



Policy analysis

Alcohol under the radar: Do we have policy options regarding unrecorded alcohol?

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ABSTRACT

Background: According to the World Health Organization, the public health impact of illicit alcohol and informally produced alcohol should be reduced. This paper summarizes and evaluates the evidence base about policy and intervention options regarding unrecorded alcohol consumption.

Methods: A systematic review of the literature using electronic databases.

Results: The literature on unrecorded consumption was sparse with less than 30 articles about policy options, mostly based on observational studies. The most simplistic option to reduce unrecorded consumption would be to lower recorded alcohol prices to remove the economic incentive of buying unrecorded alcohol. However, this may increase the net total alcohol consumption, making it an unappealing public health policy option. Other policy options largely depend on the specific sub-group of unrecorded alcohol. The prohibition of toxic compounds used to denature alcohol (e.g. methanol) can improve health outcomes associated with surrogate alcohol consumption. Cross-border shopping can be reduced by either narrowing the tax differences, or stricter control. Actions limiting illegal trade and counterfeiting include introduction of tax stamps and electronic surveillance systems of alcohol trade. Education campaigns might increase the awareness about the risks associated with illegal alcohol. The most problematic category appears to be the home and small-scale artisanal production, for which the most promising option is to offer financial incentives to the producers for registration and quality control.

Conclusion: Even though there are suggestions and theories on how to reduce unrecorded alcohol consumption, there is currently no clear evidence base on the effectiveness or cost effectiveness of available policy options. In addition, the differences in consumption levels, types of unrecorded alcohol, culture and tradition point to different measures in different parts of the world. Thus, the recommendation of a framework for moving forward in decision making currently seems premature. Instead, there is a need for systematic research.

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Introduction

Alcohol drinking can be broadly classified into recorded and unrecorded consumption. Recorded alcohol is typically comprised of alcoholic beverages that are legally sold and quality controlled. They are traceable via official statistics on alcohol consumption based on production, sales and/or trade data (Rehm, Klotsche, & Patra, 2007). The term “unrecorded alcohol”, on the other hand, carries with it multiple definitions, under four major categories (Lachenmeier, Sarsh, & Rehm, 2009): (1) illegally produced or smuggled alcohol, (2) surrogate alcohol, i.e. non-beverage alcohol not officially intended for human consumption, such as perfume,

(3) alcohol not registered in the country where it is consumed, and (4) legal unregistered alcohol (e.g. homemade alcohol in countries where it is legal). Of course, there are various subcategories within these broad categories. For instance, illegally produced alcohol can stem from the same factory as legal alcohol, but a proportion of the alcohol produced is not declared to the authorities. About 30% of global alcohol consumption comes from unrecorded sources, but there are huge regional differences (see Table 1 and Fig. 1). Unrecorded alcohol consumption is highest in Europe, especially in Eastern Europe, followed by South America and Africa.

Currently it is not clear whether unrecorded alcohol has an impact on health over and above the effect of recorded alcohol (Lachenmeier & Rehm, 2009; Lachenmeier et al., in press; Rehm, Kanteres, & Lachenmeier, 2010). Overall, there is a correlation between the level of unrecorded consumption and liver cirrhosis rates, even after controlling for per capita consumption ($r=0.35$;

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Table 1
Global distribution of unrecorded adult per capita alcohol consumption 2005 (own calculation based on WHO (2010a)).

WHO region	Unrecorded adult per capita alcohol consumption in l pure ethanol	Total adult per capita alcohol consumption in l pure ethanol	Proportion unrecorded
Africa	1.93	6.19	31%
Americas	2.01	8.70	23%
Eastern Mediterranean Region	0.34	0.62	55%
Europe	2.67	12.20	22%
South East Asia Region	1.52	2.24	68%
Western Pacific Region	1.63	6.23	26%
World	1.75	6.13	29%

$t=2.96$; $p=0.04$ based on the numbers displayed in the Global Status Report on Alcohol; WHO 2010a). However as alcohol consumption *per se* has been shown to cause liver cirrhosis as well (Rehm, Taylor, et al., 2010), the specific contribution of unrecorded alcohol is not clear.

In their recent strategies to reduce the harmful use of alcohol (WHO, 2010b), the World Health Organization (WHO) stressed reductions in the public health impact of illicit alcohol and informally produced alcohol and provided some broad policy interventions as potential solutions. These included: (1) Good quality control with regard to production and distribution of alcoholic beverages. (2) Regulating the sale of informally produced alcohol and bringing it into the taxation system. (3) An efficient control and enforcement system, including tax stamps. (4) Developing or strengthening tracking and tracing systems for illicit alcohol. (5) Ensuring necessary cooperation and exchange of relevant information on combating illicit alcohol amongst authorities at national and international levels. (6) Issuing relevant public warnings about contaminants and other health threats from informal or illicit alcohol.

In consideration of the amount of unrecorded alcohol consumed worldwide and the fear of an increase due to the economic crisis, it is surprising that almost no policy research at all has been conducted on this topic. There is no literature on the effectiveness or implementation costs of the WHO suggestions, probably in part explained by concerns that the systematic evaluation of unrecorded consumption can be seen as supporting the alcohol industry (Lachenmeier & Rehm, 2009). However, from a public health point of view, such an evaluation is necessary, as policy interventions in the area of the harmful use of alcohol as in other areas should be based on evidence in order to minimize attributable

harm. We hope to fill this research gap with empirical evidence through systematically examining policy options aimed at reducing the impact of unrecorded alcohol and to provide a framework for moving forward in research and decision-making alike.

Methods

A computer-assisted literature search was conducted using the following key word combination: (alcohol* OR spirits) AND (unrecorded, homemade, homebrew, farm-made, illegal, illicit, clandestine, informal, artisanal OR surrogate) AND (policy OR intervention).

