e.g. changes of remission, case fatality and disability) are followed up using population model for 100 years of which the intervention is applied for the first 10 years.

^b Ischemic heart disease.

^c Chronic obstructive pulmonary disease.

^d Residual (or background) mortality is the general rate of mortality minus the cause-specific rate of mortality.

epidemiologic situation and intervention costs. Additional information on contextualisation process and data sources is available from the website of Estonian Ministry of Social affairs [8,43].

2.5. Uncertainty analysis

Uncertainty analysis of population-level estimates of intervention costs and effects was performed using best and worse case scenarios incorporating upper and lower estimates of total intervention cost and effectiveness as described by Chisholm et al. [16].

3. Results

Interventions targeting hazardous alcohol consumption can annually avert 1000–3000 DALYs when implemented individually, and almost 7500 DALY when implemented in combination. Interventions targeting smoking behaviour can annually save between 6000 and 13,000 DALYs, and when implemented in combination, this increases to 30,000 DALYs (Tables 3 and 4).

The least costly interventions were all legislative in their nature, including taxation and advertising bans. The annual costs of implementing these legislative interventions ranged from EEK 1.5 to 3 million, and are thereby significantly cheaper than personal intervention strategies such as brief interventions in primary care (EEK 12 million) and nicotine replacement therapy (EEK 21 million), which involve additional resources at patient level.

Costs, health effects and cost-effectiveness ratios of all evaluated interventions for hazardous alcohol consumption are shown in Table 3. The most cost-effective intervention is taxation at a 50% increased level (EEK 759 per additional DALY averted). Adding an advertising ban to this tax increase would be the next most efficient choice (an incremental cost-effectiveness ratio of EEK 1331 per DALY averted). A full combination of increased taxation, advertising ban, brief advice, reduced access to retail outlet, and road-side breath testing was estimated to have an incremental cost-effectiveness ratio of EEK 7152 per DALY averted. Fig. 1 plots the total costs and effects of each single and combined intervention. The lower right boundary of this plot represents the increasing incremental cost

Table 3
Costs, effectiveness and cost-effectiveness of alcohol control strategies in Estonia

No.	Intervention	Cost per year (EEK, millions)	DALYs averted per year	ACER ^a (EEK per DALY saved)	ICER ^b (EEK per DALY saved)
1	Current situation (beginning of 2005)	8.4	3214	2,621	Dominated
2	Current taxation (beginning of 2005)	2.3	2452	958	Dominated
3	Increased taxation (current + 25%)	2.3	2727	861	Dominated
4	Increased taxation (current + 50%)	2.3	3096	759	759
5	Reduced access to retail outlets	1.8	1009	1,810	Dominated
6	Comprehensive advertising ban	1.5	1036	1,408	Dominated
7	Brief advice in primary care	12.1	1035	11,739	Dominated
8	Roadside breath-testing (fatal injuries)	11.8	1599	7359	Dominated
9	Roadside breath-testing (including non-fatal injuries)	11.8	1950	6,034	Dominated
10	Increased tax and roadside breath-testing	13.4	4944	2,711	Dominated
11	Increased tax and Ad ban	3.6	4049	893	1331
12	Increased tax and brief advice	14.0	4048	3,464	Dominated
13	Increased tax, Ad ban and brief advice	15.2	5011	3,035	Dominated
14	Increased tax, Ad ban, brief advice and reduced access	16.9	5866	2,888	Dominated
15	Increased tax, Ad ban, brief advice, reduced access and roadside breath-testing	28.1	7475	3,762	7152

^a Average cost-effectiveness ratio.

^b Incremental cost-effectiveness ratio, i.e. ratio of additional cost per additional life-year saved when next intervention is added to a mix.

Table 4
Costs, effectiveness and cost-effectiveness of tobacco control strategies in Estonia

No.	Intervention	Cost per year (EEK, millions)	DALYs averted per year	ACER ^a (EEK per DALY saved)	ICER ^b (EEK per DALY saved)
1	Current situation (beginning of 2005)	2.8	9,633	292	Dominated
2	Increased taxation	2.8	12,908	218	218
3	Advertising ban	2.2	6,841	323	Dominated
4	Clean indoor air law	2.8	6,292	447	Dominated
5	Nicotine replacement therapy	21.0	6,194	3398	Dominated
6	Increased tax and Ad ban	4.8	19,354	247	304
7	Increased tax and clean indoor law	5.3	18,816	284	Dominated
9	Increased tax, Ad ban and clean indoor law	7.4	25,260	295	453
8	Increased tax and nicotine replacement therapy	22.7	18,720	1211	Dominated
10	Combination of all interventions	27.4	30,623	896	3728

^a Average cost-effectiveness ratio.

