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DISPONIBILIDADE DE ALCOÓIS NÃO BEBIVEIS NA RÚSSIA EM 2015-2020: AS POLÍTICAS DE CONTROLE IMPLEMENTADAS DESDE 2005 FORAM EFETIVAS?

AVAILABILITY OF NON-BEVERAGE ALCOHOLS IN RUSSIA IN 2015-2020: WERE CONTROL POLICIES IMPLEMENTED SINCE 2005 EFFECTIVE?

ДОСТУПНОСТЬ НЕПИТЬЕВОГО АЛКОГОЛЯ В РОССИИ В 2015-2020 ГОДАХ: БЫЛА ЛИ ПОЛИТИКА ПО ЕГО КОНТРОЛЮ, ПРОВОДИМАЯ С 2005 ГОДА, ЭФФЕКТИВНА?

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RESUMO

O consumo álcoois não bebíveis é um aspecto importante do alooclismo, impactando na mortalidade por várias *causa mortis*. Desde 2005, os álcoois não bebíveis na Rússia têm sido objeto de regulamentação ativa para controlar seu consumo. Este estudo teve como objetivo determinar se os álcoois não bebíveis estavam disponíveis na Rússia em 2015–2020 para avaliar a eficácia das políticas de controle implementadas. Durante a primeira fase da pesquisa entre 2015 e 2017, 50 cidades russas de vários tamanhos, tipos e locais foram monitoradas. A segunda fase foi realizada entre 2018 e 2020 em 5 cidades, que foram monitoradas durante a primeira fase. Os pesquisadores de campo visitaram vários pontos de venda e compraram amostras de álcoois que não são bebidas: líquidos espirituosos com um teor de etanol de pelo menos 60% em volume, vendidos a um preço inferior a 45 rublos por garrafa ($ 0,57, € 0,49, £ 0,44). Até 2016, vários tipos de álcoois não bebíveis, conhecidos por serem consumidos, estavam disponíveis no varejo. A disponibilidade desses álcoois diferia entre as cidades, dependendo do nível de aplicação local dos regulamentos de controle. Os regulamentos promulgados em resposta ao surto massivo de intoxicações por álcoois não bebíveis em Irkutsk em 2016, causado pelo consumo de metanol contendo aditivo de banho falso "Hawthorn", retirou do mercado vários tipos de álcoois não bebíveis, reduzindo significativamente sua disponibilidade desde 2017. No entanto, fontes de etanol de baixo custo, como tinturas medicinais, anti-sépticos, água-de-colônias não desnaturadas, permaneceram disponíveis em 2017-2020, enquanto novos tipos de álcoois não bebíveis baratos adequados

para beber foram introduzidos no mercado (anti-sépticos para uso veterinário, desinfetantes de mãos anti-SARS-CoV-2). As bebidas alcoólicas ilegais comumente produzidas a partir de etanol farmacêutico/medicinal desviado também estavam disponíveis em redes de varejo que vendem álcoois não bebíveis. Desde 2005, as políticas implementadas e especialmente aquelas reforçadas e recentemente promulgadas em 2017 e posteriormente em resposta ao surto de Irkutsk em 2016, podem de fato ter reduzido a disponibilidade física de álcoois não consumíveis. No entanto, uma ação mais decisiva ainda é necessária para prevenir o consumo de tipos específicos de álcool não-bebíveis e bebidas alcoólicas ilegais, que são comumente produzidos a partir do álcool lícito ou desviados do mercado legal, não registrado ilícito farmacêutico/medicinal.

Palavras-chave: *álcool sem álcool, álcool não registrado, álcool substituto, SARS-CoV-2, COVID-19, Rússia.*

ABSTRACT

Consumption of non-beverage alcohol is an important aspect of hazardous drinking, impacting mortality from various causes of death. Since 2005, non-beverage alcohols in Russia have been the subject of active regulation to control their consumption for drinking. This study was purported to determine whether non-beverage alcohols were available in Russia in 2015–2020 to assess the effectiveness of implemented control policies. During the first wave of the survey between 2015 and 2017, 50 Russian cities of various sizes, types, and locations were surveyed. The second wave was conducted between 2018 and 2020 in 5 cities, which were surveyed during the first wave. Fieldworkers visited various retail outlets and purchased samples of non-beverage alcohols: spirituous liquids with an ethanol content of at least 60% by volume sold at a price of less than 45 roubles per bottle ($0.57, €0.49, £0.44). Up until 2016 various types of non-beverage alcohols known as consumed for drinking were available in retail. The availability of these alcohols differed between cities depending on the level of local enforcement of control regulations. The regulations enacted in response to the 2016 Irkutsk outbreak of mass alcohol poisonings, caused by the consumption of methanol containing fake bath additive “Hawthorn”, removed from the market several types of non-beverage alcohols, significantly reducing their availability since 2017. However, low-cost ethanol sources, such as medicinal tinctures, antiseptics, not denatured eau-de-colognes, remained available in 2017-2020, while new sorts of cheap non-beverage alcohols suitable for drinking were introduced to the market (antiseptics for veterinary use, anti-SARS-CoV-2 hand sanitizers). Illegal alcoholic beverages commonly produced from diverted pharmaceutical/medicinal ethanol were also available in retail networks selling non-beverage alcohols. Since 2005, policies implemented and especially those reinforced and newly enacted in 2017 and later in response to the 2016 Irkutsk outbreak, may have indeed reduced the physical availability of non-beverage alcohols. However, more decisive action is still required to prevent consumption of newly appearing and existing specific sorts of non-beverage alcohols and illegal alcoholic beverages, which are commonly produced from the licit or diverted from the legal market unrecorded illicit pharmaceutical/medicinal ethanol.

Keywords: *non-beverage alcohol, unrecorded alcohol, surrogate alcohol, SARS-CoV-2, COVID-19, Russia*

АННОТАЦИЯ

Употребление непитьевого алкоголя является важным аспектом опасного потребления алкоголя, влияющим на смертность от разных причин. С 2005 года непитьевой алкоголь в России является предметом активного регулирования, направленного на предотвращение его потребления для питья. Целью данного исследования было определение физической доступности непитьевого алкоголя в России в 2015-2020 годах для оценки эффективности предпринятых для его контроля мер. В ходе первого этапа исследования в 2015-2017 годах были обследованы 50 российских городов разного размера, типа и географического расположения. В ходе второго этапа в 2018-2020 годах были обследованы пять городов, исследованных в ходе первого этапа. Полевые работники посещали разнообразные торговые точки и приобретали образцы непитьевого алкоголя: спиртосодержащие жидкости с содержанием этанола не менее 60%, продаваемые по цене менее 45 рублей ($0.57, €0.49, £0.44) за бутылку. До 2016 года различные типы непитьевого алкоголя, известные как употребляемые для питья, были доступны в рознице. Их доступность отличалась в разных городах в зависимости от уровня локального соблюдения законодательных мер по контролю непитьевого алкоголя. Меры, предпринятые в ответ на вспышку массовых алкогольных отравлений в Иркутске в 2016 году, вызванных употреблением метанолсодержащего фальсифицированного концентрата для принятия ванн «Боярышник», убрали с рынка несколько разновидностей непитьевого алкоголя и снизили его физическую доступность с 2017 года. Однако, дешевые источники этанола, такие как медицинские настойки, антисептики, неденатурированные одеколоны, остались доступными в 2017-2020 годах, при одновременном появлении на рынке новых подходящих для питья разновидностей непитьевого алкоголя (антисептики для использования в ветеринарии, анти-SARS-CoV-2 санитайзеры для рук). Нелегальные алкогольные

напитки, часто производимые из фармацевтического/медицинского этанола, были также доступны в розничных сетях, продающих непитьевой алкоголь. Введенные с 2005 года меры контроля непитьевого алкоголя, особенно усиленные и дополненные в 2017 и последующих годах в ответ на вспышку смертельных алкогольных отравлений в 2016 году в Иркутске, могли действительно снизить физическую доступность непитьевого алкоголя. Тем не менее, по-прежнему требуется усиление политики по предотвращению потребления вновь появляющихся на рынке и существующих разновидностей непитьевого алкоголя и нелегальных алкогольных напитков, которые обычно производятся из легального или из выведенного из легального оборота неучтенного фармацевтического/медицинского этанола.

Ключевые слова: *непитьевой алкоголь, незарегистрированный алкоголь, суррогатный алкоголь, SARS-CoV-2, COVID-19, Россия*.

1. INTRODUCTION:

Non-beverage alcohols are industrially produced alcoholic products not intended for drinking but which can be consumed instead of alcoholic beverages. They are most often referred to as “surrogate alcohols” in Russia, not regulated as alcoholic beverages, and can be manufactured legally and illegally. A significant proportion of them is illegal, semi-legal, falsified, or counterfeit alcoholic products as their chemical composition often does not correspond to the chemical composition of legally produced spirituous products (e.g., aftershaves, lotions, eau-de-colognes that do not contain flavoring agents; medicinal tinctures that do not contain extracts of medicinal plants, except ethanol alone) (McKee *et al*. 2005; Gil *et al*., 2018b). Their packaging and consumer properties often make them unsuitable for their intended use, but they make them drinkable.

The most commonly consumed non-beverage alcohols reported in studies include spirituous fake aftershave lotions and perfumes, medicinal tinctures and antiseptics, and concentrated technical ethanol used for a variety of technical purposes in different industries (Gil *et al*., 2018a, Leon *et al*., 2007). Non-beverage alcohols shall be distinguished from the home-brewed alcohols, such as the strong ones as “samogon” (home-brewed in Russia distilled moonshine) and those with low alcohol content as wines and “braga” (home-brewed in Russia not distilled alcoholic drink derived from the fast fermentation of products rich with carbohydrates, with an alcohol concentration below 8%). These alcohols are produced for drinking in contrast to non-beverage alcohols, which are officially produced not for drinking. Non-beverage alcohols in Russia can be sold legally and illegally from various types of retail outlets such as shops of different types and sizes, street kiosks, closed and open markets.

Consumption of non-beverage alcohols for drinking is a long-standing phenomenon in Russia and an important component of the hazardous pattern of drinking impacting mortality from various causes of death (Leon *et al*., 2007; Tomkins et al., 2007; Treml, 1982; Leon *et al*., 2009; Tomkins *et al*., 2012; Andreev *et al*., 2013). In a population-based study conducted in 2003-2005 in the city of Izhevsk, 7% of working-age Russian males consumed non-beverage alcohols for drinking, which was associated with a seven-fold increase in odds of death adjusted for smoking, education, and amount of ethanol consumed from alcoholic beverages (Leon *et al*., 2007).

The main hazard associated with the consumption of non-beverage alcohols is determined by contained in them highly concentrated rectified ethanol (up to 95% by volume) (McKee *et al*., 2005; Rehm *et al*., 2014). However, some sorts of non-beverage alcohols can be more hazardous than the others, as they contain other toxic admixtures in quantities, which raise public health concerns (e.g., diethyl phthalate, polyhexamethyleneguanidine hydrochloride, formic acid, and other substances) (Solodun *et al*., 2011; Gil *et al*., 2018b). Besides this, illegally produced non-beverage alcohols may contain spirits other than ethanol, which are used for their manufacturing (i.e., methanol). Such cases of illegal production regularly manifest in outbreaks of deadly alcohol poisonings. The largest recent outbreak of this sort occurred on 17-26 December 2016 in the Siberian city of Irkutsk, where 123 people were poisoned after drinking fake spirituous bath concentrate “Hawthorn”, of which 78 died (Zobnin *et al*., 2017; Russian Information Agency “TASS”, 2017). The consumption of other methanol-based non-beverage alcohols, such as counterfeit and falsified antifreeze and windshield washer liquids, cause over a thousand sporadically occurring cases of methanol poisoning annually (Neufeld *et al*., 2016; Federal State Statistics Service, 2017).