Searches were carried out in July 2010, in the following databases: PubMed (U.S. National Library of Medicine, Bethesda, MD), Web of Science (Thomson Reuters, Philadelphia, PA), and Scopus (Elsevier B.V., Amsterdam, the Netherlands). This was accompanied by a hand search of the extensive literature collection of the authors as well as of the reference lists of all selected articles for any relevant studies not included in main database search.

English was the main language of the electronic databases; however, there were no language restrictions and authors were able to review articles in English, French, Spanish, Portuguese, German, Russian, Polish and Chinese. The references, including abstracts, were imported into Reference Manager V.12 (Thomson Reuters, Carlsbad, CA) and the relevant articles were manually identified and obtained in full text.

The inclusion criteria were:

1. Article must contain data on unrecorded alcohol consumption combined with specific mention of explicit policy options and their effects, and the benefit or harm of its implementation

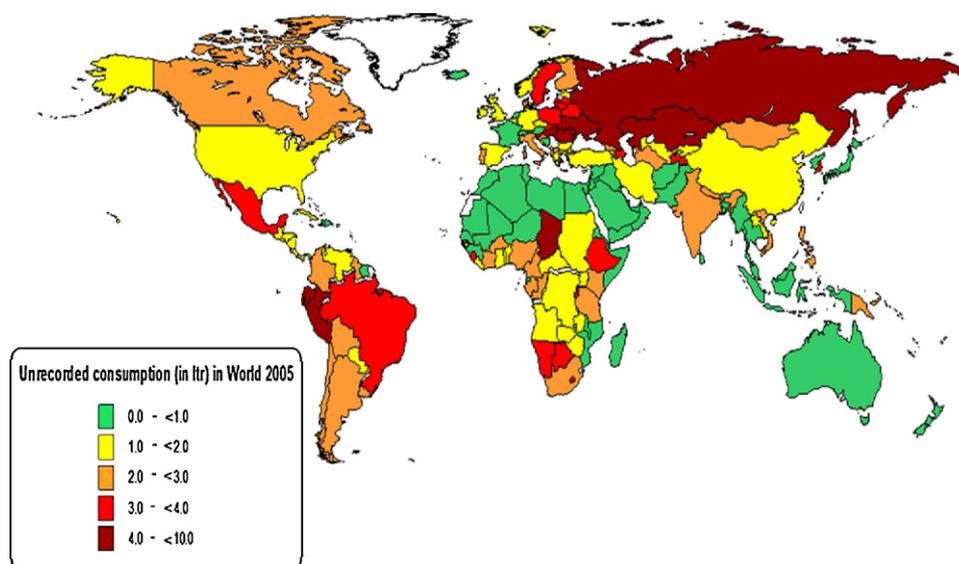


Fig. 1. Unrecorded adult per capita consumption in litres pure ethanol 2005.

2. The policy must have been implemented to reduce or control some aspect of unrecorded alcohol; i.e. broad measures to reduce all alcohol consumption generally were not sufficient for inclusion

Clearly misclassified papers were directly excluded (e.g. studies dealing with the illegal sale of alcohol to minors or intoxicated bar patrons, or other connexions of illegality with alcohol, e.g. drink driving or workplace drinking).

Results

The articles identified from the search were grouped into two categories. The first group, which contained the majority of articles were broadly classified as a “policy need” category. They identified certain detrimental health effects of unrecorded alcohol and concluded that there was a need for alcohol policy measures or interventions (hence the inclusion of these key words in the articles) (Gorgulho & Da Ros, 2006; John et al., 2009; Kanteres, Lachenmeier, & Rehm, 2009; Kurian, Kuruvilla, & Jacob, 2006; Lachenmeier, Kanteres, & Rehm, 2009; Lachenmeier, Lima, et al., 2010; Lachenmeier & Rehm, 2009; Lachenmeier, Rehm, & Gmel, 2007; Lachenmeier et al., in press; Lachenmeier & Sohnius, 2008; Lang, Väli, Szücs, Ádány, & McKee, 2006; Leitz, Kuballa, Rehm, & Lachenmeier, 2009; Leon et al., 2007; Leon, Shkolnikov, & McKee, 2009; Lindström, 2005; Luginaah & Dakubo, 2003; MacDonald, Wells, & Giesbrecht, 1999; McKee et al., 2005; Norström, 1998; Onya & Flisher, 2006; Pärna, Lang, Raju, Väli, & McKee, 2007; Pomerleau et al., 2008; Popova, Rehm, Patra, & Zatonski, 2007; Rehm, Klotsch, et al., 2007; Rehm et al., 2003; Rehm, Sulkowska, et al., 2007; Rehm et al., 2009; Rehm, Kanteres, et al., 2010; Rehm, Taylor, et al., 2010; Zaridze et al., 2009). This category further includes observational literature on the problem of cross-border shopping in Nordic countries particularly (Bygvrå, 2009; Grittner & Bloomfield, 2009; Lavik & Nordlund, 2009; Mäkelä, Bloomfield, Gustafsson, Huhtanen, & Room, 2008; Ramstedt & Gustafsson, 2009; Svensson, 2009). However, as none of these articles provided any concrete suggestions about exactly what policy measures were recommended in terms of implementation or cost–benefit, they were of lower relevance to our topic. However, we did not exclude these articles from our literature list, as they provided interesting information on the categories of unrecorded alcohol and the regional distribution and characteristics of the related problems (see ‘Discussion’ section).

The second category was comprised of “policy recommendation” articles. This group contained studies that dealt with policy measures specifically, mostly about problems regarding cross-border shopping of alcohol, particularly in Nordic countries (Cnossen, 2007; Holder, 2009; Karlsson & Österberg, 2009; Mäkelä et al., 2008; Mäkelä & Österberg, 2009; Natvig & Aarø, 1998; Nordlund & Österberg, 2000) or on the US–Canada border (Room & West, 1998). Only three articles addressed policy approaches to decrease illegal alcohol production and non-beverage alcohol consumption, especially focusing on Central and Eastern Europe and the former Soviet countries, with some mention of existing or past policies in place in these areas (Moskalewicz & Simpura, 2000; Khaltourina & Korotayev, 2008; Bobrova et al., 2009). The effectiveness of Russian policies to reduce consumption of non-beverage alcohol was discussed by Gil et al. (2009) and Levintova (2007), as well as Bobrova et al. (2009) to some degree. Botha (2009) provided some examples from Africa from an industry perspective.

