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Research article

ALCOHOL CONSUMPTION AS HEALTH RISK FACTOR FOR THE POPULATION IN THE RF REGIONS IN THE 'BEFORE CRISIS' AND 'AFTER CRISIS' PERIODS (2017–2022)

N.A. Lebedeva-Nesevria^{1,2}, S.S. Gordeeva²

¹Federal Scientific Center for Medical and Preventive Health Risk Management Technologies, 82 Monastyrskaya Str., Perm, 614045, Russian Federation

²Perm State University, 15 Bukireva Str., Perm, 614990, Russian Federation

In this study, we have estimated alcohol consumption and alcohol-associated incidence in the RF regions in the 'before crisis' (2017–2019) and 'crisis' (2020–2022) periods. We identified types of the RF regions using hierarchical cluster analysis (Ward's method) and relying on indirect indicators of alcohol consumption. As a result, we established considerable differences between the macro-regions (the Federal Districts) and RF regions as per alcohol consumption and severity of its outcomes. Poles in this differentiation are represented by 'favorable' regions in the Southern Russia where alcohol sales, alcohol-associated crime and incidence are low and 'unfavorable' regions located in the Far East and southern Siberia where alcohol-associated crime and incidence are high. We have shown in this study that retail alcohol sales cannot be considered a sufficient indicator to describe alcohol use in a given region. Thus, considerable volumes of alcohol sales involve severe socially significant outcomes in some regions (for example, the Khabarovsk region and Primorye) whereas such outcomes do not occur in other regions with similarly high alcohol sales (Moscow, Saint Petersburg, the Moscow region and the Leningrad region). The level of socioeconomic welfare on a given territory is confirmed as a significant determinant of alcohol consumption.

We have also analyzed a correlation between economic vulnerability of RF regions during the 'pandemic' and 'sanction' crises and levels of alcohol consumption. The analysis revealed that large industrial regions, though expected to be vulnerable, turned out to be quite stable (it is probably due to delayed macroeconomic effects). We have not been able to identify any resources of improving a tense situation with alcohol consumption in economically unfavorable but less vulnerable subsidized agricultural regions. In general, the crisis period of 2020–2022 can be considered a source of additional health risks for the population in the RF regions where the situation with alcohol consumption was rather unfavorable in the 'before crisis' period.

Keywords: alcohol consumption, crimes, alcohol intoxication, incidence, alcoholism, alcoholic psychoses, RF regions.

Alcohol consumption remains a leading behavioral health risk factor worldwide. It makes a significant contribution to incidence [1, 2] and preventable mortality [3, 4] as per many nosologies. According to the Global Strategy to Reduce the Harmful Use of Alcohol issued by the World Health Organization (WHO) as far back as in 2010, prevention and

reductions of harmful use of alcohol should become a top priority of public healthcare both in developed and developing countries¹. In 2018, average world alcohol consumption per capita (people aged 15 years and older) equaled 6.2 liters (9.7 liters for males aged 15 years and older) according to the data provided by the WHO and World Bank². Russia

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Natalia A. Lebedeva-Nesevria – Doctor of Sociological Sciences, Head of the Laboratory for Social Risks Analysis (e-mail: natnes@fcrisk.ru; tel.: +7 (342) 237-25-47; ORCID: <https://orcid.org/0000-0003-3036-3542>).

Svetlana S. Gordeeva – Candidate of Sociological Sciences, Associate Professor at the Department of Sociology (e-mail: SSGordeeva@mail.ru; tel.: +7 (342) 239-63-29; ORCID: <https://orcid.org/0000-0002-5309-8318>).

¹ Global strategy to reduce the harmful use of alcohol. WHO. Available at: http://apps.who.int/iris/bitstream/handle/10665/44395/9789241599931_eng.pdf?sequence=1 (March 01, 2023).