^b Incremental cost-effectiveness ratio, i.e. ratio of additional cost per additional life-year saved when next intervention is added to a mix.

of saving one additional DALY and indicates the most efficient way of combining different strategies. Interventions to the north-west of this cost-effectiveness frontier or expansion path are ‘dominated’, i.e. they are less effective and/or more costly than (a combination of) other interventions.

The most cost-effective intervention for smoking reduction is an increase in taxation from 49% of consumer price to 60%, costing EEK 218 per DALY averted (Table 4). The next best choice would be to add comprehensive advertising ban with EEK 304 per DALY averted additionally, followed by the addition

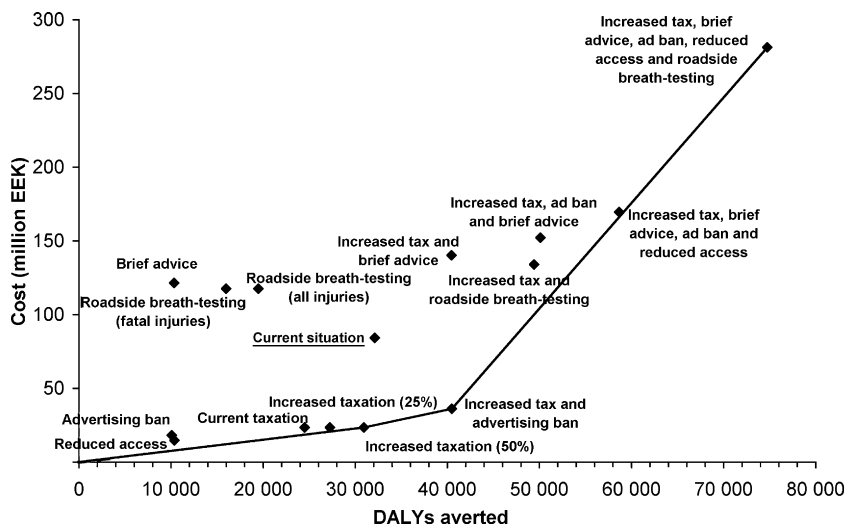


Fig. 1. Cost-effectiveness of alcohol interventions and selection order according to incremental cost-effectiveness ratio (ICER).

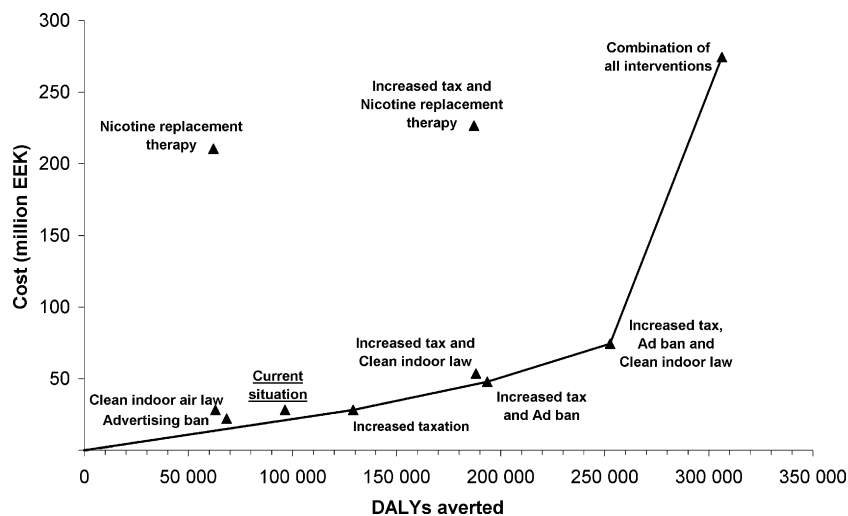


Fig. 2. Cost-effectiveness of tobacco interventions (excluding NRT related) and selection order according to incremental cost-effectiveness ratio (ICER).

of clean indoor air law (EEK 453 per additional DALY averted) and nicotine replacement therapy for the full combination of all interventions (EEK 3728 per additional DALY averted). The expansion path is shown in Fig. 2.