Some policy implications regarding small-scale artisanal alcohol production were outlined for Guatemala (Kanteres, Rehm, & Lachenmeier, 2009) and Ukraine (Lachenmeier, Samokhvalov, et al., 2010). Mutisya and Willis (2009) discussed similar problems in

Kenya. Examples for reduction of unrecorded alcohol in 1920s Germany were found as well (Hözllein, 1989; Lachenmeier & Rehm, 2010).

The effectiveness of alcohol policies aimed at reducing the public health effect of illegally and informally produced alcohol was briefly considered by Anderson, Chisholm, and Fuhr (2009) in their review on the cost–effectiveness of alcohol policies in general. However, the discussion remained limited on some aspects such as methanol contamination and smuggling. The special problems of unrecorded consumption for alcohol control policies were also discussed by Room, Graham, Rehm, Jernigan, and Monteiro (2003) in their paper on alcohol policy. We will consider these suggestions in our discussion in more detail. A summary of the literature regarding policy options on unrecorded alcohol including our own evaluations is given in Table 2.

Discussion

There are a number of potential policy options outlined by this review. However, it must be stressed that many options identified thus far in the literature are not as sophisticated or evidence-based as the options for recorded alcohol (Babor et al., 2010), and are often based on the experience of a single country only. Work in this area is new and developing – we believe that the review here provides a foundation for future thinking and research about potential policy options, and not a concrete, well-developed manual for direct implementation.

It must be stressed further that there is wide variation in the public health impact of unrecorded alcohol that is in part determined by its type (i.e. legal, small scale artisanal wine production versus denatured alcohol consumption) and thus governs the type of policy that may be suitable. Therefore, the following discussion will consider six broad categories of unrecorded alcohol policy intervention and discuss each in detail with respect to its specific target alcohol type. Whilst the first option (price reduction of recorded alcohol) refers to unrecorded alcohol in general, the following discussion will consider the sub-categories of unrecorded alcohol (see ‘Introduction’ section) separately.

Price reduction of recorded alcohol to decrease unrecorded consumption in general

As pointed out by Nordlund and Österberg (2000) a simplistic option to resolve the problem of large unrecorded alcohol consumption would be lowered alcohol excise taxes, as an interrelation between the legal and illegal markets is expected. The alcohol industry also favours this option and has suggested incentives for legal producers to sell quality low-cost alcohol (e.g. by reduced taxation for products targeted to low-income consumers) (Botha, 2009). Policy makers have not been willing to follow these suggestions, though, since lower alcohol excise taxes in many cases lead to lower levels of alcohol-related government tax incomes (Nordlund & Österberg, 2000). From a public health standpoint, it is likewise imprudent to lower taxes for recorded alcohols, as this may have the unintended consequence of increasing the total consumption of alcohol above the original level, as was found in Finland (Mäkelä & Österberg, 2009), with consequences of increased consumption, and increased mortality and morbidity (Babor et al., 2010; Wagenaar, Salois, & Komro, 2009; Wagenaar, Tobler, & Komro, 2010). Whilst these consequences seem to depend on the economic level as well as on other factors (Room, Österberg, Ramstedt, & Rehm, 2009), they have been found in a majority of cases examined (Wagenaar et al., 2009, 2010).

However, the impact on unrecorded consumption is less clear: to what degree are changes in recorded consumption compensated

Table 2
Overview of policy options regarding different categories of unrecorded alcohol.