² Total alcohol consumption per capita (liters of pure alcohol, projected estimates, 15+ years of age). *The World Bank*. Available at: <https://data.worldbank.org/indicator/SH.ALC.PCAP.LI> (March 01, 2023).

belonged to the group of countries where alcohol consumption was higher than the world average and equaled 11.19 liters per capita (this group also included Poland, Greece, Romania, Great Britain, Australia, and some other countries). However, alcohol consumption in Russia typically follows a specific ('northern') pattern with high shares of strong spirits in its structure [5] (there was a slight shift in it towards a 'mixed' style by the end of 2010ties [6]) and 'alcohol burden' is typically distributed unevenly in the country with the prevailing share of middle-aged man among consumers of strong alcohols [7]. Besides, regional differentiation in alcohol consumption also tends to be typical for Russia [8]; it determines substantial differences in alcohol-associated incidence and mortality between RF regions [9].

Alcohol consumption has been declining steadily in Russia since the early 2000ties; the trend is confirmed both by data on alcohol sales and results of social surveys among population [10]. However, the COVID-19 pandemic started in 2020 and involved introducing various prohibitions and restrictions (including those limiting free travel and social contacts), growing social tensions, and inability of the public healthcare to perform its functions properly. All this raised a sound concern whether this favorable trend was likely to persist (and not only in Russia). Already at the end of 2020, American experts established a growth in alcohol consumption by the US population [11]; a systemic review by British experts that covered 45 studies on consumption of psychoactive substances (PAS) during the pandemic revealed a growth in consumption of not only alcohol but also drugs and other nonnarcotic PAS [12]. At the same time, an opposite trend was identified in some countries where alcohol consumption declined due to its decreasing physical availability [13].

Indirect indicators of alcohol consumption in Russia were estimated for a period be-

tween January and November 2020; they indicated a growth in it including a growth in consumption of strong alcohols and related outcomes becoming more severe [14]. Retail alcohol sales also grew in Russia between 2019 and 2021 [15]. Results of social surveys performed during the first months of the pandemic established multidirectional changes in frequency and volumes of alcohol consumption [16]. It is noteworthy that such an indirect indicator as 'spending on purchases in alcohol-selling outlets', which is widely used by the Public Opinion Foundation to describe alcohol consumption, reveals a rather positive trend³.

Considerable stressors in the environment and growing uncertainty are key reasons for growing alcohol consumption during crises (including pandemics or world economic crises) as well as increasing alcohol-related health problems and alcohol psychoses. These harmful factors make people perceive a situation subjectively as unsafe, unstable and hardly predictable [18, 19]. The epidemiological crisis associated with the COVID-19 pandemic in 2020–2021 was followed by a socioeconomic one in Russia, the latter being called 'system crisis' [20], 'sanction crisis' [21], or 'economic crisis of non-economic nature' [22]. Probably, the whole period from 2020 and up to now can be described as 'a permanent crisis' in Russia and we can assume that the current level of stressors in the environment is fundamentally different from that observed over several previous years.

Little attention has been given by experts to regional peculiarities of alcohol consumption by Russians during the COVID-19 pandemic (2020–2021) and after it (2022). There is some evidence of fundamentally different dynamics of alcohol consumption estimated on the basis of retail alcohol sales in RF regions in 2020 against 2019, from a growth by several dozen percent in some regions to a similar

³ Potreblenie na fone pandemii. Kak epidemiya koronavirusa menyaet potrebitel'skie praktiki rossiyan [Consumption against the pandemic. How the coronavirus epidemics changes consumer practices in Russia]. *Fond Obshchestvennoe Mnenie [Public Opinion Fund]: official web-site*. Available at: <https://covid19.fom.ru/post/potreblenie-na-fone-pandemii> (March 03, 2023) (in Russian).

decline in others [17]. However, experts have not yet come up with a convincing model able to explain these data. Differences in vulnerability of RF regions to the 2022 socioeconomic crisis imply that heterogeneous dynamics of alcohol consumption in them is quite likely.

In this study, our aim was to identify different types of the RF regions as per alcohol consumption and dynamics of alcohol-associated incidence in Russia over the period between 2017 and 2022 and to suggest a model able to explain the detected regional differences.