The uncertainty analysis of results of alcohol and tobacco interventions showed a 56–60% difference between best- and worst-case scenarios while two-thirds of the difference incurred from the latter, thus indicating possibility of higher than average cost per unit of outcome.

4. Discussion

Results show that there are several very cost-effective possibilities to reduce disease burden caused by tobacco use and hazardous alcohol consumption. The WHO's Commission on Macroeconomics and Health has suggested [44] that all interventions that cost less than GDP per capita can be considered a very cost-effective use of societal resources. For Estonia, this would mean that all interventions that cost less than EEK 90,454 per DALY [45] could be labelled cost-effective, and render all interventions to reduce smoking and hazardous alcohol use as cost-effective. Thus purely from a cost-effectiveness point of view, all the interventions analysed are advisable for implemen-

tation. Still it is important to note that cost-effectiveness information is only one input for decisions to improve population health; there are other political and public interests with legitimate goals for the health system (e.g. reducing health inequalities) or in regard to overall economic policies.

Importantly for policy discussions, it should be noted that the current intervention mix, both for alcohol and tobacco (see Figs. 1 and 2), does not appear on the expansion path, indicating room for improvement from a cost-effectiveness point of view and that therefore more DALYs could be saved by increasing the taxation level, improving coverage of interventions and better enforcement, possibly even in the current budgetary range using resource re-allocation. However, when one compares how close the current situation is to the most efficient pathway, it is clear that current measures for smoking are more efficiently applied than these of alcohol (due to the higher level of tax on tobacco products).

The current implementation and effective coverage of alcohol and tobacco policies or interventions within Estonia is variable and could be improved. For example, the implementation of restrictions on access to alcohol is highly variable, with some municipalities disallowing 24-h alcohol sales while others bypass such restrictions. Reaching consensus on policy changes and provision of sufficient resources for intervention

enforcement are the two key tasks that have to be addressed for successful expansion of interventions.

The previous evidence on the economic consequences of smoking in Estonia in 1998 has shown that the burden from tobacco consumption in pure economic terms is higher than the excise tax revenue [40]—evidence which contributed to the additional increase of excise taxes on tobacco after the study was released. This current study of the avertable burden of tobacco and alcohol use provides a similar opportunity to inform health policy making (and resource allocation) in Estonia. In fact, the results of the current study have provided the grounds for such policy discussion with actors within and beyond the health system, e.g. in the debate on the adequacy of increase in excise taxes.

This study has also indicated the superiority of general, non-personal alcohol and tobacco interventions where cost-effectiveness is concerned. This stresses the crucial role of other sectors beyond the health system *per se*, including instruments of fiscal policy such as excise tax rates. This discussion is influenced also by processes like harmonisation of tobacco regulations in Europe after Estonian accession to European Union in 2004 and ratification of the WHO Framework Convention for Tobacco Control in 2005. In these discussions, it has been put forward that an increase in excise taxes

(for both alcohol and tobacco as supported by our research) may induce inflation, and should therefore not be implemented as it conflicts with Estonian monetary policy to introduce the EURO in coming years. Further practise in 2006 has shown that monetary policy has been prioritised over public health and thus the taxation decisions postponed. Issues of restricted access to alcoholic beverage retail outlets, on the other hand, is still under discussion if to be implemented. These considerations illustrate the conflicting national policies in setting priorities that could be involved in the implementation of public health interventions.

Personal interventions like brief advice in primary health care proved to be cost-effective as well, thereby indicating that additional scaling-up of these personal interventions is justified from an economic perspective. As the whole population of Estonia is covered by a functioning primary health care system [18], it is possible to reach out to all population groups [46] and implement these personal interventions through family doctors and nurses. The challenge of training the health care workforce to provide necessary support to the patient to change their behavioural attitudes nevertheless remains an important challenge, since previous research has shown that family practitioners see limited use to applying this approach in case of alcohol use and