Problem	Policy option	Effect	References	Comments
Unrecorded alcohol consumption in general	Provide low-cost commercial drinks at prices the population can afford, e.g. special tax rates for products offered to low-income consumers	Substitution of unrecorded consumption with recorded consumption	Botha (2009)	This measure, favoured by alcohol industry, will likely increase the total net consumption (Babor et al., 2010). Unrecorded producers could also lower their prices in adjustment
Toxic compounds (methanol, diethyl phthalate) used to denature alcohol occurring in surrogate alcohol (especially cosmetic alcohol)	Prohibit substances with unfavourable toxic profile that cannot be tasted in alcohol, substitute with suitable substances (e.g. bittering agents)	Prevention of intoxication or fatal poisonings from methanol. Prevention of chronic toxic effects from other denaturing compounds	Lachenmeier et al. (2007)	Proven effectiveness in several legislations
Use of denatured alcohol for human consumption	Abolish the tax exemption for denatured alcohol	Loss of financial incentive for drinking surrogate alcohol	This article	Price increase of consumer products containing (denatured) alcohol
Use of medicinal alcohol as surrogate alcohol	Taxation similar to beverage alcohol, reduce container size, restrict number of bottles allowed to be sold per person or reduce availability of surrogate alcohols	Loss of financial incentive to use as surrogate alcohol	Hölzlein (1989), Nordlund and Österberg (2000), Khaltourina and Korotayev (2008), Gil et al. (2009), Bobrova et al. (2009)	Price increase of medicines
Consumption of other alcohols in pure form or mixed into other alcoholic beverages (e.g. methanol, isopropanol)	Increase prices of all products (especially methanol) that could be used instead of or mistaken for ethanol to a price similar to that of ethanol	Prevention of harm by accidental ingestion or intentional addition of these substances to alcohol	This article	Price increase of consumer products containing these alcohols
Cross-border shopping	Exemption of alcoholic beverages from trade agreements or provisions for the public health interest in negotiations and dispute resolution involving alcoholic beverage controls	Loss of financial incentive for cross-border shopping	Room and West (1998)	Low likelihood of implementation
Cross-border shopping	Strict control of border crossings, small quotas for travellers' tax free imports	Keep the volume of alcohol imports to a very low level	Karlsson and Österberg (2009)	Probably high costs for implementation
Cross-border shopping (in the EU)	Narrowing differences in alcohol taxes in EU member states by significantly increasing the agreed EU-wide floors to alcohol taxes	Loss of financial incentive for cross-border shopping	Cnossen (2007)	Increase of alcohol consumption if taxes are harmonized on the lower level
Illegal trade and smuggling	Introduction of tax stamps recording that duty has been paid; electronic movement and surveillance systems to track the trade of alcohol	Reduces marketability of unrecorded alcohol; allows consumers to detect illegal alcohol	Anderson et al. (2009)	High costs and bureaucracy. Penalization for small manufacturers (Gil et al., 2009)
Illegal trade	Education (e.g. mass media campaign)	Reduced use and buying of illegal spirits, substitution with recorded alcohol	Natvig and Aarø (1998)	Probably low effectiveness similar to education and persuasion in standard alcohol policy (Babor et al., 2010)
Home and small-scale artisanal alcohol production	Intermediate trade organization or monopoly that offers financial incentives for registration of producers, buys the alcohol from the distilleries, conducts quality control and purification of the alcohol, and controls the sales to the end consumer (e.g. regarding minimum prices and availability)	Legalization and quality control of small-scale production. Prevention of possible chronic toxic effects from contaminated alcohol. The often marginalized alcohol producers keep their income, but the state regains control over the sales	This article, based on the historic German alcohol monopoly example (Hofbur, 1992; Hölzlein, 1989; Lachenmeier & Rehm, 2010)	No clear proof of effectiveness for countries other than Germany. Pilot studies necessary, e.g. in Ukraine (Lachenmeier et al., 2010b)
Home and small-scale artisanal alcohol production	Tax exemption for a transitional time period for businesses that register with the government and conduct quality control	Legalization and quality control of small-scale production. Prevention of possible chronic toxic effects from contaminated alcohol	This article	No clear proof of effectiveness. Pilot studies necessary
Home and small-scale artisanal alcohol production	Competitions and awards for quality as incentives for legal home-producers to raise and maintain the standards of their beverages	Improved quality	Botha (2009)	Will probably only target a small part of home-production
Contaminated and counterfeit products	Support local authorities in random tests and identification of sources	Prohibit illegal production	Botha (2009)	Cost-effectiveness of random testing questionable

by changes in unrecorded consumption in the opposite direction? We hypothesize that if recorded alcohol costs less, many unrecorded producers would likewise lower their prices, as the current prices of unrecorded alcohol do not necessarily reflect the actual production costs (which are often very low, especially for spirits). Therefore, due to the correlation of recorded and unrecorded markets, the lowering of excise taxes may not necessarily change the distribution between the markets, but only increase total consumption.

We therefore suggest that a holistic alcohol policy should consider recorded and unrecorded consumption simultaneously. As we point out below, there is a range of intervention possibilities to restrict unrecorded consumption which appear to be effective independent of the state of policy regarding recorded alcohol.

Policy options for smuggled alcohol

The smuggling of alcohol often goes undetected by consumers. For instance, in Poland, customers were often unaware that they buy illegal alcohol (and are perhaps at a higher risk due to impurities) because restaurants and pubs sell the alcohol as if it had been legally imported (Lachenmeier, Ganss, et al., 2009). The same was reported from Canada, where black market alcohol smuggled from the US was described to be re-bottled by bars and restaurants so that the patrons believe they are buying legitimate products at the regular price (Room & West, 1998).

Previous work in this area has shown that there are a number of ways to reduce smuggling. Tax stamps have been suggested, combined with electronic movement and surveillance systems to track the trade of alcohol (Gil et al., 2009). However, implementing stamps combined with surveillance methods may be difficult due to the high degree of infrastructure and organization required. Gil et al. (2009) reported that there were major problems in implementing the 2006 system in Russia, which employed both stamps and electronic recording. Since a physical stamp must be affixed to each bottle at source, issues of availability of the stamps themselves to manufacturers were reported. In addition, there was a significant price barrier with respect to obtaining the equipment for the electronic recording of ethanol production. This combination of cost, bureaucracy, and delays led manufacturers to cease production, resulting in an overall reduction in the amount of beverage and non-beverage alcohols available in the Russian retail market in 2006.

Whilst most of the measures against illegal trade of alcohol were focused on regulating physical availability, a single study conducted by Natvig and Aarø (1998) assessed the impact of an educational campaign against smuggled alcohol in Norway. Negative messages about illegal alcohol were distributed by the mass media and the impact of the programme was assessed using consumer surveys. Results indicated that there was some impact of the campaign resulting in reductions in the purchase of illegal spirits. Correspondingly, the recorded sales of spirits increased by 4.2%, which was interpreted as an indication that the legal consumption had, to some extent, replaced illegal consumption.

In our judgement, both strategies appear to be needed. Tax stamps and surveillance are important to inform the consumer about the legal status of the products, combined with education programmes aimed at informing consumers about the potential hazards of unrecorded alcohols and the advantages of the recorded products (e.g. quality controlled by the state).

Policy options for large scale illegal production

Large scale illegal production can be, but must not necessarily be linked to legal production. By its very nature, it must be somewhat tolerated by the political powers, or else large scale productions

cannot go undetected. Thus, these parts of illegal productions could be abolished if there is a political will, and if the respective laws are enforced. Again, tax stamps and monitoring systems can be of help, as is control of all large-scale factories.

Policy options regarding surrogate alcohol

Banning the use of toxic denaturing compounds

Denatured alcohols are used most in alcohol-containing cosmetic products, such as perfumes or aftershaves. However, it has been found that in some areas, alcohol is denatured with various substances for the purpose of exemption from excise duty reserved for alcohol to be drunk. Depending on jurisdiction, this may include substances with unfavourable toxicological profiles such as methanol, thus resulting in problems in areas where surrogate alcohol consumption is prevalent. The prohibition of methanol for use to denature alcohol is probably the one area where policies targeting unrecorded alcohol were successfully implemented in the past. There is striking evidence from several countries that cases of methanol poisoning were reduced by this prohibition (e.g. in Australia) (Lachenmeier et al., 2007). Anderson et al. (2009) also applauded this measure, concluding that the complete removal of methanol from denatured spirits is probably the greatest measure to reduce morbidity and mortality attributable to surrogate alcohol consumption.