Several studies reported the misuse of non-beverage alcohol for drinking in recent years

in Russia. A pilot study conducted in 2007 in the city of Novosibirsk reported consumption of industrially produced non-beverage alcohols for drinking by clients of narcology clinic (Bobrova *et al*., 2009). Among respondents of a survey conducted in the Moscow region in 2010, 3.5% consumed non-beverage alcohols, while 12% knew someone who consumed these alcohols as well (Kholdin *et al*., 2014). In a survey of the general population conducted in three regions of Central Russia in 2010-2011, 2.9% of respondents consumed non-beverage spirit, and 0.3% - other surrogate alcohols. However, 14.1%, 7.8%, and 5.0% of respondents knew other people who drank medicinal tinctures, eau-de-colognes/aftershaves, and technical spirits, respectively (Koshkina *et al*., 2013). Interviews of 25 patients of state-run drug and alcohol treatment centers in two Russian cities (Barnaul and Petrozavodsk) in 2013 and 2014 concluded that consumption of unrecorded and non-beverage alcohols remained common among people with alcohol dependence (Neufeld *et al*., 2019). Interview of patients of narcological clinic conducted in the Siberian city of Novosibirsk in 2015 and 2016 identified consumption of diluted industrial alcohol, medicinal spirits, and windshield washer fluids (Neufeld *et al*., 2016). The survey conducted in 2015-2017 in a narcology clinic in the city of Kazan identified consumption of all major types of non-beverage alcohols sold in bottles of various sizes (from 25 ml to 500 ml) by subjects with alcohol and substance use disorders (Gil *et al*., 2018a).

Already back in 2005-2006, Russia tightened legislation targeting non-beverage alcohols with a purpose to control their consumption, and during the following years implemented a range of other control regulations and policies directed at beverage, illegal, and unrecorded alcohols (Gil *et al*., 2009; Gil *et al*., 2016; Neufeld *et al*., 2018; WHO, 2019). The most important policies directed at non-beverage alcohols included the introduction of new denaturing additives (gasoline, kerosene, crotonaldehyde, denatonium benzoate), reducing the volume of a bottle of medicinal tinctures down to 25 ml, set up of The Unified State Automated Information System (EGAIS) for monitoring volumes of produced and distributed alcohol, the introduction in response to 2016 Irkutsk outbreak of alcohol poisonings of series of temporary bans followed by a permanent ban on sales of cheap non-beverage alcohols with an ethanol concentration of more than 28%, strengthening administrative and criminal sanctions for illegal production and distribution of alcohol. However, in spite of all these implemented measures, apart from the documented continued misuse of non-beverage alcohols (Bobrova *et al*., 2009; Koshkina *et al*., 2013; Kholdin *et al*., 2014; Neufeld *et al*., 2016; Zobnin *et al*., 2017; Neufeld *et al*., 2018; Gil *et al*., 2018a), several reports suggested that suitable for drinking non-beverage alcohols may have remained highly physically available. For example, the availability survey conducted in 2007 showed that non-beverage alcohols, such as fake perfumes and medicinal spirits, were readily available immediately after the implementation of 2005-2006 control regulations (Gil *et al*., 2009). A variety of types of used for drinking non-beverage alcohols were available in retail in the Siberian city of Novosibirsk (Neufeld *et al*., 2016). In 2016, the cases of sale for the drinking of a variety of spirituous fake aftershave lotions from vending machines by particularly inventive private entrepreneurs were reported in the city of Saratov (Rossiyskaya Gazeta, 2016). This has suggested the need for conducting a comprehensive assessment of the availability of non-beverage alcohols throughout the country, as it was not sufficiently clear how effectively Russian authorities implemented and reinforced since 2005 policies and regulations adopted for control of various consumed for drinking types of non-beverage alcohols, and what particular types of non-beverage alcohols remained available till 2020. Of particular interest was the assessment of the availability of suitable for drinking antiseptics, given the upsurge in their production in 2020 in Russia caused by the SARS-CoV-2-pandemic. To address these questions, between 2015 and 2020 a survey of the availability of non-beverage alcohols in cities across Russia was conducted, the results of which are presented in this report.

2. MATERIALS AND METHODS:

The availability survey consisted of two waves. The first wave was originally planned for 2015 and 2016. However, due to the event of a deadly outbreak of mass alcohol poisonings caused by consumption of the methanol-containing non-beverage alcohol in the city of Irkutsk in 2016 (Zobnin *et al*., 2017), which forced authorities to implement specific restrictive regulations targeting non-beverage alcohols (WHO, 2019), the first wave of the survey was extended up to 2017. This allowed assessing the immediate effects of regulations introduced in response to the Irkutsk outbreak.

As it was sought to achieve high geographical coverage of the Russian Federation, the first wave of the availability survey was

conducted in 50 Russian cities situated in different geographic and climatic zones in all 8 Federal Districts of the country. For example, the surveyed cities included the largest westernmost and easternmost cities of Kaliningrad and Petropavlovsk-Kamchatsky, the largest northernmost city of Murmansk located beyond the Arctic Circle, and the southernmost subtropical city of Sochi. The cities also spanned all types and sizes, from the smallest ones, such as Petushki (13 620 residents) to the biggest metropolis of Moscow (over 12 mln residents) (Figure 1).

The second wave of availability survey was conducted between 2018 and 2020 in five Russian cities, which were surveyed during the first wave of this survey. Data obtained from both waves were sufficient to evaluate from the availability perspective the effectiveness of policies implemented for control of non-beverage alcohols between 2005 and 2020.

More specifically, the availability survey pursuit three objectives: 1) to determine whether non-beverage alcohols were still available in retail in the cities of the Russian Federation in 2015-2020, 2) to provide characteristics of different types of non-beverage alcohols that were sold, and 3) to assess the effectiveness of policy measures adopted for control of non-beverage alcohols since 2005.

To achieve stated objectives, during the first wave of the survey (2015-2017), fieldworkers were instructed to visit at least 10 retail outlets of different types in each surveyed city, purchase samples of non-beverage alcohols, and spend on this work no more than 12 hours of time. The non-beverage alcohols were defined as the manufactured alcohol-containing liquids not intended for consumption instead of alcoholic beverages, and not classed as alcoholic drinks, but which may be consumed for drinking. They were typically at least 60% by volume ethanol (as indicated on the bottle label) and cost less than 45 roubles ($0.57, €0.49, £0.44) per bottle. Purchased samples of non-beverage alcohols were compared with the types of non-beverage alcohols obtained during the previous availability survey (Gil *et al*., 2009), and with those reported to have been consumed for drinking by subjects with alcohol and substance use disorders in the narcology survey in the city of Kazan, which was conducted simultaneously with the first wave of availability survey (Gil et al., 2018a). The samples of non-beverage alcohols, which were sold in retail before the Irkutsk outbreak (in 2015 and 2016), were compared with those available after the outbreak (in 2017 and later).

The second wave of availability survey (2018-2020) consisted of short surveys of availability with control purchases of non-beverage alcohols in 5 Russian cities in 2018 (Odintsovo, Moscow), 2019 (Izhevsk, Chelyabinsk), and 2020 (Moscow, Petushki, Chelyabinsk). Fieldworkers visited 1-3 retail outlets in which non-beverage alcohols were sold during the first wave of the survey, and 1-2 new previously not visited outlets.

In both waves of the survey, fieldworkers were also asked to purchase samples of illegal alcoholic beverages if they found them in the outlets they visited. This was done after a fieldworker discovered illegal vodka at one of such outlets. This allowed us to compare the unit cost of ethanol (measured as the cost of 10 ml of pure ethanol) in illegal beverages with that in non-beverage alcohols and draw inferences about the availability and control of illegal alcoholic beverages.

The information on purchased samples of non-beverage alcohols was recorded on paper proformas, photographed, collated centrally, and entered into the SPSS database. The analysis included a descriptive statistical analysis with the estimation of proportions, means, medians, and interquartile ranges for continuous variables describing characteristics of purchased samples. The econometric analysis included estimation and comparison of the cost of a unit of ethanol in non-beverage alcohols with that in legal and illegal alcoholic beverages. All analyses were conducted in SPSS for Windows, v.21 (SPSS, Inc., Chicago, IL).

3. RESULTS AND DISCUSSION:

3.1. Availability of non-beverage alcohols in 2015-2017

During the first wave of the availability survey, 884 retail outlets were visited in 50 cities situated in 35 regions of the Russian Federation, from which 2245 samples of non-beverage alcohols were purchased. In each surveyed city, this study was able to purchase non-beverage alcohols meeting availability survey criteria. A slightly larger number of outlets at any given year was visited in the outlying areas of the cities (54-58%). About half of the visited outlets were pharmacies (54-57%); others were street kiosks (8-11%), cosmetics and domestic chemistry shops (7-9%), supermarkets (8-9%), grocery stores (5-8%), markets (5-6%), and home appliances shops (1-3%). About half of the visited retail outlets at any

given year sold at least one alcoholic product with a minimum concentration of ethanol by volume of 60% (e.g., 154 of 303 outlets for 2015) (Table 1). The majority of these outlets (e.g., 123 of 137 outlets for 2016) sold non-beverage alcohols with ethanol unit cost lower than that in the cheapest legal vodka (<9.25, <9.5, and <10.25 Russian roubles per 10 ml pure ethanol for 2015, 2016, and 2017, respectively). An even greater proportion of these outlets sold products, known to be used for drinking (e.g., 127 of 132 outlets for 2017). From the 154, 137, and 132 outlets selling non-beverage alcohols, information was obtained on 709, 661, and 766 samples of non-beverage alcohols corresponding to availability survey criteria, in 2015, 2016, and 2017, respectively (Table 1). Data by the city is presented in Tables 7 and 8.

As shown in Table 2, all major types of non-beverage alcohols, which have been reported in Kazan narcology survey as being consumed for drinking (Gil *et al*., 2018a), were purchased, except for spirituous window cleansers and anti-icers. The identified in retail samples of window cleansers and anti-icers were deliberately not purchased. Their cost per bottle by far exceeded the selected survey price threshold of 45 roubles; they were sold in larger bottles (e.g., 0.5L or larger), were not ethanol-based (according to information on bottle labels). Hence, it was unlikely that they were consumed for drinking.

Bottle size of the majority of purchased samples varied between 25 ml and 100 ml. 17 samples were purchased in bottles larger than 100 ml. Among them were food flavor enhancers, which came in 0.5 L bottles. Prices ranged from 6 to 103 roubles per bottle (median 21.9; IQR 14.3). 62.1% (1326/2136) of all samples purchased between 2015 and 2017 had a unit cost of ethanol below than that in the legal standard Russian vodka, and 28.7% (613/2136) had a unit cost of ethanol below than that in illegal vodka (Tables 3-6).

3.1.1 Non-beverage alcohols available in 2015 and 2016 (before Irkutsk outbreak)

The available in 2015 and 2016 non-beverage alcohols included the following types: (1) perfumery and cosmetics spirituous liquids (lotions, tonics, eau-de-colognes, concentrates for taking a bath), (2) medicinal spirits (tinctures, solutions for internal use, antiseptics, medicinal ethanol), (3) technical and household chemistry spirituous liquids (technical spirit/ethanol, non-medicinal antiseptics), (4) spirituous liquids for oral hygiene, (5) spirituous food flavor enhancers (Table 2).