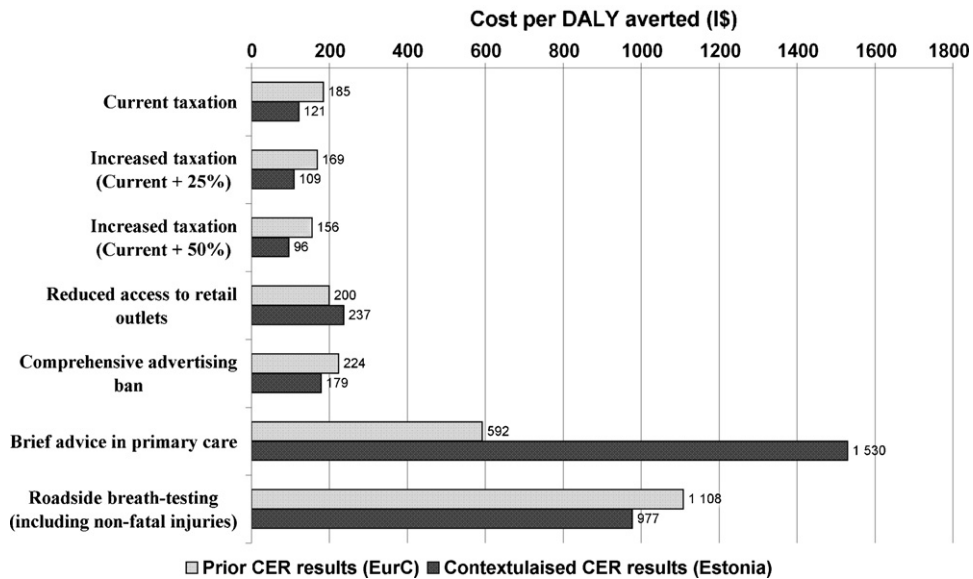


Fig. 3. Cost-effectiveness ratios of selected alcohol interventions before and after contextualisation (international dollars, effects discounted and age-weighted).

smoking, especially compared to primary health care specialists in other European countries [47].

The limitations of the current study are related to the quality of the input data. While an extensive dataset was available on burden of disease related to smoking and hazardous alcohol abuse, little is known about the country-specific effectiveness of interventions in Estonia, and data on this was retrieved from the international literature. To adjust this more to the Estonian situation a panel of experts was used to review information available and adjust the knowledge to local situation.

The contextualisation of WHO-CHOICE proved to be a feasible and useful process. One of the objectives was also to compare the regional results with the contextualised results to understand the differences. Fig. 3 shows the difference between the WHO-CHOICE results for the East-European region, and that of our study. The contextualisation has changed the results for alcohol interventions considerably. The rank order of most cost-effective interventions was changed in two cases—advertising ban and random roadside breath testing among alcohol interventions moved up by one place relegating access restrictions and brief advice in primary care to sixth and ninth position, respectively. This is driven by several factors such as differences in epidemiology, administration costs and other input factors. The results show that the contextualisation brings the regional results presumably closer to the country reality and should be applied also in other country specific exercises.

5. Conclusions

In conclusion we find that contextualisation has improved the usability of WHO-CHOICE results for

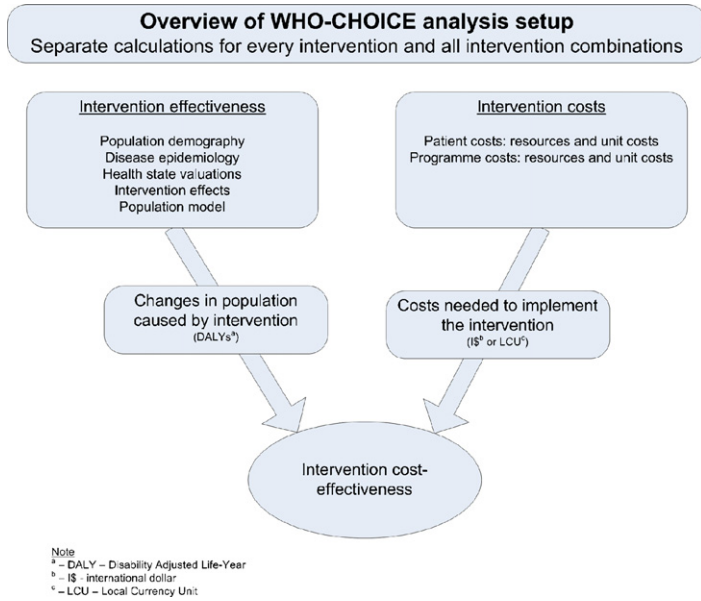
country-level health policy planning and has given valuable insight to current alcohol and tobacco interventions as well as indicated cost-effective steps that can be taken to reduce the burden of disease caused by these two health hazards. Even as the results have been used for policy discussions, the decisions made are not driven purely by cost-effectiveness, especially where strong interest groups are involved in policy development. Thus, the challenge remains how to tailor the research evidence into the policy discussions and actions where also other criteria in addition to cost-effectiveness are considered.