Other toxic denaturing compounds may be ingested in levels exceeding tolerable daily limits (e.g. diethyl phthalate) (Leitz et al., 2009). We believe that international laws should uniformly exclude toxic substances as denaturants and substitute them with substances with more favourable toxic profiles, especially ones that would effectively exclude the accidental ingestion of these products (e.g. via the use of bittering agents, see Lachenmeier et al., 2007).

Abolish the tax exemption of surrogate alcohols

Another policy option that may be viable in this area would be to eliminate the monetary incentive for producers (and consumers) by abolishing the tax exemption of these products, meaning that all types of ethanol would be similarly taxed. This would not only remove the need to use a denaturing substance at all, but also remove the financial incentive to consume these products. However, this has a major drawback since this measure might be too drastic and increase prices of all kinds of consumer products. Prior to the implementation of such a measure, further research needs to be conducted to determine the actual volume of human consumption of denatured alcohols. In some Baltic countries, it has been found that cosmetic surrogate alcohols were regularly found on markets sold for human consumption (Lachenmeier, Ganss, et al., 2009; Lang et al., 2006; McKee et al., 2005; Pärna et al., 2007), so policies that aim to increase the price of these products should be discussed. An alternative approach might include examining how surrogates are packaged, marketed, and sold, implementing measures to make them less appealing for consumption (see, for example, Lang et al., 2006; McKee et al., 2005).

Controlling availability of medicinal surrogate alcohol

Similar to denatured alcohol, one measure to reduce the use of medicinal alcohol as a surrogate would be to tax it similarly to beverage alcohol. This was suggested in the 1920s in Germany as a way to decrease consumption of unrecorded alcohol, but was later implemented only for medicinal alcohol for oral use (Hölzlein, 1989), which was ineffective since medicines for external use could be substituted. Reduction in sellable amounts seems to be a constructive policy though – rigorous control of selling of medicinal alcohol and the selling of only small container sizes have been shown to reduce potential harm from medicinal alcohols to a

marginal problem in the Nordic countries (Nordlund & Österberg, 2000). Gil et al. (2009) reported that Russia had implemented a similar policy in 2006 restricting alcohol-containing medicines to bottles of no more than 25 ml of volume (prior to that medicines were sold in bottles of 100 ml or more). However, the impact of the policy was not clear at the survey time when the larger bottles were still available.

Policy options for alcohol not registered in the country where it is consumed (border trade)

The main motive for border trade in alcohol is differences in the prices of alcoholic beverages. The greater the price difference, the higher the volume of border trade in alcoholic beverages, all other things being equal (Karlsson & Österberg, 2009). The straightforward option is therefore to harmonize the taxes of neighbouring countries. However, there are two problems with this solution: first, international trade regulations often remove country-specific taxation, e.g. for the EU (Babor et al., 2010). Second, historically it has been shown that in such situations, two countries often agree on the lower taxation level. As a consequence, alcohol-related problems in the country with the lowered tax would probably rise (Room & West, 1998). Holder (2009) also warned that a national policy to lower alcohol taxes in order to reduce cross border sales could be counterproductive, since lower domestic alcohol prices affect every citizen and not only those along the border. Other policy options include the strict control of border crossings as well as small quotas for traveller's tax free imports of alcoholic beverages (Karlsson & Österberg, 2009). Again, though, international trade regulations and stakeholder interest may prevent this, making this a very complicated area of policy implementation that requires more research and pilot study.

Policy options for small-scale artisanal or home production of alcohol (either legal or illegal depending on jurisdiction)

This category of home-produced unrecorded alcohol is especially relevant for policy interventions, as it could be the most important one from a quantitative standpoint in many regions (e.g. the majority of unrecorded consumption stems from Africa, South America, and parts of Asia where home brewing and home distillation is very prevalent). However, it is also a complex policy-based issue – the home production of alcohol in thousands of households is more complicated to target than large criminal entities that produce illegal alcohol on an industrial scale. Additionally, it could be argued that much of small-scale and artisanal production is not problem-laden. Many beverages produced and consumed in this category are of acceptable quality (Ejim, Brands, Rehm, & Lachenmeier, 2007) and a matter of pride and tradition for the producer or region. Interfering with this artisanal production may mean eliminating a part of national heritage and a valuable cottage industry for local citizens, calling into question the desirability to interfere at all. On the other hand, though, our observations in Guatemala have shown that the reality of artisanal alcohol production is far from this romanticized view and may bring alcohol-related harm for the community, including health problems, criminality, violence and domestic abuse (Kanteres, Lachenmeier, et al., 2009). We therefore must agree with the WHO (2010b) strategy that some regulation of this informal sector of alcohol production is necessary, but must be mindful of the cultural and micro-economic trade-offs.

Whilst we have no empirical evidence, we hypothesize that none of the alcohol policy measures mentioned above for the other types of unrecorded alcohol would have any effect on home production. Due to the large problem of unrecorded consumption in Russia, Khaltourina and Korotayev (2008) suggested that

a complete ban on home distilling would be necessary. Currently though, we cannot see how such a ban could work or be enforced since examples of these kinds of policy and their enforcement are few. An interesting historical example of how to successfully deal with small-scale clandestine alcohol production was provided in Germany. During the First World War, when alcohol for drinking purposes was prohibited, the clandestine businesses increased alarmingly. The German government counteracted the problem in 1929 with amendments to the law regarding the alcohol monopoly (Hölzlein, 1989), which was reorganized to carry out four basic tasks (Hofbur, 1992): (1) The buying of alcohol from distilleries, (2) the import of alcohol from other countries, (3) the purification of alcohol, and (4) the selling of alcohol acquired via tasks 1–3.