Medicinal tinctures sold in 25 ml bottles were the most common type of non-beverage alcohol available, followed by fake cosmetic lotions, tonics, and eau-de-colognes. The largest number of non-beverage alcohols was provided by pharmacies (mainly tinctures in 25 ml, 40 ml, 100 ml bottles, and antiseptics in 50 ml and 100 ml bottles). Other main sources of non-beverage alcohols were street kiosks, cosmetics, and domestic chemistry shops (Tables 3-6).

The current survey was able to buy the same types of non-beverage alcoholic products, which were purchased in the previous availability survey in 2007 (Gil *et al*., 2009). The most illustrative examples of purchased non-beverage alcohols with their characteristics are shown in Figure 2. However, compared with the previous survey, a new type of non-beverage alcohol was identified in 2015 and 2016. It was industrially manufactured spirituous food flavor enhancers with a low unit cost of ethanol, the consumption of which for drinking was reported in Kazan narcology survey (Figure 3).

3.1.2 Non-beverage alcohols available in 2017 (after Irkutsk outbreak)

In 2017, the fieldworkers could no longer purchase a range of types and brand names of non-beverage alcohols because they were removed from the market. They were spirituous liquids for oral and body hygiene, concentrates on taking a bath, food flavor enhancers, specific sorts of non-medicinal antiseptics, and the most commonly consumed for drinking types of perfumery cosmetics liquids, such as the cheap spirituous fake aftershave and cosmetic lotions, and tonics. However, medicinal tinctures in 25 ml, 40 ml, and 100 ml bottles, medicinal spirituous solutions for internal use (e.g., Limanovit, 100 ml bottle), medicinal antiseptics (e.g., Formic Spirit, 50 ml and 100 ml bottles), and cheap not denatured eau-de-colognes (e.g., Troynoy, Shipr) were still available in 2017 (Tables 2-6). In 2017, a new type of non-beverage alcohol – the spirituous antiseptic for veterinary use “StopSept” (low unit cost of ethanol, 100 ml bottle) appeared on the market (Figure 2).

In 2017, pharmacies became almost the only providers of the legally allowed for sale non-beverage alcohols containing cheap ethanol (97.8% of all purchased samples). However, in 2017, the 42 samples of non-beverage alcohols with a low unit cost of ethanol (13.2% of all purchased in 2017 samples with cheaper than in vodka ethanol) were nevertheless purchased, which were prohibited for sale after the Irkutsk outbreak, the majority of which (39 samples) were

not denatured eau-de-colognes. They were purchased in a variety of types of retail outlets (Table 6).

3.2. Availability of non-beverage alcohols in 2018-2020

During the second wave of the availability survey, 27 retail outlets selling non-beverage alcohols were visited in five surveyed cities: 16 pharmacies, 4 small shops/kiosks/pavilions, 5 open and closed markets, 2 supermarkets. From these outlets, 126 samples of non-beverage alcohols were purchased: 78 medicinal tinctures/extracts/solutions for internal use, 14 medicinal antiseptics, 3 antiseptics for veterinary use, 2 bottles of medicinal ethanol, 6 denatured and 18 not denatured eau-de-colognes, 2 not denatured lotions, 1 fake cosmetic tonic, and 2 spirituous sanitizers for hand disinfection (appeared on the market in 2020 during the first months of the SARS-CoV-2 pandemic (Figure 4)). 63.5% of the purchased samples were of sorts reported as drunk by subjects with alcohol and substance use disorders in the narcology survey (Gil *et al*., 2018a). 9 retail outlets visited were selling non-beverage alcohols used for drinking round-the-clock (24 hours a day).

3.3. Illegal alcoholic beverages

In five surveyed cities, fieldworkers identified and purchased 23 samples of illegal alcoholic beverages. The prices per 0.5L bottle of the cheapest illegal vodka ranged from 110 roubles ($1.76, €1.51, £1.32) in 2015 to 150 roubles ($2.05, €1.69, £1.55) in 2020. Eight retail outlets selling illegal alcoholic beverages were also selling nonbeverage alcohols known as consumed for drinking.

All samples of illegal beverages were purchased at prices, which were 1.5-3 times lower than the minimum prices established by the state for different alcoholic beverages. The cost of the cheapest illegal vodka was used to compare the unit cost of ethanol in illegal vodka and non-beverage alcohols. The typical samples of illegal alcoholic beverages, purchased in this survey, are presented in Figures 5 and 6.

3.4. Cost of a unit of ethanol in non-beverage alcohols

In 2015 and 2016, the majority of purchased samples of non-beverage alcohols with a minimum ethanol concentration of 60% by volume had ethanol unit cost lower than that in legal vodka (e.g., 78.3% (555/709) in 2015). However, in 2017 this proportion significantly dropped to 41.6% (319/766). The greatest proportions of non-beverage alcohols with a low unit cost of ethanol were among types prohibited for sale since 2017: 100%, 97.7%, and 91.3%; and 65.5%, 43.5%, and 47.9% in comparison with legal and illegal vodka for 2015, 2016, and 2017, respectively (Table 4).

The mean unit cost of ethanol in non-beverage alcohols sold in larger bottles was lower than that of legal and illegal vodka in 2015 and 2016. However, in 2017, it was practically equal to the mean unit cost of ethanol in illegal vodka but was still lower than in legal vodka. (Figure 7 A, B, C).

In 2015, all purchased samples of the major types of non-beverage alcohols (with the exception of proportion of medicinal tinctures, extracts, and solutions for internal use) contained ethanol, which was cheaper than in legal vodka. However, in 2017, the largest proportions of samples (over 80%) with a low unit cost of ethanol were identified mainly among antiseptics and eau-de-colognes, and in a few purchased samples of banned in 2017, hence illegal, fake lotions. The same types of non-beverage alcohols, which were reported as consumed for drinking in the Kazan narcology survey, provided high proportions of samples with cheap ethanol in 2017 (Figure 7 D).

By 2017, the proportion of samples with cheap ethanol, among all purchased samples, reduced for all volumes of bottles. However, it still remained very high (≈80% and higher) for non-beverage alcohols, which came in 80-100 ml bottles, and especially which were reported as consumed for drinking in the Kazan narcology survey (Figure 7 E). In 2017, the greatest proportions of samples with cheap ethanol were in non-beverage alcohols, which were not prohibited for sale after the Irkutsk outbreak and came in 99-100 ml bottles (more than 90% of samples) (Figure 7 F). These were mainly medicinal tinctures, antiseptics, and cheap, not denatured eau-de-colognes.

In 2018-2020, 57.9% of all purchased samples and 78.3% of samples of non-beverage alcohols known as misused for drinking had a cost of the unit of ethanol below that of standard 0.5L legal Russian vodka sold at established by the state minimum price. 34.6% of samples of medicinal tinctures/extracts/spirituous solutions for internal use, 91.7% of eau-de-colognes, and all samples of other types of non-beverage alcohols had a cost of a unit of ethanol below that of legal vodka. A greater percentage of tinctures and colognes, known as consumed for drinking, had cheaper ethanol than in legal vodka: 54.1% and

95.5%, respectively (Figure 8 A).

In comparison with illegal vodka, 34.1% of all purchased samples and 49.4% of samples of alcohols reported as drunk had a cheaper unit cost of ethanol. Among all samples, 14.1% of medicinal tinctures/extracts/solutions for internal use, 33.3% of cosmetic lotions/tonics, 58.3% of colognes, 71.4% of medicinal antiseptics, and all samples of other types of non-beverage alcohols contained a unit of ethanol with a cost below that of illegal vodka. Among alcohols known as drunk, 24.3% of medicinal tinctures, 33.3% of cosmetic lotions/tonics, 63.6% of colognes, 71.4% of medicinal antiseptics, and all samples of the remaining types of non-beverage alcohols had cheaper than in illegal vodka unit of ethanol (Figure 8 B).

The majority of non-beverage alcohols sold in larger bottles had cheaper ethanol in comparison with legal and illegal vodka. 54.8% and 19.4% of medicinal tinctures sold in 25 ml bottles contained a cheaper unit of ethanol than that of legal and illegal vodka, respectively (Figure 8 C, D).

Interestingly enough, for some of the medical antiseptics purchased after the start of the SARS-CoV-2 pandemic in 2020, the cost of a unit of ethanol rose sharply due to a substantial increase in retail prices on antiseptics (e.g., antiseptic “Aseptolin”). While for other sorts of antiseptics, the retail prices and the cost of a unit of ethanol remained low (e.g., “Formic Spirit”). In addition, the new antiseptic with a low cost of a unit of ethanol appeared on sale during the first months of the SARS-CoV-2 pandemic (“hand tonic Ethyl Alpha", 99 ml, 95% ethanol by volume) (Figures 2 and 4).

3.5. Gaps in the legal regulation of non-beverage alcohols

Results of the survey obtained till 2016 go in agreement with previous availability survey (Gil *et al*., 2009), and with other studies, carried between 2010 and 2016, reporting various sorts of available in retail consumed for drinking non-beverage alcohols in some of the cities in which the presented in this paper availability survey was conducted (Novosibirsk, Barnaul, Moscow) (Koshkina *et al*., 2013; Neufeld *et al*., 2016; Neufeld *et al*., 2019). This suggests reduced quality, problems with implementation and loopholes in the regulation of non-beverage alcohols during the period under analysis.

Identified in the survey low cost per single bottle, the low unit cost of ethanol in comparison with that in legal and illegal alcoholic beverages of significant proportions of available in retail non-beverage alcohols suggest insufficient use and enforcement of policies, which can reduce the affordability of these spirituous products (e.g., taxation, minimum prices). A number of studies and reports point to the significant role of economic considerations in decisions about consuming various alcohols (Gil *et al*., 2016; Kotelnikova *et al*., 2017; Gil *et al*., 2018a; Shield *et al*., 2019). For example, for consumers of non-beverage alcohols, the cost per unit of ethanol is important and the cost of an individual bottle of alcohol. The very low cost per bottle of some sorts of medicinal tinctures sold in 25 ml bottles (from 9 rubles or $0.1, €0.1, £0.09 per bottle in 2020), for instance, may explain their continued use for drinking when a consumer can derive an equivalent of 200 ml of vodka from four such bottles at a time at a very low cost (36 roubles).

In 2017 and later, the Russian Agency ”Rospotrebnadzor” (The Federal Agency for Consumer Rights and Health Protection), triggered by the 2016 Irkutsk outbreak of poisonings, introduced bans on the sale of a range of cheap non-beverage alcohols. As a result, according to data of this survey, a variety of types and brand names of fake perfumes, concentrates for taking bath, non-medicinal antiseptics, and food flavor enhancers have entirely or almost entirely disappeared from the market. However, cheap medicinal alcohols (tinctures and medicinal antiseptics), sold in pharmacies, and cheap, not denatured eau-de-colognes remained available.

The continued availability of medicinal spirits can be explained by the fact that they are regulated by another Russian agency named ”Roszdravnadzor” (The Federal Service for Surveillance in Healthcare). Hence, the regulations and provisions enacted by the Rospotrebnadzor agency are not applied to medicinal alcohols. Besides it, the Russian Federation has not yet introduced minimum prices for the pharmaceutical/medicinal ethanol as it did for the non-medicinal ethanol to discourage production and consumption of non-beverage alcoholic products, illegal and unrecorded alcohol. This still makes extremely profitable to use the low-cost raw pharmaceutical/medicinal ethanol for the production of consumed for drinking legal non-beverage medicinal alcohols (tinctures, extracts, antiseptics), legal, semi-legal, and illegal non-beverage non-medicinal alcohols (real and fake perfumes, antiseptics, bath additives), and unrecorded illegal alcoholic beverages.