Acknowledgements

The base study of burden of disease and cost-effectiveness of interventions is supported by Estonian Ministry of Social Affairs, World Health Organization and Ministry of Education targeted research funding grant 2648 to the Department of Public Health, University of Tartu. Hereby authors would like to acknowledge the support and data provided by various institutions (Ministry of Social affairs, Estonian Statistical Office, National Institute for Health Development, Estonian Health Insurance Fund, Estonian Road Administration, Estonian Institute of Economic Research, etc.) and individuals who participated in the study. In addition we would like to acknowledge everybody who have contributed to basic report development and have provided comments to earlier versions of the paper. The views expressed in this paper are those of the authors and do not necessarily reflect those of the organisations for whom they work.

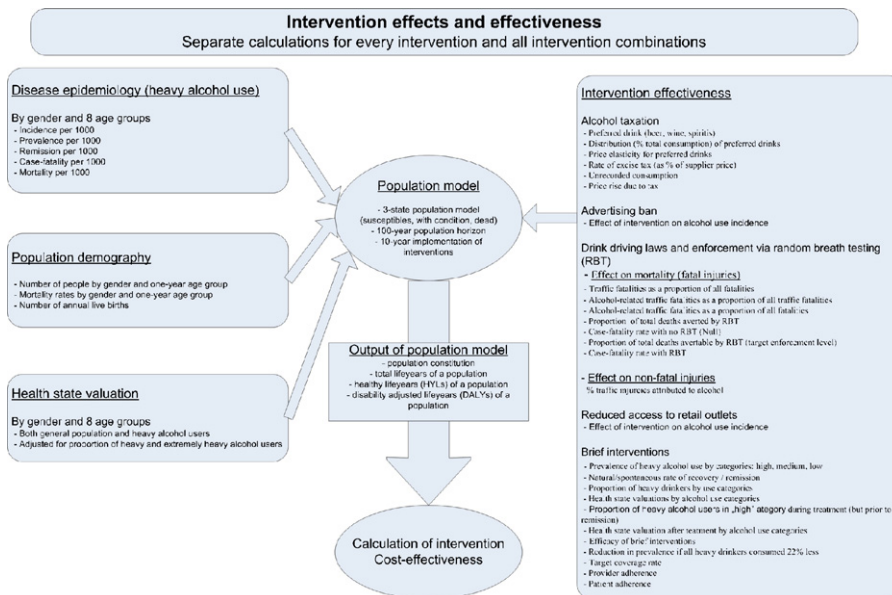
Appendix A

General overview of WHO-CHOICE analysis framework.



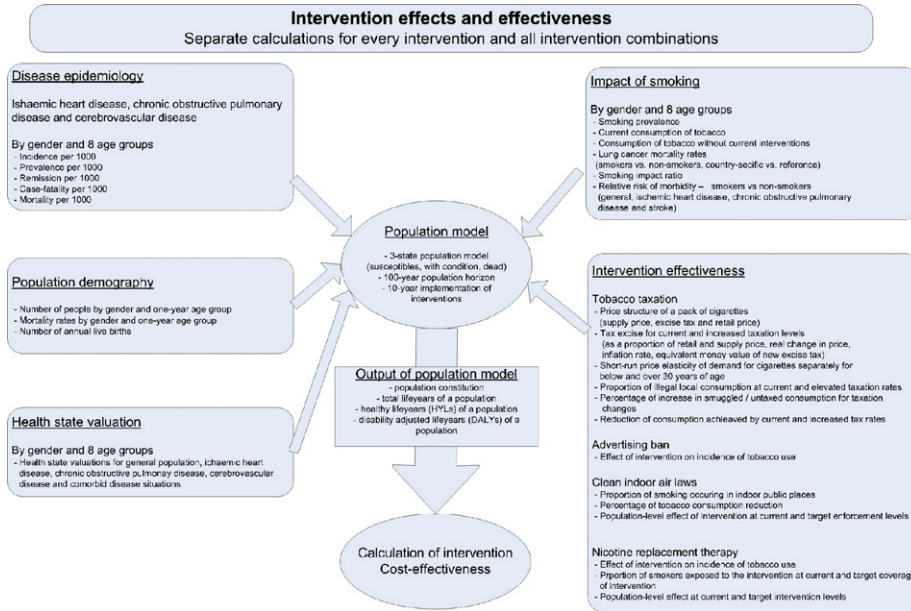
Appendix B

Effectiveness calculation: Alcohol interventions, layout and main types of data used in calculations in WHO-CHOICE framework.