Tasks 1 and 3 of the monopoly were the ones that focused on home production in the following way: the monopoly would buy artisanal manufactured alcohol irrespective of its quality (e.g. methanol content). However, prior to the marketing of the alcohol (e.g. to the food, pharmaceutical or cosmetic industries), the monopoly would oversee its purification according to standards that were even stricter than the current EU standards (see Brose, 1989 for details). Thus, through this model of an intermediate trade monopoly, the consumer was effectively protected from contaminated, home-brewed alcohol. This model also allows a quality control at a central point (the monopoly organization), which would not be as effective if thousands of decentralized producers needed to be controlled onsite.

The incentive for the distilleries to register with the state and to refrain from the illegal production was a guaranteed, fixed price for the alcohol that was often higher than the market price (Lachenmeier & Rehm, 2010). Concomitantly, the enforcement against illegal distilleries was tightened in the 1930s, with suspect businesses subjected to regular, unannounced inspections (Hölzlein, 1989).

It currently remains a question if this concept can be transferred to other countries, e.g. in Eastern Europe, parts of Asia, Africa or South or Central America where lack of infrastructure and different beverage types (i.e. beer rather than spirits) would prohibit successful introduction of recommended quality control measures. We had suggested such a model for Guatemala, where contaminated alcohol from artisanal producers was sold to consumers, suggesting the formation of an intermediate organization (not necessarily a monopoly) that buys and purifies the alcohol may be warranted (Kanteres, Rehm, et al., 2009). We hypothesized that such a measure would not only guarantee the income of the alcohol producers (artisanal alcohol production often has important implications for the economic survival of women in many developing countries) but simultaneously increase the health of risky drinkers since the product quality would be under tighter control. However, we postulate that long transitional periods need to be implemented to reduce the illegal alcohol production. For example, a transitional period of 10 years with complete tax exemption could be implemented along with a guarantee for exemption of punishment for producers that register themselves. After the 10 years, a step-wise taxation could be implemented. Finally, enforcement authorities need to be established that control the quality of the alcohol, as well as the correct registration and other aspects such as hygiene of the businesses.

Conclusion

We fully agree with Room et al. (2003) that it is important for the state to gain effective control over informal alcohol production and distribution. Gaining such control is not only important to avoid contaminated, low-quality alcohol, but is also crucial for an effective regime of taxation to ensure that the market in legal alcoholic beverages cannot be undercut by illegal production and distribution.

The disparity of consumption levels, as well as the close link between some types of unrecorded alcohol and local culture and tradition means that different measures are likely to have different results in different parts of the world. Therefore, a global approach to unrecorded alcohol is neither feasible nor realistic. In Central and Western Europe, the process of gaining control over informal production and distribution took decades or even longer (Room et al., 2003), and we can expect a similar time frame is required for Eastern Europe. In less developed regions, such as Africa, Asia and Latin America, barriers are even higher since alcohol policy, even for recorded consumption is only just emerging.

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Conflict of interest

None declared.