Since 2017, Russia has included crude pharmaceutical/medicinal ethanol in the federal

system for monitoring volumes of alcohol produced, which is called the “EGAIS monitoring system”. However, the sale of end non-beverage alcoholic products manufactured from this ethanol is still not covered by this system, making the diversion of raw pharmaceutical/medicinal ethanol into the production of a variety of unrecorded alcohols invisible to the state. It is important to note that some of the manufacturers of pharmaceutical/medicinal ethanol and non-beverage alcohols produced from this ethanol in Russia are the large-scale businesses capable of influencing the alcohol policy-making process.

In 2017 this survey purchased the newly appeared on the market antiseptic for veterinary use “StopSept” sold in 100 ml bottles with a cheap unit cost of ethanol, which was produced from the pharmaceutical/medicinal ethanol by one of the largest pharmaceutical manufacturers infamous for its “Hawthorn” tincture business (Figure 2). This antiseptic was invented after an earlier enacted poorly observed order of the Roszdravnadzor agency was enforced in response to the 2016 Irkutsk outbreak, restricting the production and sale of medicinal non-beverage alcohols in bottles larger than 25 ml by volume. Thus, in order to exclude the best-selling non-beverage alcohols produced for human use in 100 ml bottles from this restrictive regulation, this antiseptic, intended for veterinary (but not human) use, made it possible to continue selling cheap non-beverage ethanol for drinking, which has previously been sold under the brands of hawthorn and other medicinal tinctures that came in 100 ml bottles.

In 2018-2020, due to the continued supply of cheap pharmaceutical/medicinal ethanol, the consumed for drinking medicinal spirits (tinctures, extracts, antiseptics) with a low unit cost of ethanol were readily available in pharmacies. Also, in 2018-2020 the cheap non-medicinal (veterinary) antiseptics, medicinal ethanol, and spirituous hand sanitizers were identified to have been sold in small street shops/pavilions/kiosks, although the number of such points of sale, according to observations of fieldworkers, was small in comparison with pharmacies selling legal tinctures and medicinal antiseptics.

Particular attention deserves the situation around antiseptics during the 2020 SARS-CoV-2 pandemic. According to data of this availability survey, the pandemic affected certain brands of medicinal antiseptics (e.g., antiseptic “Aseptolin”) in a way that their prices skyrocketed due to the huge demand for them among the general population, which began to actively use them as hand and surface disinfectants. This made them unaffordable to certain population groups, who drunk them before the SARS-CoV-2 pandemic. However, the prices for other medicinal antiseptics, which were also previously used for drinking and were sold in pharmacies, have remained low, which has left them still affordable for surrogate alcohol drinkers (e.g., Formic Spirit). In addition, since no immediate control regulations were put in place for the restriction of cheap antiseptics, the new not denatured anti-SARS-CoV-2 hand sanitizers with a low unit cost of ethanol appeared on the market. They were sold in small street shops in bottles that don’t prevent their consumption for drinking (“hand tonic Ethyl Alpha", 99 ml, 95% ethanol by volume) (Figure 4).

Purchased in this availability survey samples of illegal falsified alcoholic beverages were also likely produced from the diverted pharmaceutical/medicinal ethanol because the latter during the past several years has been the cheapest source of the raw ethanol in Russia.

Apart from the regulatory loopholes and insufficiencies in implementing control policies described above, other gaps in the regulation of non-beverage alcohols may explain their continued availability through 2020. The policies implemented over recent decades for control of unrecorded, surrogate, and non-beverage alcohols are well summarised by WHO (WHO, 2019). Our analysis of the current, newly enacted, and amended since 2005 regulations targeting non-beverage alcohols revealed problems with their quality, diversity of provided control policies, the timing of their implementation, and the overall organization of the alcohol policy-making process (Gil *et al*., 2020). Among the major gaps, which shall be noted are the following: 1) limited range and fragmentary implementation of control policies (e.g. minimum prices were introduced only for non-medicinal non-beverage alcohols making medicinal/pharmaceutical spirits the cheapest sources of ethanol; underutilization of separate excise taxes on all different types of non-beverage alcohols), 2) lack of harmonization and discrepancies between different orders and decrees (e.g. while one order banned medicinal tinctures in larger bottles (>25 ml of volume), another decree allowed their registration for production and sale in bottles up to 100 ml of volume), 3) poor enforcement (e.g. continued until 2017 sale of fake spirituous perfumes and other specific types of non-beverage alcohols in spite of the implemented control policies in 2005-2006; existence of a sizable market of counterfeit methanol-based windshield washer and antifreeze liquids despite a legal ban on their production and

sale), 4) recommendatory nature of some regulations (e.g. denaturing is recommended, but not obligatory), 5) delayed implementation of effective policies (e.g. ban on the sale of fake perfumes, non-medicinal antiseptics, and spirituous food flavor enhancers was implemented only after the large scale outbreak of alcohol poisonings in Irkutsk in 2016, while previous smaller-scale outbreaks caused by consumption of these products were ignored), 6) implementation of partially effective regulations in isolation from other effective policies, which could have been enacted simultaneously (e.g. introduction of the very small bottle size of 25 ml of volume for the medicinal tinctures without implementing minimum prices on them or on raw pharmaceutical/medicinal ethanol hasn't completely prevented their consumption for drinking (Gil *et al*., 2018a)), 7) overall lack of coordination and harmonization between different state agencies responsible for the control of non-beverage alcohols (e.g. while one agency effectively suppressed the consumption of fake spirituous perfumes, food flavor enhancers, and non-medicinal antiseptics, another agency responsible for medicinal spirits hasn't done that, having switched non-beverage alcohol drinkers to the predominant consumption of medicinal spirits), 8) the ambiguity of texts of some orders and decrees, which allows them to be interpreted in several often opposite and contradicting ways, and other gaps.

This study has a limitation, which shall be noted. The surveyed retail outlets in cities are not a representative sample of all outlets in a given city or country. Hence, the distribution of surveyed outlets by type and purchased alcohols by their varieties may reflect the survey patterns specific to individual field workers. However, the analysis of these distributions did not reveal significant differences between the fieldworkers. In contrast, differences were found in distributing the types of outlets visited and the types of alcohol samples purchased between different cities surveyed by the same field worker. Given that several fieldworkers surveyed several cities they have never visited before, this variation may, in fact, indicate a different situation with non-beverage alcohol availability in different cities. For example, in Arkhangelsk in 2016, a fieldworker visited 5 street kiosks, where purchased 11 samples of various consumed for drinking fake spirituous lotions, aftershaves, and bath additives. However, the same fieldworker in the same year in the city of Petrozavodsk (has a size comparable to that of Arkhangelsk) examined only 1 street kiosk, where purchased only 1 sample of a cheap not denatured eau-de-cologne. According to the observations of this fieldworker, non-beverage alcohols were more readily available in Arkhangelsk since the retail outlets selling them were encountered much more frequently along the way during the survey than in Petrozavodsk. According to the same fieldworker, non-beverage alcohols and outlets where they were sold were more common, for example, in such cities as Murmansk, Novosibirsk, and Vologda, and less common in Tyumen, Salekhard, and Pitkaranta. Other fieldworkers who surveyed several other cities they had never visited before also reported that the availability of non-beverage alcohols could differ significantly between cities, which may reflect varying degrees of enforcement of enacted regulations, hence regional variations in the implementation of control policies targeting non-beverage alcohols.

4. CONCLUSIONS:

The survey results showed that the wide variety of consumed for drinking non-beverage alcohols was readily available up untill 2016 – after a decade-long period of their targeted regulation. In 2017 and later, large segments of non-beverage alcohols represented by fake spirituous perfumes and hygienic liquids (aftershaves, lotions, tonics, bath additives, spirituous liquids for oral and body hygiene), cheap non-medicinal antiseptics, and spirituous food flavor enhancers were removed from the market. This was done by reinforcement of the previously implemented restrictive regulations and enacting the new bans in response to the 2016 Irkutsk outbreak of mass alcohol poisoning caused by consumption of methanol containing non-beverage alcohol. However, a range of consumed for drinking non-beverage alcohols remained available in retail up until 2020. They included a large segment of alcohols produced from the pharmaceutical/medicinal ethanol such as the medicinal alcohols (tinctures, extracts, solutions for internal use, antiseptics, medicinal ethanol), antiseptics for veterinary use, and cheap not denatured real and fake eau-de-colognes. In addition to them, the cheap used for drinking spirituous hand sanitizers/antiseptics invented by producers of surrogate alcohols were introduced to the market during the SARS-CoV-2 pandemic.

While policies and regulations implemented since 2005, and especially those reinforced and newly enacted in response to the 2016 Irkutsk outbreak, may have indeed significantly reduced the physical availability of non-beverage alcohols, stronger action is still required in Russia to prevent the consumption of

the newly apprearing and existing specific sorts of non-beverage alcohols, as well as illegal alcoholic beverages, which are often produced from the low-cost legal and illegal diverted from the official production pharmaceutical/medicinal ethanol.

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Table 1. *Availability of non-beverage alcohols in retail in 50 Russian cities, 2015-2017, (n)*

			Year 2015	2016	2017
Number of items 60% or more ethanol purchased	**Total**		709	661	766
	Items prohibited for sale since 2017		162	190	55
	Medicinal tinctures	**25 ml**	387	380	583
		40 ml	62	55	69
		100 ml*	51	17	14
Number of retail outlets	**Visited**		303	285	296
	Selling products 60% or more ethanol		154	137	132
	Selling products with unit cost < legal vodka		147	123	112
	Selling products reported as drunk in Kazan**		153	127	127
	Selling products prohibited for sale since 2017		55	58	26
	Selling medicinal tinctures	**25 ml**	100	78	104
		40 ml	62	53	69
		100 ml*	22	14	10

** including medicinal spirituous solutions for internal use, regulated as medicinal tinctures, sold in 100 ml bottles (e.g. Limanovit);*

*** selling non-beverage alcoholic products, which were reported by subjects with alcohol and substance use disorders as consumed for drinking (Gil et al., 2018a); some of the similar sorts of non-beverage alcohols were reported consumed for drinking in other studies as well (Bobrova et al., 2009; Koshkina et al., 2013; Kholdin et al., 2014; Neufeld et al., 2016; Zobnin et al., 2017; Neufeld et al., 2018).*

Table 2. *Main types of manufactured non-beverage alcohols reported as drunk by patients of narcology clinic, and the number and characteristics of these alcohols purchased in the survey of availability in 50 Russian cities in 2015-2017, (n)*

Narcology survey in Kazan		Availability survey in 50 cities						
Type of non-beverage alcohol*		n of narco-logy pati-ents**	Number of samples purchased				% ethanol by volume***	Volume of bottle (ml)***
			Total	2015	2016	2017		
I. Perfumery and cosmetics spirituous liquids	**Lotions/ aftershaves**	190	118	53	62	3	25; 30; 40; 68; 70; 75; 95	99; 100; 250
	Tonics	33	27	19	8	0	75; 80	100
	Eau-de-colognes	34	114	38	44	32	60; 64; 75; 75.7; 79.5	80; 83; 85; 86; 99; 100
	Bath concentrates	51	3	2	1	0	75; 93	250
II. Medicinal spirituous liquids	**Medicinal tinctures#**	135 17 80	64 190 740	35 62 257	17 56 202	12 72 281	70; 90 70 70; 90	100 40 25
	Solutions for internal use	8	16	14	0	2	95	100
	Antiseptics	35	103	46	17	40	70; 90	50; 100
	Medicinal ethanol	3	2	1	1	0	95	100
III. Technical and household chemistry spirituous liquids	**Technical ethanol**	71	0	0	0	0	95	100
	Antiseptics	1	1	0	1	0	85	300
	Anti-icers	2	0	0	0	0	-	-
	Window cleansers	5	0	0	0	0	-	-
IV. Spirituous liquids for oral hygiene		1	6	5	1	0	60	100
V. Spirituous food flavour enhancers		5	9	3	4	0	45	500

** non-beverage alcoholic products, which were reported by subjects with alcohol and substance use disorders as consumed for drinking (Gil et al., 2018a); some of the similar sorts of non-beverage alcohols were reported consumed for drinking in other studies as well (Bobrova et al., 2009; Koshkina et al., 2013; Kholdin et al., 2014; Neufeld et al., 2016; Zobnin et al., 2017; Neufeld et al., 2018);*

*** denominator for the percentages are 165 narcology patients who reported to have drunk non-beverage alcohols in the previous year (Gil et al., 2018a);*

****as stated on the bottle label;*

 # in the narcology survey, we specifically asked survey participants to indicate the volume of a bottle of medicinal tinctures consumed for drinking in order to assess the effectiveness of regulations providing for reducing the volume of a bottle of medicinal tinctures down to 25 ml, aimed at preventing their consumption for drinking (Gil et al., 2018a).