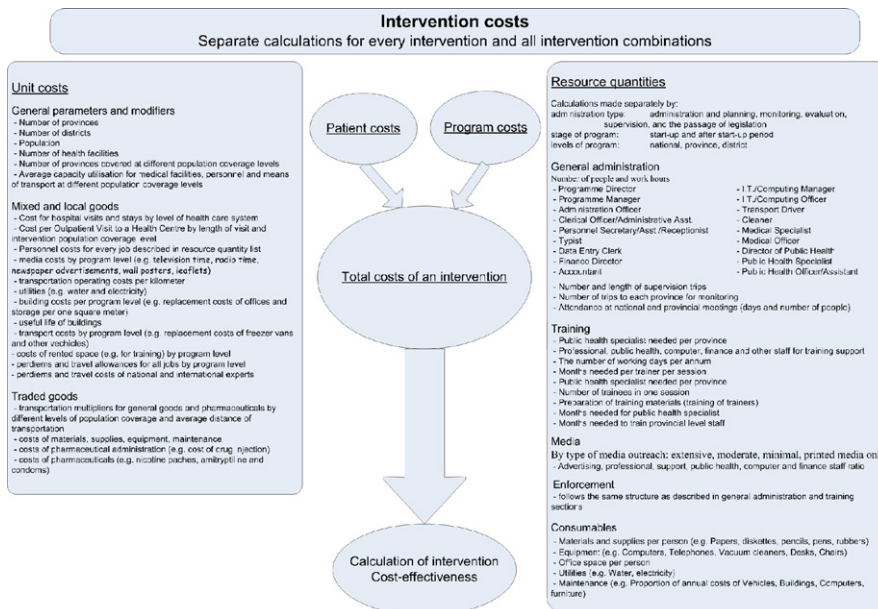
Appendix C

Effectiveness calculation: Tobacco interventions, layout and main types of data used in calculations in WHO-CHOICE framework.



Appendix D

Cost calculation: Layout and main types of data used in calculations in WHO-CHOICE framework.