References

- Anderson, P., Chisholm, D., & Fuhr, D. C. (2009). Effectiveness and cost-effectiveness of policies and programmes to reduce the harm caused by alcohol. *The Lancet*, 373, 2234–2246.
- Babor, T., Caetano, R., Casswell, S., Edwards, G., Giesbrecht, N., Graham, K., et al. (2010). *Alcohol: No ordinary commodity. Research and public policy* (2nd edition). Oxford UK: Oxford University Press.
- Bobrova, N., West, R., Malutina, D., Koshkina, E., Terkulov, R., & Bobak, M. (2009). Drinking alcohol surrogates among clients of an alcohol-misuser treatment clinic in Novosibirsk, Russia. *Substance Use & Misuse*, 44, 1821–1832.
- Botha, A. (2009). Understanding alcohol availability. Noncommercial beverages. In M. Grant, & M. Leverton (Eds.), *Working together to reduce harmful drinking* (pp. 39–62). New York, NY: Routledge.
- Brose, R. (1989). Vor- und Nachlaufbranntwein, Steuer- und monopolrechtliche Behandlung (Teil 3) [Heads- and tailings fractions of spirits. Aspects of taxlaw and monopoly law (Part 3)]. *Alkohol-Industrie*, 102, 397–399.
- Bygvrá, S. (2009). Distance and cross-border shopping for alcohol – evidence from Danes' cross border shopping 1986–2003. *NAT Nordic Studies on Alcohol and Drugs*, 26, 141–164.
- Cnossen, S. (2007). Alcohol taxation and regulation in the European Union. *International Tax and Public Finance*, 14, 699–732.
- Ejim, O. S., Brands, B., Rehm, J., & Lachenmeier, D. W. (2007). Composition of surrogate alcohol from South-Eastern Nigeria. *African Journal of Drug and Alcohol Studies*, 6, 65–74.
- Gil, A., Polikina, O., Koroleva, N., McKee, M., Tomkins, S., & Leon, D. A. (2009). Availability and characteristics of nonbeverage alcohols sold in 17 Russian cities in 2007. *Alcoholism: Clinical and Experimental Research*, 33, 79–85.
- Gorgulho, M., & Da Ros, V. (2006). Alcohol and harm reduction in Brazil. *International Journal of Drug Policy*, 17, 350–357.
- Grittner, U., & Bloomfield, K. (2009). Changes in private alcohol importation after alcohol tax reductions and import allowance increases in Denmark. *NAT Nordic Studies on Alcohol and Drugs*, 26, 177–191.
- Hofbur, D. (1992). Das Gesetz über das Branntweinmonopol wird 70 Jahre alt, Ein kleiner Streifzug durch das deutsche Branntweinmonopol als nationale Marktordnung [The law about the spirits monopoly turns 70. A short description of the German spirits monopoly as national market organization]. *Branntweinwirtschaft*, 132, 90–99.
- Holder, H. (2009). Border trade and private import in Nordic countries: Implications for alcohol policy. *NAT Nordic Studies on Alcohol and Drugs*, 26, 232–236.
- Hölzlein, H. (1989). Chronik des deutschen Branntweinmonopols, 2. Fortsetzung [Chronicle of the German spirits monopoly. Second sequel]. *Branntweinwirtschaft*, 129, 338–340.
- John, A., Barman, A., Bal, D., Chandy, G., Samuel, J., Thokchom, M., et al. (2009). Hazardous alcohol use in rural southern India: Nature, prevalence and risk factors. *National Medical Journal of India*, 22, 123–125.
- Kanteres, F., Lachenmeier, D. W., & Rehm, J. (2009). Alcohol in Mayan Guatemala: Consumption, distribution, production and composition of cuxa. *Addiction*, 104, 752–759.
- Kanteres, F., Rehm, J., & Lachenmeier, D. W. (2009). Artisanal alcohol production in Mayan Guatemala: Chemical safety evaluation with special regard to acetaldehyde contamination. *Science of the Total Environment*, 407, 5861–5868.
- Karlsson, T., & Österberg, E. (2009). The Nordic borders are not alike. *NAT Nordic Studies on Alcohol and Drugs*, 26, 117–140.
- Khaltourina, D. A., & Korotayev, A. V. (2008). Potential for alcohol policy to decrease the mortality crisis in Russia. *Evaluation & the Health Professions*, 31, 272–281.
- Kurian, S., Kuruvilla, A., & Jacob, K. S. (2006). Local and illicit alcohol in India. *National Medical Journal of India*, 19, 296.
- Lachenmeier, D. W., Ganss, S., Rychlak, B., Rehm, J., Sulkowska, U., Skiba, M., et al. (2009). Association between quality of cheap and unrecorded alcohol products and public health consequences in Poland. *Alcoholism: Clinical and Experimental Research*, 33, 1757–1769.
- Lachenmeier, D. W., Kanteres, F., & Rehm, J. (2009). Carcinogenicity of acetaldehyde in alcoholic beverages: Risk assessment outside ethanol metabolism. *Addiction*, 104, 533–550.
- Lachenmeier, D. W., Lima, M. C., Nóbrega, I. C., Pereira, J. A., Kerr-Corrêa, F., Kanteres, F., et al. (2010). Cancer risk assessment of ethyl carbamate in alcoholic beverages from Brazil with special consideration to the spirits cachaça and tiquira. *BMC Cancer*, 10, 266.
- Lachenmeier, D. W., & Rehm, J. (2009). Unrecorded alcohol: A threat to public health? *Addiction*, 104, 875–877.
- Lachenmeier, D. W., & Rehm, J. (2010). Bootleggers and heavy drinkers: The impact of the German alcohol monopoly on public health and consumer safety. *Sucht*, 56, 91–93.
- Lachenmeier, D. W., Rehm, J., & Gmel, G. (2007). Surrogate alcohol: What do we know and where do we go? *Alcoholism: Clinical and Experimental Research*, 31, 1613–1624.
- Lachenmeier, D. W., Samokhvalov, A. V., Leitz, J., Schoeberl, K., Kuballa, T., Linsky, I. V., et al. (2010). The composition of unrecorded alcohol from Eastern Ukraine: Is there a toxicological concern beyond ethanol alone? *Food and Chemical Toxicology*, 48, 2842–2847.
- Lachenmeier, D. W., Sarsh, B., & Rehm, J. (2009). The composition of alcohol products from markets in Lithuania and Hungary, and potential health consequences: A pilot study. *Alcohol and Alcoholism*, 44, 93–102.
- Lachenmeier, D. W., Schoeberl, K., Kanteres, F., Kuballa, T., Sohnius, E.-M., & Rehm, J. (in press). Is contaminated alcohol a health problem in the European Union? A review of existing and methodological outline for future studies. *Addiction*.
- Lachenmeier, D. W., & Sohnius, E.-M. (2008). The role of acetaldehyde outside ethanol metabolism in the carcinogenicity of alcoholic beverages: Evidence from a large chemical survey. *Food and Chemical Toxicology*, 46, 2903–2911.
- Lang, K., Väli, M., Szűcs, S., Ádány, R., & McKee, M. (2006). The composition of surrogate and illegal alcohol products in Estonia. *Alcohol and Alcoholism*, 41, 446–450.
- Lavik, R., & Nordlund, S. (2009). Norway at the border of EU – cross-border shopping and its implications. *NAT Nordic Studies on Alcohol and Drugs*, 26, 205–231.
- Leitz, J., Kuballa, T., Rehm, J., & Lachenmeier, D. W. (2009). Chemical analysis and risk assessment of diethyl phthalate in alcoholic beverages with special regard to unrecorded alcohol. *PLoS One*, 4, e8127.
- Leon, D. A., Saburova, L., Tomkins, S., Andreev, E., Kiyonov, N., McKee, M., et al. (2007). Hazardous alcohol drinking and premature mortality in Russia: A population based case-control study. *The Lancet*, 369, 2001–2009.
- Leon, D. A., Shkolnikov, V. M., & McKee, M. (2009). Alcohol and Russian mortality: A continuing crisis. *Addiction*, 104, 1630–1636.
- Levintova, M. (2007). Russian alcohol policy in the making. *Alcohol and Alcoholism*, 42, 500–505.
- Lindström, M. (2005). Social capital, the miniaturisation of community and consumption of homemade liquor and smuggled liquor during the past year: A population-based study. *European Journal of Public Health*, 15, 593–600.
- Luginaah, I., & Dakubo, C. (2003). Consumption and impacts of local brewed alcohol (akpeteshie) in the Upper West Region of Ghana: A public health tragedy. *Social Science & Medicine*, 57, 1747–1760.
- MacDonald, S., Wells, S., & Giesbrecht, N. (1999). Unrecorded alcohol consumption in Ontario, Canada: Estimation procedures and research implications. *Drug and Alcohol Review*, 18, 21–29.
- Mäkelä, P., Bloomfield, K., Gustafsson, N. K., Huhtanen, P., & Room, R. (2008). Changes in volume of drinking after changes in alcohol taxes and travellers' allowances: Results from a panel study. *Addiction*, 103, 181–191.
- Mäkelä, P., & Österberg, E. (2009). Weakening of one more alcohol control pillar: A review of the effects of the alcohol tax cuts in Finland in 2004. *Addiction*, 104, 554–563.
- McKee, M., Szűcs, S., Sáraváry, A., Ádány, R., Kiryanov, N., Saburova, L., et al. (2005). The composition of surrogate alcohols consumed in Russia. *Alcoholism: Clinical and Experimental Research*, 29, 1884–1888.
- Moskalewicz, J., & Simpura, J. (2000). The supply of alcoholic beverages in transitional conditions: The case of Central and Eastern Europe. *Addiction*, 95(Suppl. 4), S505–S522.
- Mutisya, D., & Willis, J. (2009). Budget drinking: Alcohol consumption in two Kenyan towns. *Journal of Eastern African Studies*, 3, 55–73.
- Natvig, H., & Aarø, L. E. (1998). Evaluation of the Norwegian campaign against the illegal spirits trade. *Health Education Research*, 13, 275–284.
- Nordlund, S., & Österberg, E. (2000). Unrecorded alcohol consumption: Its economics and its effects on alcohol control in the Nordic countries. *Addiction*, 95, S551–S564.
- Norström, T. (1998). Estimating changes in unrecorded alcohol consumption in Norway using indicators of harm. *Addiction*, 93, 1531–1538.