Table 3. *Characteristics of all purchased and reported as consumed for drinking non-beverage alcohols identified with minimum ethanol concentration of 60% by volume, 50 Russian cities, 2015-2017, (n (%))*

	All non-beverage alcohols			Reported as drunk in Kazan narcology survey		
	2015	2016	2017	2015	2016	2017
Place of purchase within city						
Center	296 (41.7)	297 (44.9)	346 (45.2)	222 (41.9)	183 (44.4)	190 (43.3)
Outlying area	413 (58.3)	364 (55.1)	420 (54.8)	308 (58.1)	229 (55.6)	249 (56.7)
Type of retail outlet						
Pharmacy	554 (78.1)	477 (72.2)	710 (92.7)	421 (79.4)	297 (72.1)	408 (92.9)
Kiosk	56 (7.9)	42 (6.4)	5 (0.6)	45 (8.5)	32 (7.8)	1 (0.2)
Open market	9 (1.3)	14 (2.1)	9 (1.2)	8 (1.5)	12 (2.9)	6 (1.4)
Covered market	26 (3.7)	14 (2.1)	12 (1.6)	14 (2.6)	11 (2.7)	10 (2.3)
Cosmetics/domestic chemistry shop	43 (6.1)	80 (12.1)	18 (2.3)	24 (4.5)	38 (9.2)	10 (2.3)
Supermarket	4 (0.6)	7 (1.1)	1 (0.1)	4 (0.8)	6 (1.5)	1 (0.2)
Home appliances shop	15 (2.1)	12 (1.8)	11 (1.4)	12 (2.3)	3 (0.7)	3 (0.7)
Grocery store	2 (0.3)	15 (2.3)	0 (0)	2 (0.4)	13 (3.2)	0 (0)
Type of non-beverage alcohol						
Medicinal tincture	501 (70.7)	453 (68.5)	676 (88.3)	368 (69.4)	274 (66.5)	372 (84.7)
Cosmetic lotion/tonic	80 (11.3)	84 (12.7)	2 (0.3)	71 (13.4)	72 (17.5)	1 (0.2)
Eau-de-cologne	74 (10.4)	102 (15.4)	52 (6.8)	37 (7.0)	45 (10.9)	31 (7.1)
Antiseptic	46 (6.5)	18 (2.7)	36 (4.7)	46 (8.7)	18 (4.4)	35 (8.0)
Liquids for body or oral hygiene	5 (0.7)	2 (0.3)	0 (0)	5 (0.9)	2 (0.5)	0 (0)
Bath concentrates	2 (0.3)	0 (0)	0 (0)	2 (0.4)	0 (0)	0 (0)
Other	1 (0.1)	2 (0.3)	0 (0)	1 (0.2)	1 (0.2)	0 (0)
Bottle size (ml)						
25	387 (54.6)	380 (57.5)	583 (76.1)	257 (48.5)	202 (49.0)	284 (64.7)
40	62 (8.7)	55 (8.3)	69 (9.0)	62 (11.7)	55 (13.3)	69 (15.7)
50	17 (2.4)	8 (1.2)	37 (4.8)	16 (3.0)	6 (1.5)	32 (7.3)
80-98	49 (6.9)	79 (12.0)	29 (3.8)	12 (2.3)	23 (5.6)	9 (2.1)
99-100	190 (26.8)	133 (20.1)	48 (6.3)	179 (33.8)	124 (30.1)	45 (10.3)
>100	4 (0.6)	6 (0.9)	0 (0)	4 (0.8)	2 (0.5)	0 (0)
Bottle price (roubles)						
<10.00	62 (8.7)	36 (5.5)	5 (0.7)	60 (11.3)	26 (6.3)	3 (0.7)
10.00-19.99	301 (42.5)	224 (33.9)	215 (28.1)	224 (42.3)	158 (38.3)	165 (37.6)
20.00-29.99	250 (35.3)	188 (28.4)	233 (30.4)	181 (34.2)	128 (31.1)	142 (32.3)
30.00-39.99	85 (12.0)	100 (15.1)	169 (22.1)	57 (10.8)	47 (11.4)	76 (17.3)
≥40.00	11 (1.6)	113 (17.1)	144 (18.8)	8 (1.5)	53 (12.9)	53 (12.1)
Ethanol concentration (% by volume)						
60.0-69.9	78 (11.0)	93 (14.1)	43 (5.6)	41 (7.7)	50 (12.1)	27 (6.2)
70.0-79.9	486 (68.5)	431 (65.2)	515 (67.2)	412 (77.7)	326 (79.1)	357 (81.3)
80.0-89.9	25 (3.5)	46 (7.0)	63 (8.2)	1 (0.2)	1 (0.2)	0 (0)
90.0+	120 (16.9)	91 (13.8)	145 (18.9)	76 (14.3)	35 (8.5)	55 (12.5)
Unit cost per 10 ml pure ethanol (roubles)						
<3.00	88 (12.4)	37 (5.6)	4 (0.5)	84 (15.8)	31 (7.5)	4 (0.9)
3.00-5.99	249 (35.1)	175 (26.5)	74 (9.7)	203 (38.3)	130 (31.6)	67 (15.3)
6.00-8.99	200 (28.2)	217 (32.8)	186 (24.3)	150 (28.3)	147 (35.7)	129 (29.4)
≥9.00	172 (24.3)	232 (35.1)	502 (65.5)	93 (17.5)	104 (25.2)	239 (54.4)
Unit cost per 10 ml pure ethanol in comparison with that in standard 0.5L bottle of legal Russian vodka sold at minimum established by the state price						
Cheaper	555 (78.3)	452 (68.4)	319 (41.6)	451 (85.1)	319 (77.4)	238 (54.2)
More expensive	154 (21.7)	207 (31.3)	447 (58.4)	79 (14.9)	92 (22.3)	201 (45.8)
The same	0 (0)	2 (0.3)	0 (0)	0 (0)	1 (0.1)	0 (0)
Unit cost per 10 ml pure ethanol in comparison with that in illegal 0.5L bottle of vodka*						
Cheaper	300 (42.3)	212 (32.1)	101 (13.2)	254 (47.9)	161 (39.1)	92 (21.0)
More expensive	409 (57.7)	448 (67.8)	665 (86.8)	276 (52.1)	250 (60.7)	347 (79.0)
The same	0 (0)	1 (0.1)	0 (0)	0 (0)	1 (0.2)	0 (0)
Total	709 (100)	661 (100)	766 (100)	530 (100)	412 (100)	439 (100)

** the cheapest samples of illegal 0.5L bottles of vodka were purchased for 110 ($1.76, €1.51, £1.32), 120 ($1.92, €1.65, £1.44), and 130 roubles ($2.08, €1,79, £1.56) per bottle in 2015, 2016, and 2017, respectively.*

Table 4. *Characteristics of not prohibited and prohibited for sale since 2017 non-beverage alcohols identified with minimum ethanol concentration of 60% by volume, 50 Russian cities, 2015-2017, (n (%))*

	Not prohibited for sale since 2017			Prohibited for sale since 2017		
	2015	**2016**	**2017**	**2015**	**2016**	**2017**
Place of purchase within city						
Center	225 (41.1)	234 (47.8)	322 (44.7)	71 (43.8)	63 (36.8)	24 (52.2)
Outlying area	322 (58.9)	256 (52.2)	398 (55.3)	91 (56.2)	108 (63.2)	22 (47.8)
Type of retail outlet						
Pharmacy	547 (100)	471 (96.1)	709 (98.4)	7 (4.3)	6 (3.5)	1 (2.2)
Kiosk	0 (0)	0 (0)	2 (0.3)	56 (34.6)	42 (24.6)	3 (6.5)
Open market	0 (0)	0 (0)	2 (0.3)	9 (5.6)	14 (8.2)	9 (19.6)
Covered market	0 (0)	1 (0.2)	0 (0)	26 (16.0)	13 (7.6)	10 (21.7)
Cosmetics/domestic chemistry shop	0 (0)	18 (3.7)	7 (1.0)	43 (26.5)	62 (36.3)	11 (23.9)
Supermarket	0 (0)	0 (0)	0 (0)	4 (2.5)	7 (4.1)	1 (2.2)
Home appliances shop	0 (0)	0 (0)	0 (0)	15 (9.3)	12 (7.0)	11 (23.9)
Grocery store	0 (0)	0 (0)	0 (0)	2 (1.2)	15 (8.8)	0 (0)
Type of non-beverage alcohol						
Medicinal tincture	501 (91.6)	453 (92.4)	676 (93.9)	0 (0)	0 (0)	0 (0)
Cosmetic lotion/tonic	0 (0)	0 (0)	0 (0)	80 (49.4)	84 (49.1)	2 (4.3)
Eau-de-cologne	0 (0)	19 (3.9)*	9 (1.3)*	74 (45.7)#	83 (48.5)#	43 (93.5)#
Antiseptic	46 (8.4)	17 (3.5)	35 (4.9)	0 (0)	1 (0.6)	1 (2.2)
Liquids for body or oral hygiene	0 (0)	0 (0)	0 (0)	5 (3.1)	2 (1.2)	0 (0)
Bath concentrates	0 (0)	0 (0)	0 (0)	2 (1.2)	0 (0)	0 (0)
Other	0 (0)	1 (0.2)	0 (0)	1 (0.6)	1 (0.6)	0 (0)
Bottle size (ml)						
25	387 (70.7)	380 (77.6)	583 (81.0)	0 (0)	0 (0)	0 (0)
40	62 (11.3)	55 (11.2)	69 (9.6)	0 (0)	0 (0)	0 (0)
50	17 (3.1)	8 (1.6)	37 (5.1)	0 (0)	0 (0)	0 (0)
80-98	0 (0)	19 (3.9)	6 (0.8)	49 (30.2)	60 (35.1)	23 (50.0)
99-100	81 (14.8)	28 (5.7)	25 (3.5)	109 (67.3)	105 (61.4)	23 (50.0)
>100	0 (0)	0 (0)	0 (0)	4 (2.5)	6 (3.5)	0 (0)
Bottle price (roubles)						
<10.00	62 (11.3)	36 (7.3)	5 (0.7)	0 (0)	0 (0)	0 (0)
10.00-19.99	247 (45.1)	209 (42.7)	215 (29.9)	54 (33.3)	15 (8.8)	0 (0)
20.00-29.99	159 (29.1)	124 (25.3)	230 (31.9)	91 (56.2)	64 (37.4)	3 (6.5)
30.00-39.99	71 (13.0)	62 (12.7)	147 (20.4)	14 (8.6)	38 (22.2)	22 (47.8)
≥40.00	8 (1.5)	59 (12.0)	123 (17.1)	3 (1.9)	54 (31.6)	21 (45.7)
Ethanol concentration (% by volume)						
60.0-69.9	0 (0)	17 (3.5)	3 (0.4)	78 (48.1)	76 (44.4)	40 (87.0)
70.0-79.9	418 (76.4)	348 (71.0)	510 (70.8)	68 (42.0)	83 (48.5)	5 (10.9)
80.0-89.9	23 (4.2)	41 (8.4)	63 (8.8)	2 (1.2)	5 (2.9)	0 (0)
90.0+	106 (19.4)	84 (17.1)	144 (20.0)	14 (8.6)	7 (4.1)	1 (2.2)
Unit cost per 10 ml pure ethanol (roubles)						
<3.00	30 (5.5)	11 (2.2)	4 (0.6)	58 (35.8)	26 (15.2)	0 (0)
3.00-5.99	153 (28.0)	89 (18.2)	57 (7.9)	96 (59.3)	86 (50.3)	17 (37.0)
6.00-8.99	192 (35.1)	165 (33.7)	165 (22.9)	8 (4.9)	52 (30.4)	21 (45.7)
≥9.00	172 (31.4)	225 (45.9)	494 (68.6)	0 (0)	7 (4.1)	8 (17.3)
Unit cost per 10 ml pure ethanol in comparison with that in standard 0.5L bottle of legal Russian vodka sold at minimum established by the state price						
Cheaper	393 (71.8)	285 (58.2)	277 (38.5)	162 (100)	167 (97.7)	42 (91.3)
More expensive	154 (28.2)	203 (41.4)	443 (61.5)	0 (0)	4 (2.3)	4 (8.7)
The same	0 (0)	2 (0.4)	0 (0)	0 (0)	0 (0)	0 (0)
Unit cost per 10 ml pure ethanol in comparison with that in illegal 0.5L bottle of vodka**						
Cheaper	146 (26.7)	100 (20.4)	81 (11.2)	154 (95.1)	112 (65.5)	20 (43.5)
More expensive	401 (73.3)	389 (79.4)	639 (88.8)	8 (4.9)	59 (34.5)	26 (56.5)
The same	0 (0)	1 (0.2)	0 (0)	0 (0)	0 (0)	0 (0)
Total	547 (100)	490 (100)	720 (100)	162 (100)	171 (00)	46 (100)