References

- [1] Parna K, Rahu K, Rahu M. Patterns of smoking in Estonia. *Addiction* 2002;97(7):871–6.
- [2] Kunst AE, Leinsalu M, Habicht J, Kasmel A, Niglas K. Social inequalities in health in Estonia. Tallinn: Ministry of Social Affairs; 2002.
- [3] Young people's health in context. Health Behaviour in School-aged Children (HBSC) study: international report from the 2001/2002 survey. Report No.: 4. World Health Organization; 2004.
- [4] Helasoja V, Prattala R, Klumbiene J, Petkeviciene J, Kasmel A, Lipand A, et al. Smoking and passive smoking in Estonia, Lithuania and Finland: identifying target groups of tobacco policy. *European Journal of Public Health* 2001;11(2):206–10.
- [5] Kiivet R, Harro J. 1991–2002 Health in Estonia. Tartu: University of Tartu; 2002.
- [6] Hibell B, Andersson B, Bjarnason T, Ahlström S, Balakireva O, Kokkevi A, et al., The ESPAD Report 2003. Alcohol and Other Drug Use Among Students in 35 European Countries. Stockholm: The Swedish Council for Information on Alcohol and Other Drugs (CAN) and the Pampidou Group at the Council of Europe; 2004.
- [7] Lai T, Vals K, Kiivet R. Haiguskoormuse tõttu kaotatud eluaastad ehk tervisekadu Eestis [Burden of Disease in Estonia]. Tallinn: Sotsiaalministeerium; 2003.
- [8] Lai T, Vals K, Kiivet R. Haiguskoormuse tõttu kaotatud eluaastad Eestis: seosed riskifaktoritega ja riskide vähendamise kulutõhusus [Burden of Disease in Estonia: burden of disease and health risks]. Tallinn: Sotsiaalministeerium; 2004. [http://www.sm.ee/est/HtmlPages/RiskiKoormus2004/\\$file/RiskiKoormus2004.pdf](http://www.sm.ee/est/HtmlPages/RiskiKoormus2004/$file/RiskiKoormus2004.pdf) (accessed on April 24, 2005).
- [9] Elsinga E, Rutten FF. Economic evaluation in support of national health policy: the case of The Netherlands. *Social Science and Medicine* 1997;45:605–20.
- [10] Le Pen C. Pharmaceutical economy and the economic assessment of drugs in France. *Social Science Medicine* 1997;45:635–43.
- [11] Evans DB, Edejer TT, Adam T, Lim SS. Methods to assess the costs and health effects of interventions for improving health in developing countries. *British Medical Journal* 2005;331(7525):1137–40.
- [12] Murray CJ, Evans DB, Acharya A, Baltussen RM. Development of WHO guidelines on generalized cost-effectiveness analysis. *Health Economics* 2000;9(3):235–51.
- [13] World Health Organization. WHO-CHOICE; 2006. <http://www.who.int/choice/en/> (accessed on October 10, 2006).
- [14] Hutubessy RCW, Baltussen RMPM, Tan Torres-Edejer T, Evans DB. Generalised cost-effectiveness analysis: an aid to decision making in health. *Applied Health Economics and Health Policy* 2002;1:89–95.
- [15] World Health Organization. GBD Regions used for WHO-CHOICE analyses; 2002. http://www3.who.int/whosis/cea/region/region.cfm?path=evidence.cea.cea_regions&language=english (accessed on July 21, 2005).
- [16] Chisholm D, Rehm J, van Ommeren M, Monteiro M. Reducing the global burden of hazardous alcohol use: a comparative cost-effectiveness analysis. *Journal of Studies on Alcohol* 2004;65(6):782–93.
- [17] Shibuya K, Ciecierski C, Guindon E, Bettcher DW, Evans DB, Murray CJL. WHO Framework Convention on Tobacco Control: development of an evidence based global public health treaty. *British Medical Journal* 2003;327(7407):154–7.
- [18] Jesse M, Habicht J, Aaviksoo A, Koppel A, Irs A, Thomson S. Health care systems in transition: Estonia. Copenhagen: WHO Regional Office for Europe on behalf of the European Observatory on Health Systems and Policies; 2004.
- [19] Tragakes E, Lessof S. Health care systems in transition: Russia. Copenhagen: WHO Regional Office for Europe on behalf of the European Observatory on Health Systems and Policies; 2003.
- [20] Wasserman D, Varnik A. Suicide-preventive effects of perestroika in the former USSR: the role of alcohol restriction. *Acta Psychiatry Scandinavica Supplement* 1998;394:1–4.
- [21] Nemtsov AV. Alcohol-related harm and alcohol consumption in Moscow before, during and after a major anti-alcohol campaign. *Addiction* 1998;93(10):1501–10.
- [22] World Health Organization. Tobacco control database; 2006. <http://data.euro.who.int/tobacco/> (accessed on September 22, 2006).
- [23] World Health Organization. Alcohol control database; 2006. <http://data.euro.who.int/alcohol/> (accessed on September 22, 2006).
- [24] Tan Torres-Edejer T, Baltussen R, Adam T, Hutubessy R, Acharya A, Evans DB, et al. Making choices in health: WHO guide to cost-effectiveness analysis. Geneva: World Health Organization; 2003.
- [25] Lauer JA, Rohrich K, Wirth H, Charette C, Gribble S, Murray CJ. PopMod: a longitudinal population model with two interacting disease states. *Cost Effectiveness of Resource Allocation* 2003;1(1):6.
- [26] Kasmel A, Lipand A. Eesti täiskasvanud elanikkonna tervisekäitumise uuring 2002 [Health behaviour survey of Estonian adult population 2002]. Tallinn: Eesti Tervisekasvatuse Ühing; 2003.
- [27] Eesti statistika aastaraamat 2004 [Statistical Yearbook of Estonia 2004]. Tallinn: Statistikaamet; 2004.
- [28] McKee M, Pomerleau J, Robertson A, Pudule I, Grinberga D, Kadziauskiene K, et al. Alcohol consumption in the Baltic Republics. *Journal of Epidemiology Community Health* 2000;54(5):361–6.
- [29] Puska P, Helasoja V, Prattala R, Kasmel A, Klumbiene J. Health behaviour in Estonia, Finland and Lithuania 1994–1998: standardized comparison. *European Journal of Public Health* 2003;13(1):11–7.
- [30] Reitan TC. On the verge of EU membership: alcohol cultures in the Baltic Sea region in a European perspective. *Contemporary Drug Problems* 2004;31(2):287–328.
- [31] Simpura J, Tigerstedt C, Hanhinen S, Lagerspetz M, Leifman H, Moskalewicz J, et al. Alcohol misuse as a health and social issue in the Baltic Sea region. A summary of findings from the Baltica Study. *Alcohol and Alcoholism* 1999;34(6):805–23.
- [32] Magnum Medical: Raviainete jaotus anatoomiliste tasemetega järgi [Anatomical Therapeutic Chemical (ATC) Classifi-