- Onya, H. E., & Flisher, A. (2006). Home brewed alcohol use among high school students in a rural South African community. *Journal of Psychology in Africa*, 16, 65–75.
- Pärna, K., Lang, K., Raju, K., Väli, M., & McKee, M. (2007). A rapid situation assessment of the market for surrogate and illegal alcohols in Tallinn, Estonia. *International Journal of Public Health*, 52, 402–410.
- Pomerleau, J., McKee, M., Rose, R., Haerpfer, C. W., Rotman, D., & Tumanov, S. (2008). Hazardous alcohol drinking in the former soviet union: A cross-sectional study of eight countries. *Alcohol and Alcoholism*, 43, 351–359.
- Popova, S., Rehm, J., Patra, J., & Zatonski, W. (2007). Comparing alcohol consumption in central and eastern Europe to other European countries. *Alcohol and Alcoholism*, 42, 465–473.
- Ramstedt, M., & Gustafsson, N. K. (2009). Increasing travellers' allowances in Sweden – how did it affect travellers' imports and Systembolaget's sales? *NAT Nordic Studies on Alcohol and Drugs*, 26, 165–176.
- Rehm, J., Kanteres, F., & Lachenmeier, D. W. (2010). Unrecorded consumption, quality of alcohol and health consequences. *Drug and Alcohol Review*, 29, 426–436.
- Rehm, J., Klotsche, J., & Patra, J. (2007). Comparative quantification of alcohol exposure as risk factor for global burden of disease. *International Journal of Methods in Psychiatric Research*, 16, 66–76.
- Rehm, J., Mathers, C., Popova, S., Thavorncharoensap, M., Teerawattananon, Y., & Patra, J. (2009). Global burden of disease and injury and economic cost attributable to alcohol use and alcohol-use disorders. *The Lancet*, 373, 2223–2233.
- Rehm, J., Rehn, N., Room, R., Monteiro, M., Gmel, G., Jernigan, D., et al. (2003). The global distribution of average volume of alcohol consumption and patterns of drinking. *European Addiction Research*, 9, 147–156.
- Rehm, J., Sulikowska, U., Manczuk, M., Boffetta, P., Powles, J., Popova, S., et al. (2007). Alcohol accounts for a high proportion of premature mortality in central and eastern Europe. *International Journal of Epidemiology*, 36, 458–467.
- Rehm, J., Taylor, B., Mohapatra, S., Irving, H., Baliunas, D., Patra, J., et al. (2010). Alcohol as a risk factor for liver cirrhosis – a systematic review and meta-analysis. *Drug and Alcohol Review*, 29, 437–445.
- Room, R., Graham, K., Rehm, J., Jernigan, D., & Monteiro, M. (2003). Drinking and its burden in a global perspective: Policy considerations and options. *European Addiction Research*, 9, 165–175.
- Room, R., Österberg, E., Ramstedt, M., & Rehm, J. (2009). Explaining change and stasis in alcohol consumption. *Addiction Research & Theory*, 17, 562–576.
- Room, R., & West, P. (1998). Alcohol and the U.S.–Canada border: Trade disputes and border traffic problems. *Journal of Public Health Policy*, 19, 68–87.
- Svensson, J. (2009). Travellers' alcohol imports to Sweden at the beginning of the 21st century. *NAT Nordic Studies on Alcohol and Drugs*, 26, 193–203.
- Wagenaar, A. C., Salois, M. J., & Komro, K. A. (2009). Effects of beverage alcohol price and tax levels on drinking: A meta-analysis of 1003 estimates from 112 studies. *Addiction*, 104, 179–190.
- Wagenaar, A. C., Tobler, A. L., & Komro, K. A. (2010). Effects of alcohol tax and price policies on morbidity and mortality: A systematic review. *American Journal of Public Health*, 100, 2270–2278.
- WHO. (2010a). *Global status report alcohol*. Geneva, Switzerland: World Health Organization.
- WHO. (2010b). *Strategies to reduce the harmful use of alcohol: Draft global strategy. Sixty-third world health assembly. 25 March*. Geneva, Switzerland: World Health Organization.
- Zaridze, D., Brennan, P., Boreham, J., Boroda, A., Karpov, R., Lazarev, A., et al. (2009). Alcohol and cause-specific mortality in Russia: A retrospective case-control study of 48 557 adult deaths. *The Lancet*, 373, 2201–2214.