** denatured eau-de-colognes; # not denatures eau-de-colognes*

*** the cheapest samples of illegal 0.5L bottles of vodka were purchased for 110 ($1.76, €1.51, £1.32), 120 ($1.92, €1.65, £1.44), and 130 roubles ($2.08, €1,79, £1.56) per bottle in 2015, 2016, and 2017, respectively.*

Table 5. *Characteristics of all purchased and reported as consumed for drinking non-beverage alcohols identified with minimum ethanol concentration of 60% by volume, with a unit cost for ethanol less than in legal vodka (<9.25 rubs (2015), <9.5 rubs (2016), <10,25 rubs (2017)/10ml), 50 Russian cities, 2015-2017, (n (%))*

	All non-beverage alcohols			Reported as drunk in Kazan narcology survey		
	2015	**2016**	**2017**	**2015**	**2016**	**2017**
Place of purchase within city						
Center	235 (42.3)	188 (41.6)	118 (37.0)	185 (41.0)	130 (40.8)	85 (35.7)
Outlying area	320 (57.7)	264 (58.4)	201 (63.0)	266 (59.0)	189 (59.2)	153 (64.3)
Type of retail outlet						
Pharmacy	400 (72.1)	277 (61.3)	272 (85.3)	342 (75.8)	207 (64.9)	209 (87.8)
Kiosk	56 (10.1)	40 (8.8)	4 (1.2)	45 (10.0)	31 (9.7)	1 (0.4)
Open market	9 (1.6)	12 (2,7)	8 (2.5)	8 (1.8)	11 (3.4)	5 (2.1)
Covered market	26 (4.7)	14 (3.1)	10 (3.1)	14 (3.1)	11 (3.4)	9 (3.8)
Cosmetics/domestic chemistry shop	43 (7.7)	75 (16.6)	14 (4.4)	24 (5.3)	37 (11.6)	10 (4.2)
Supermarket	4 (0.7)	7 (1.5)	1 (0.3)	4 (0.9)	6 (1.9)	1 (0.4)
Home appliances shop	15 (2.7)	12 (2.7)	10 (3.1)	12 (2.7)	3 (0.9)	3 (1.3)
Foods shop	2 (0.4)	15 (3.3)	0 (0)	2 (0.4)	13 (4.1)	0 (0)
Type of non-beverage alcohol						
Medicinal tincture	347 (62.5)	254 (56.2)	239 (74.9)	289 (64.1)	184 (57.7)	175 (73.5)
Cosmetic lotion/tonic	80 (14.4)	82 (18.1)	2 (0.6)	71 (15.7)	70 (21.9)	1 (0.4)
Eau-de-cologne	74 (13.3)	95 (21.0)	44 (13.8)	37 (8.2)	44 (13.8)	29 (12.2)
Antiseptic	46 (8.3)	18 (4.0)	34 (10.7)	46 (10.2)	18 (5.6)	33 (13.9)
Liquids for body or oral hygiene	5 (0.9)	2 (0.4)	0 (0)	5 (1.1)	2 (0.6)	0 (0)
Bath concentrates	2 (0.4)	0 (0)	0 (0)	2 (0.4)	0 ()	0 (0)
Other	1 (0.2)	1 (0.2)	0 (0)	1 (0.2)	1 (0.3)	0 (0)
Bottle size (ml)						
25	260 (46.8)	206 (45.6)	178 (55.8)	204 (45.2)	136 (42.6)	114 (47.9)
40	36 (6.5)	31 (6.9)	42 (13.2)	36 (8.0)	31 (9.7)	42 (17.6)
50	16 (2.9)	6 (1.3)	30 (9.4)	16 (3.5)	6 (1.9)	30 (12.6)
80-98	49 (8.8)	72 (15.9)	23 (7.2)	12 (2.7)	22 (6.9)	9 (3.8)
99-100	190 (34.2)	131 (29.0)	46 (14.4)	179 (39.7)	122 (38.2)	43 (18.1)
>100	4 (0.7)	6 (1.3)	0 (0)	4 (0.9)	2 (0.6)	0 (0)
Bottle price (roubles)						
<10.00	62 (11.2)	36 (8.0)	5 (1.6)	60 (13.3)	26 (8.2)	3 (1.3)
10.00-19.99	262 (47.2)	195 (43.1)	174 (54.5)	193 (42.8)	137 (42.9)	132 (55.5)
20.00-29.99	177 (31.9)	107 (23.7)	77 (24.1)	151 (33.5)	88 (27.6)	57 (23.8)
30.00-39.99	50 (9.0)	55 (12.2)	38 (11.9)	44 (9.8)	33 (10.3)	33 (13.9)
≥40.00	4 (0.7)	59 (13.1)	25 (7.8)	3 (0.7)	35 (11.0)	13 (5.5)
Ethanol concentration (% by volume)						
60.0-69.9	78 (14.1)	85 (18.8)	39 (12.2)	41 (9.1)	47 (14.7)	26 (10.9)
70.0-79.9	371 (66.8)	293 (64.8)	214 (67.1)	334 (74.1)	244 (76.5)	179 (75.2)
80.0-89.9	5 (0.9)	14 (3.1)	0 (0)	1 (0.2)	1 (0.3)	0 (0)
90.0+	101 (18.2)	60 (13.3)	66 (20.7)	75 (16.6)	27 (8.5)	33 (13.9)
Unit cost per 10 ml pure ethanol (roubles)						
<3.00	88 (15.9)	37 (8.2)	4 (1.3)	84 (18.6)	31 (9.7)	4 (1.7)
3.00-5.99	249 (44.9)	175 (38.7)	74 (23.2)	203 (45.0)	130 (40.8)	67 (28.2)
6.00-8.99	200 (36.0)	216 (47.8)	186 (58.3)	150 (33.3)	146 (45.8)	129 (54.1)
≥9.00	18 (3.2)	24 (5.3)	55 (17.2)	14 (3.1)	12 (3.8)	38 (16.0)
Unit cost per 10 ml pure ethanol in comparison with that in illegal 0.5L bottle of vodka**						
Cheaper	300 (54.1)	212 (46.9)	101 (31.7)	254 (56.3)	161 (50.5)	92 (38.7)
More expensive	255 (45.9)	239 (52.9)	218 (68.3)	197 (43.7)	157 (49.2)	146 (61.3)
The same	0 (0)	1 (0.2)	0 (0)	0 (0)	1 (0.3)	0 (0)
Total	555 (100)	452 (100)	319 (100)	451 (100)	319 (100)	238 (100)

** denatured eau-de-colognes; # not denatures eau-de-colognes*

*** the cheapest samples of illegal 0.5L bottles of vodka were purchased for 110 ($1.76, €1.51, £1.32), 120 ($1.92, €1.65, £1.44), and 130 roubles ($2.08, €1,79, £1.56) per bottle in 2015, 2016, and 2017, respectively.*

Table 6. *Characteristics of not prohibited and prohibited for sale since 2017 non-beverage alcohols identified with minimum ethanol concentration of 60% by volume, with a unit cost for ethanol less than in legal vodka (<9.25 rubs (2015), <9.5 rubs (2016), <10,25 rubs (2017)/10ml), 50 Russian cities, 2015-2017, (n (%))*