- cation of medication]; 2005. <http://www.magnum.ee/cgi-bin/script/atc?> (accessed on April 12, 2005).
- [33] TopMed: Toimeainete kataloog [Anatomical Therapeutic Chemical (ATC) Classification of medication]; 2005. <http://www.topmed.ee/atc.php?sid=oilyr1s305> (accessed on April 12, 2005).
- [34] Babor T, Caetano R, Casswell S. Alcohol: no ordinary commodity—a consumer's guide to public policy. Oxford: Oxford University Press; 2003.
- [35] Ludbrook A, Godfrey C, Wyness L. Effective and cost-effective measures to reduce alcohol misuse in Scotland: a literature review. Aberdeen: Health Economics Research Unit; 2002.
- [36] Ornstein SI, Levy D. Price and income elasticities of demand for alcoholic beverages. *Recent Development in Alcoholism* 1983;1:303–45.
- [37] Norstrom T, Skog OJ. Saturday opening of alcohol retail shops in Sweden: an experiment in two phases. *Addiction* 2005;100(6):767–76.
- [38] Saffer H, Chaloupka F. The effect of tobacco advertising bans on tobacco consumption. *Journal of Health Economics* 2000;19(6):1117–37.
- [39] Peek-Asa C. The effect of random alcohol screening in reducing motor vehicle crash injuries. *American Journal of Preventive Medicine* 1999;16(1 Suppl):57–67.
- [40] Hu WT, Kiiwet R, Taal A. The economics of tobacco in Estonia [19]. World Bank. HNP discussion paper series; 2004.
- [41] Fichtenberg CM, Glantz SA. Effect of smoke-free workplaces on smoking behaviour: systematic review. *British Medical Journal* 2002;325(7357):188.
- [42] Jha P, Chaloupka FJ. Tobacco control in developing countries. Oxford: Oxford University Press; 2000.
- [43] Reinap M, Lai T, Janno S, Tamme T, Tamm M. Cost-effectiveness of mental health interventions in Estonia. Tallinn: Healthcare Society; 2005 (accessed on January 23, 2007) [http://www.sm.ee/est/HtmlPages/mental_health_cost/\\$file/mental_health_cost.pdf](http://www.sm.ee/est/HtmlPages/mental_health_cost/$file/mental_health_cost.pdf).
- [44] WHO Commission on Macroeconomics and Health. Macroeconomics and health: investing in health for economic development. Report of the Commission on Macroeconomics and Health: Executive Summary. Geneva: World Health Organization; 2001.
- [45] Gross domestic product and gross national income per capita at constant 2000 prices. Statistical Office of Estonia; 2006. http://pub.stat.ee/px-web.2001/Dialog/varval.asp?ma=NAA022&ti=GROSS+DOMESTIC+PRODUCT+AND+GROSS+NATIONAL+INCOME+%28GROSS+NATIONAL+PRODUCT%29+PER+CAPITA%2C+KROONS%2C++EUROS%2C+US+DOLLARS&path=/I.Databas/Economy/23National_accounts/01Gross_domestic_product_%28GDP%29/12Main_national_accounts_indicators/&lang=1 (accessed on January 1, 2006).
- [46] Habicht J, Kunst AE. Social inequalities in health care services utilisation after eight years of health care reforms: a cross-sectional study of Estonia, 1999. *Social Science Medicine* 2005;60(4):777–87.
- [47] Brotans C, Bjorkelund C, Bulc M, Ciurana R, Godycki-Cwirko M, Jurgova E, et al. Prevention and health promotion in clinical practice: the views of general practitioners in Europe. *Preventive Medicine* 2005;40(5):595–601.