	Not prohibited for sale since 2017			Prohibited for sale since 2017		
	2015	**2016**	**2017**	**2015**	**2016**	**2017**
Place of purchase within city						
Center	164 (41.7)	127 (44.6)	96 (34.7)	71 (43.8)	61 (36.5)	22 (52.4)
Outlying area	229 (58.3)	158 (55.4)	181 (65.3)	91 (56.2)	106 (63.5)	20 (47.6)
Type of retail outlet						
Pharmacy	393 (100)	271 (95.1)	271 (97.8)	7 (4.3)	6 (3.6)	1 (2.4)
Kiosk	0 (0)	0 (0)	1 (0.4)	56 (34.6)	40 (24.0)	3 (7.2)
Open market	0 (0)	0 (0)	0 (0)	9 (5.6)	12 (7.2)	8 (19.0)
Covered market	0 (0)	1 (0.4)	0 (0)	26 (16.0)	13 (7.8)	10 (23.8)
Cosmetics/domestic chemistry shop	0 (0)	13 (4.5)	5 (1.8)	43 (26.5)	62 (37.1)	9 (21.4)
Supermarket	0 (0)	0 (0)	0 (0)	4 (2.5)	7 (4.2)	1 (2.4)
Home appliances shop	0 (0)	0 (0)	0 (0)	15 (9.3)	12 (7.2)	10 (23.8)
Foods shop	0 (0)	0 (0)	0 (0)	2 (1.2)	15 (9.0)	0 (0)
Type of non-beverage alcohol						
Medicinal tincture	347 (88.3)	254 (89.1)	239 (86.3)	0 (0)	0 (0)	0 (0)
Cosmetic lotion/tonic	0 (0)	0 (0)	0 (0)	80 (49.4)	82 (49.1)	2 (4.7)
Eau-de-cologne	0 (0)	14 (4.9)*	5 (1.8)*	74 (45.7)#	81 (48.5)#	39 (92.9)#
Antiseptic	46 (11.7)	17 (6.0)	33 (11.9)	0 (0)	1 (0.6)	1 (2.4)
Liquids for body or oral hygiene	0 (0)	0 (0)	0 (0)	5 (3.1)	2 (1.2)	0 (0)
Bath concentrates	0 (0)	0 (0)	0 (0)	2 (1.2)	0 (0)	0 (0)
Other	0 (0)	0 (0)	0 (0)	1 (0.6)	1 (0.6)	0 (0)
Bottle size (ml)						
25	260 (66.2)	206 (72.3)	178 (64.3)	0 (0)	0 (0)	0 (0)
40	36 (9.2)	31 (10.9)	42 (15.2)	0 (0)	0 (0)	0 (0)
50	16 (4.1)	6 (2.1)	30 (10.7)	0 (0)	0 (0)	0 (0)
80-98	0 (0)	14 (4.9)	3 (1.1)	49 (30.2)	58 (34.7)	20 (47.6)
99-100	81 (20.6)	28 (9.8)	24 (8.7)	109 (67.3)	103 (61.7)	22 (52.4)
>100	0 (0)	0 (0)	0 (0)	4 (2.5)	6 (3.6)	0 (0)
Bottle price (roubles)						
<10.00	62 (15.8)	36 (12.6)	5 (1.8)	0 (0)	0 (0)	0 (0)
10.00-19.99	208 (52.9)	180 (63.2)	174 (62.8)	54 (33.3)	15 (9.0)	0 (0)
20.00-29.99	86 (21.9)	43 (15.1)	74 (26.7)	91 (56.2)	64 (38.3)	3 (7.1)
30.00-39.99	36 (9.2)	17 (6.0)	16 (5.8)	14 (8.6)	38 (22.8)	22 (52.4)
≥40.00	1 (0.3)	9 (3.2)	8 (2.9)	3 (1.9)	50 (29.9)	17 (40.5)
Ethanol concentration (% by volume)						
60.0-69.9	0 (0)	13 (4.6)	3 (1.1)	78 (48.1)	72 (43.1)	36 (85.7)
70.0-79.9	303 (77.1)	210 (73.7)	209 (75.5)	68 (42.0)	83 (49.7)	5 (11.9)
80.0-89.9	3 (0.8)	9 (3.2)	0 (0)	2 (1.2)	5 (3.0)	0 (0)
90.0+	87 (22.1)	53 (18.6)	65 (23.5)	14 (8.6)	7 (4.2)	1 (2.4)
Unit cost per 10 ml pure ethanol (roubles)						
<3.00	30 (7.6)	11 (3.9)	4 (1.4)	58 (35.8)	26 (15.6)	0 (0)
3.00-5.99	153 (38.9)	89 (31.2)	57 (20.6)	96 (59.3)	86 (51.5)	17 (40.5)
6.00-8.99	192 (48.9)	164 (57.5)	165 (59.6)	8 (4.9)	52 (31.1)	21 (50.0)
≥9.00	18 (4.6)	21 (7.4)	51 (18.4)	0 (0)	3 (1.8)	4 (9.5)
Unit cost per 10 ml pure ethanol in comparison with that in illegal 0.5L bottle of vodka**						
Cheaper	146 (37.2)	100 (35.1)	81 (29.2)	154 (95.1)	112 (67.1)	20 (47.6)
More expensive	247 (62.8)	184 (64.5)	196 (70.8)	8 (4.9)	55 (32.9)	22 (52.4)
The same	0 (0)	1 (0.4)	0 (0)	0 (0)	0 (0)	0 (0)
Total	393 (100)	285 (100)	277 (100)	162 (100)	167 (100)	42 (100)

** denatured eau-de-colognes; # not denatures eau-de-colognes*

*** the cheapest samples of illegal 0.5L bottles of vodka were purchased for 110 ($1.76, €1.51, £1.32), 120 ($1.92, €1.65, £1.44), and 130 roubles ($2.08, €1,79, £1.56) per bottle in 2015, 2016, and 2017, respectively*

Table 7. *Number of samples of non-beverage alcohols with 60% or more ethanol purchased, by city, 2015-2017, (n)*

City	Total	Items prohibited for sale since 2017	Medicinal tinctures		
			25 ml	40 ml	100 ml*
		2015			
Berdsk	38	7	27	3	0
Chelyabinsk	26	12	12	2	0
Iskitim	23	12	8	2	0
Izhevsk	74	26	26	5	13
Kazan	48	10	35	2	0
Kopeysk	30	4	24	1	0
Korkino	16	1	13	1	0
Krasnodar	37	1	25	4	0
Krasnoyarsk	34	11	19	2	0
Novosibirsk	42	1	23	4	9
Novotroitsk	34	12	17	2	1
Orsk	51	10	25	3	9
Voronezh	49	29	9	8	1
Votkinsk	36	0	26	3	4
Rostov-on-Don	24	13	7	2	0
Ryazan	40	4	26	9	0
Sarapul	40	0	24	3	9
Stavropol	28	8	13	3	0
Tyumen	39	1	28	3	5
Total	709	162	387	62	51
		2016			
Arkhangelsk	51	14	30	3	1
Danilov	22	2	16	2	1
Kazan	33	10	20	2	0
Khabarovsk	26	10	12	4	0
Moscow	71	30	31	4	4
Murmansk	43	16	23	3	0
Orekhovo-Zuevo	29	3	22	3	0
Petropavlovsk-Kamchatsky	30	5	20	5	0
Petrozavodsk	44	8	30	4	0
Petushki	42	16	22	3	1
Vologda	50	12	27	4	3
Rossosh	41	15	22	3	1
Saratov	52	12	28	5	6
Sochi	53	17	29	5	0
Ulan-Ude	39	6	28	4	0
Yakutsk	35	14	20	1	0
Total	661	190	380	55	17
		2017			
Arkhangelsk	46	2	37	3	1
Chita	38	1	32	3	0
Barnaul	29	1	23	3	2
Chelyabinsk	18	1**	15	2	0
Inta	33	1	27	3	0
Irkutsk	33	1	25	5	0
Izhevsk	27	2	12	3	4
Kaliningrad	45	2	32	5	2
Kazan	30	4	21	4	1
Kemerovo	42	1	37	3	1
Labytnangi	28	1	22	3	0
Norilsk	37	1	32	4	0
Odintsovo	44	4	33	3	1
Petushki	37	10	24	2	0
Pitkaranta	32	0	30	2	0
Volgograd	60	6	44	5	0
Salekhard	27	1	21	3	0
Suojarvi	19	1	14	2	0
Tver	52	0	40	5	0
Tula	56	14	33	4	2
Zeya	33	1	29	2	0
Total	766	55	583	69	14

** including medicinal spirituous solutions for internal use, regulated as medicinal tinctures, sold in 100 ml bottles (e.g. Limanovit);*
*** antiseptic for veterinary use "StopSept" (100ml bottle, 75% ethanol, not denatured, cheap unit cost of ethanol) registered for production and sale in 2017.*

Table 8. *Number of retail outlets visited by characteristics of non-beverage alcohols sold, by city, 2015-2017, (n)*

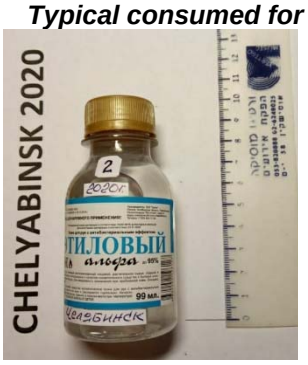
City	Visited	Selling products 60% or more ethanol	Selling products with unit cost < legal vodka	Selling products reported as drunk in Kazan	Selling products prohibited for sale since 2017	Selling medicinal tinctures		
						25 ml	40 ml	100 ml*
			2015					
Berdsk	10	8	8	7	3	5	3	0
Chelyabinsk	18	7	7	7	4	3	2	0
Iskitim	8	6	6	6	4	2	2	0
Izhevsk	12	8	8	8	3	5	5	4
Kazan	19	11	11	11	7	5	2	0
Kopeysk	11	7	7	7	2	5	1	0
Korkino	8	4	4	4	1	4	1	0
Krasnodar	24	7	7	7	1	5	4	0
Krasnoyarsk	16	9	8	9	4	5	2	0
Novosibirsk	22	8	6	8	1	7	4	3
Novotroitsk	18	10	10	10	6	4	2	1
Orsk	15	8	8	8	5	5	3	4
Voronezh	24	15	14	15	5	9	8	1
Votkinsk	16	5	5	5	0	5	3	3
Rostov-on-Don	17	5	5	5	2	3	2	0
Ryazan	14	12	12	12	2	9	9	0
Sarapul	14	6	6	6	0	6	3	4
Stavropol	16	9	9	9	4	6	3	0
Tyumen	21	9	6	9	1	7	3	2
Total	303	154	147	153	55	100	62	22
			2016					
Arkhangelsk	24	11	11	8	5	5	3	1
Danilov	8	6	5	6	2	3	2	1
Kazan	19	6	4	6	1	5	2	0
Khabarovsk	27	7	5	7	3	4	3	0
Moscow	33	12	12	12	6	5	4	4
Murmansk	13	7	7	7	4	3	3	0
Orekhovo-Zuevo	12	5	5	5	1	4	3	0
Petropavlovsk-Kamchatsky	32	13	5	9	1	11	5	0
Petrozavodsk	16	8	8	8	3	5	4	0
Petushki	15	11	11	11	6	5	3	1
Vologda	16	9	9	9	6	5	4	2
Rossosh	12	7	7	6	4	4	3	1
Saratov	18	13	13	12	7	6	5	4
Sochi	16	9	8	8	4	5	5	0
Ulan-Ude	14	8	8	8	3	5	3	0
Yakutsk	10	5	5	5	2	3	1	0
Total	285	137	123	127	58	78	53	14
			2017					
Arkhangelsk	24	6	4	6	1	5	3	1
Chita	16	6	6	6	1	5	3	0
Barnaul	14	6	5	6	1	5	3	2
Chelyabinsk	18	5	5	4	1**	4	2	0
Inta	8	5	5	5	1	4	3	0
Irkutsk	28	6	6	5	1	5	5	0
Izhevsk	12	6	5	6	1	4	3	1

Kaliningrad	10	7	7	7	2	5	5	1
Kazan	19	11	8	11	1	8	4	1
Kemerovo	14	6	4	6	1	5	3	1
Labytnangi	8	5	5	5	1	4	3	0
Norilsk	13	6	4	6	1	5	4	0
Odintsovo	10	8	7	8	2	6	3	1
Petushki	15	6	6	5	1	5	2	0
Pitkaranta	8	4	3	4	0	4	2	0
Volgograd	24	10	10	9	3	6	5	0
Salekhard	12	6	3	6	1	5	3	0
Suojarvi	6	5	5	4	1	4	2	0
Tver	10	7	6	7	0	7	5	0
Tula	11	6	6	6	4	4	4	2
Zeya	8	5	2	5	1	4	2	0
Total	296	132	112	127	26	104	69	10

** including medicinal spirituous solutions for internal use, regulated as medicinal tinctures, sold in 100 ml bottles (e.g. Limanovit);*
*** antiseptic for veterinary use "StopSept" (100ml bottle, 75% ethanol, not denatured, cheap unit cost of ethanol) registered for production and sale in 2017.*

Figure 1. *Map of the Russian Federation showing location of surveyed cities*

Typical consumed for drinking non-beverage alcohols available at least till September 2020



Anti-SARS-CoV-2 hand sanitizer "Ethyl Alpha", 99 ml plastic bottle, 95% ethanol,apperared in2020

Antiseptic for veterinary use "StopSept", 100 ml glass bottle, 90% ethanol, appeared in 2017

Medicinal ethanol 100 ml glass bottle 95% ethanol

"Formic Spirit" 100 ml plastic bottle 70% ethanol

Tincture "Herboton" 100 ml glass bottle 70% ethanol

Eau-de-cologne ""Troynoy", 99 ml glass bottle, 60% ethanol

Solution "Limanovit" 100 ml glass bottle 95% ethanol

Pepper tincture 100 ml glass bottle 70% ethanol

Hawthorn tincture 25 ml glass bottle 70% ethanol

Tincture of Valerian 25 ml glass bottle 70% ethanol

Tincture of Motherwort 25 ml glass bottle 70% ethanol

Tincture of Calendula 40 ml glass bottle 70% ethanol

Typical consumed for drinking non-beverage alcohols removed from the market from 2017

Cosmetic lotion "Vesnushka" 250 ml plastic bottle 75% ethanol

Concentrate for taking bath "Hawthorn" 250 ml plastic bottle 93% ethanol

Cosmetic lotion "Hawthorn" 250 ml plastic bottle 75% ethanol

Cosmetic lotion "LUX" 99 ml glass bottle 75% ethanol

Figure 2. *Typical non-beverage alcohols consumed for drinking, purchased in availability survey in 2015-2020.*

Figure 3. *The samples of spirituous food flavor enhansers (45 % ethanol by volume, 0.5 L bottle) purchased in availability survey in 2015-2016.*

Figure 4. *Anti-SARS-CoV-2 hand sanitizer ("hand tonic Ethyl Alpha", 99 ml bottle, 95 % ethanol by volume, not denatured, low unit cost of ethanol) used for drinking as was observed by a fieldworker, and a small street shop selling it round-the-clock (24 hours a day), Chelyabinsk, Russia, 2020.*

Vodka "Versta", Novotroitsk 2016 | *Vodka "Belaya Beryoza", Sochi 2016* | *Rum "Bacardi Black", Ryazan 2016*

Whiskey "Jameson", Ryazan 2016 | *Vodka "Bobrovka", Ryazan 2016* | *Vodka"Tsarskaya Okhota",Ryazan 2016*

Cognac "Hennessy", Ryazan 2017 | *Cognac"Abilay Khan",Chelyabinsk 2017* | *Whiskey"Jack Daniels",Chelyabinsk 2017*

Figure 5. *Typical samples of falsified and illicit alcoholic beverages sold at prices below minimum state prices established for alcoholic beverages, purchased in availability survey in 2015-2017.*

Vodka"Tsarskaya Okhota",Ryazan 2018

Cognac "Hennessy", Ryazan 2018

Cognac "Dagestan", Ryazan 2018

Vodka"Belaya Beryoska",Chelyabinsk 2019

Cognac "Rossiyskiy", Ryazan 2019

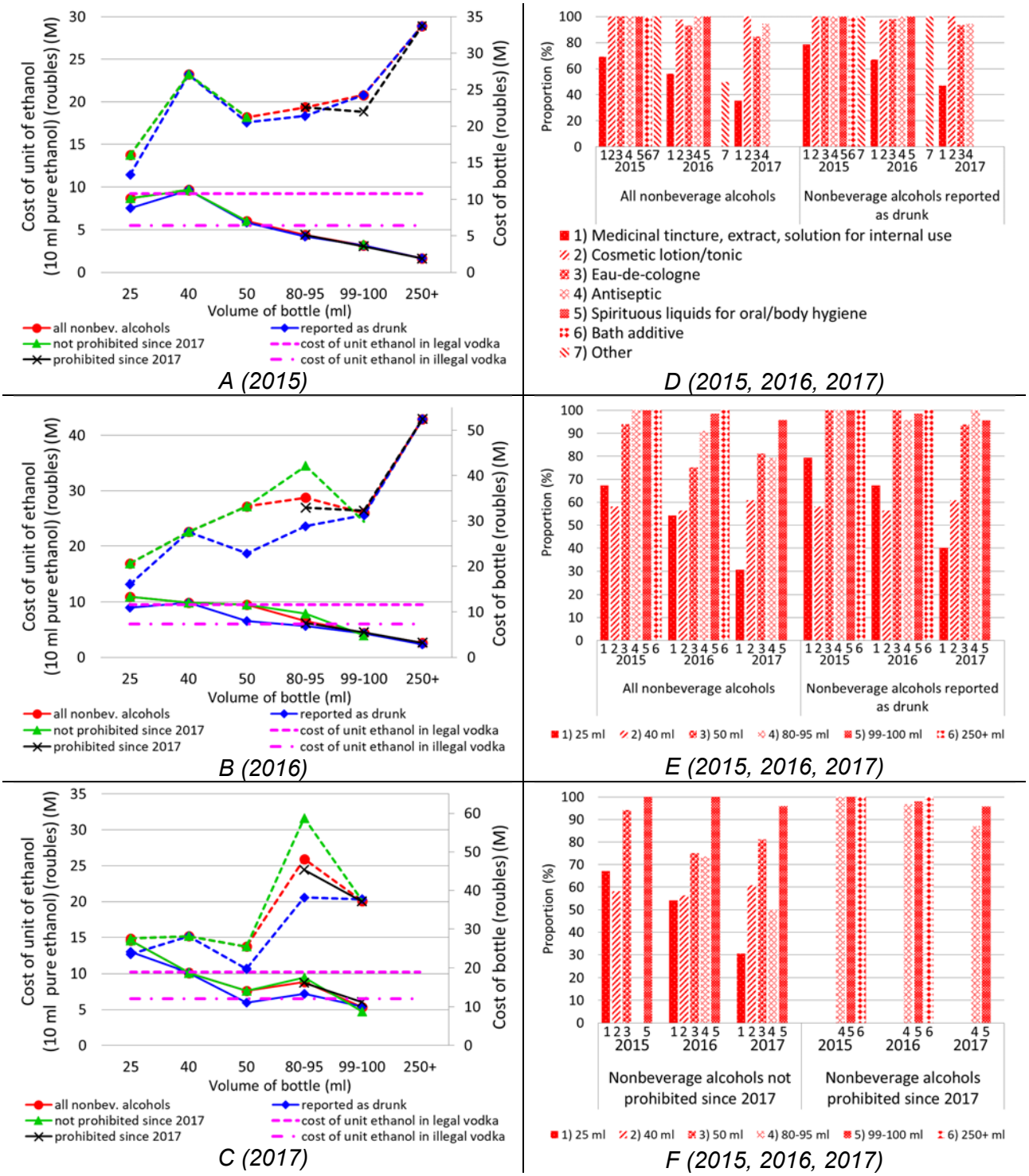
Cognac "Divin 3", Petushki 2019

Vodka "Staroe Cafe", Petushki 2020

Cognac "Kazakhstan",Chelyabinsk 2020

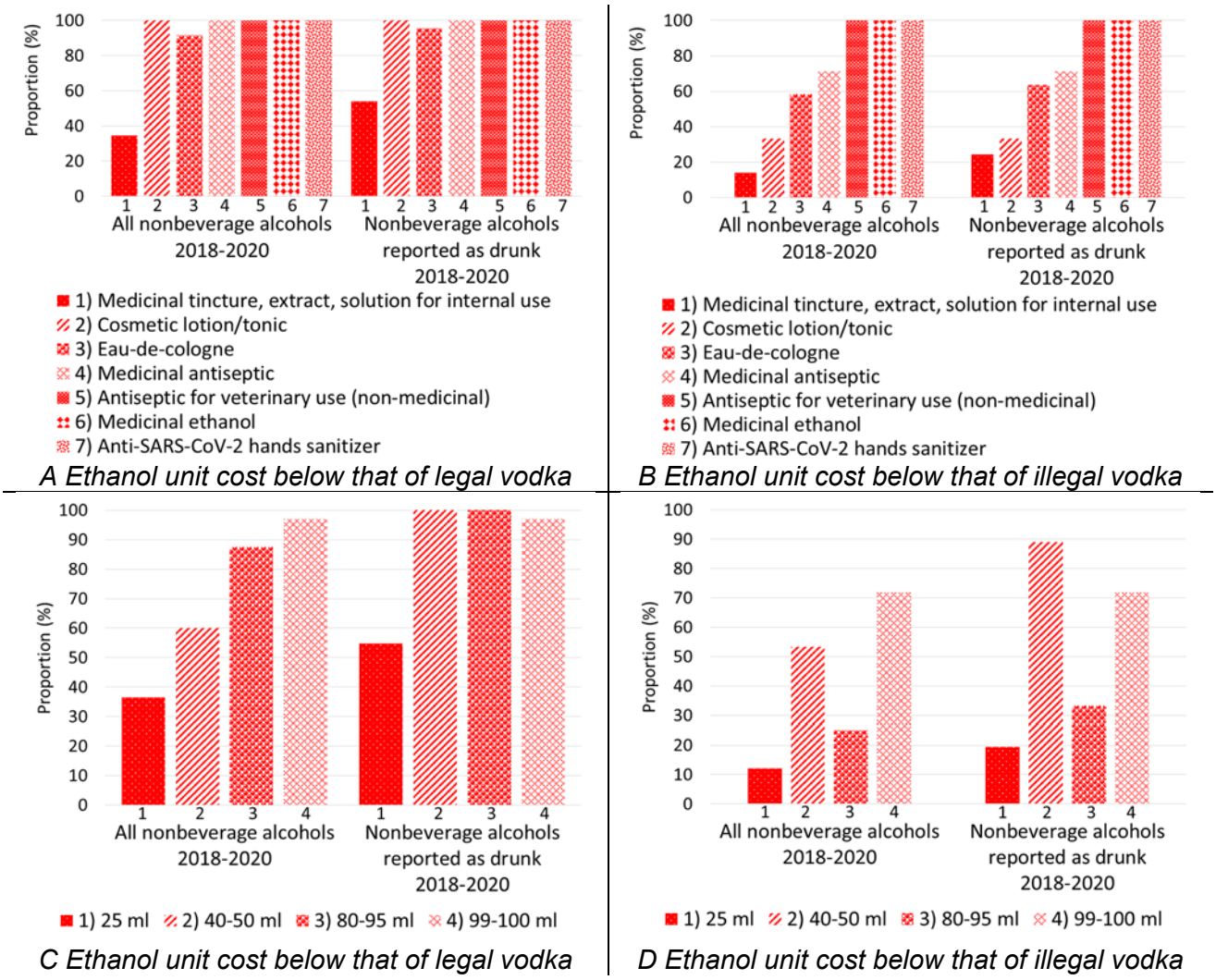
Whiskey"Johnny Walker", Ryazan 2020

Figure 6. *Typical samples of falsified and illicit alcoholic beverages sold at prices below minimum state prices established for alcoholic beverages, purchased in availability survey in 2018-2020.*



A, B, C: Relationship of the size of bottle to mean unit cost of ethanol (10 ml of pure ethanol) (continuous line) and bottle price (dash line) in non-beverage alcohols, and comparison with a unit cost of ethanol in legal Russian vodka sold at minimum established by the state price, and in illegal vodka
D, E, F: Proportion of non-beverage alcohols with a unit cost of ethanol (10 ml of pure ethanol) below that of standard Russian vodka, by type of non-beverage alcohol, the status of reported consumption for drinking by subjects with alcohol and substance use disorders (Gil et al., 2018a), the volume of the bottle, and status of prohibition since 2017.

Figure 7. *Results of econometric analysis of available non-beverage alcohols by their type, prohibition status, and reported consumption for drinking, 2015-2017.*



Proportion of non-beverage alcohols with a unit cost of ethanol (10 ml of pure ethanol) below that of standard Russian vodka (A, C), and illegal unrecorded vodka (B, D), by type of non-beverage alcohol (A, B), the volume of the bottle (C, D), and status of reported consumption for drinking by subjects with alcohol and substance use disorders (A, B, C, D) (Gil et al., 2018a)

Figure 8. *Results of econometric analysis of available non-beverage alcohols by their type and reported consumption for drinking, 2018-2020.*