Material and methods. In this study, we relied on data (both the whole country and as per specific regions) taken from the Unified Interdepartmental Informational Statistical System (UIISS); the data were collected from 2017 to 2022 and covered two indirect indicators of alcohol consumption⁴, retail alcohol sales (per 100 thousand people) and the number of crimes (from preliminarily investigated ones) committed under alcohol intoxication (per 100 thousand people). Alcohol-associated incidence was described based on the following indicator: ‘Incidence of the first diagnosed alcoholism and alcoholic psychosis (per 100 thousand people)’⁵.

To identify specific types of RF regions (overall, 85 RF regions were included in the study) as per alcohol consumption and alcohol-associated incidence, we applied hierarchical cluster analysis (Ward’s method). Clusterization was performed separately for two periods, ‘before crisis’ (2017–2019) and ‘crisis’ (2020–2022) as per all the selected indicators. We used SPSS Statistics v. 23 for statistical analysis.

Results and discussion. Analysis of the situation on the country level established different dynamics of the selected indicators that described alcohol consumption. Thus, retail alcohol sales grew steadily in Russia between

2017 and 2020. In 2021, a slight decline occurred in this indicator; however, alcohol sales grew again in 2022. A drastic growth in alcohol sales occurred in 2018 (by 8.5 % against 2017). Regions with the maximum growth in alcohol sales in 2018 include Ingushetia (+47.8 %), the Altai Republic (+32.5 %), the Amur region and Khakassia (+28.7 % and +27.3 % accordingly). Ingushetia remained the leader as per a growth in alcohol sales in 2022 against 2021 (+28.8 %). Alcohol sales also grew in the Altai Republic (+9.5 %), Khakassia (+9.2 %), the Belgorod region (+12 %) and the Karachai-Cherkess Republic (+14.1 %).

The number of people who committed crimes under alcohol intoxication declined annually in Russia between 2017 and 2022. In 2017 the country ‘number of crimes (from preliminarily investigated) committed under alcohol intoxication per 100 thousand people’ equaled 257.5 cases; in 2022, this number fell to 173.9 cases. However, the level of ‘alcohol-related crime’ in 2022 is rather alerting since the share of people who committed crimes under alcohol intoxication is rather significant and accounts for almost one third of the whole number of people who committed crimes. Several RF regions had high numbers of crimes committed under alcohol intoxication between 2017 and 2019 including Transbaikalia, Chukotka, the Altai Republic and Tyva. It is typical that no significant changes in the number and structure of leader (and anti-leader) regions as per the number of crimes committed under alcohol intoxication per 100 thousand people were identified between 2020 and 2022.

Incidence of the first diagnosed alcohol and alcoholic psychosis (per 100 thousand people) had non-linear dynamics in the RF. Its level decreased from 55.7 to 40.3 (by 27.6 %) between 2017 and 2020. However,

⁴ Data on alcohol consumption based on direct indicators are not collected continually in Russia, either in the country as a whole or in specific regions.

⁵ Another important indicator to analyze outcomes of alcohol consumption is mortality caused by accidental alcohol poisonings; unfortunately, these data are not available in the UIISS for 2022 as per specific regions.

this incidence grew again after 2020 and equaled 46.3 and 46.5 cases in 2021 and 2022 accordingly. The Khabarovsk region, the Magadan region and the Nenets Autonomous Area had stably high levels of alcohol-associated incidence between 2017 and 2019; these levels were significantly higher than the national average. In 2021, the situation changed and new regional leaders appeared including the Mari El Republic (364.6 cases per 100 thousand people), the Khabarovsk region (143.3 cases), and Mordovia (151.4 cases). Chukotka raised special concern between 2017 and 2022 as regards alcohol-associated incidence.

The clusterization of the RF regions between 2017 and 2019 allowed identifying seven different clusters (Figure 1). Table 1 provides average indicator values as per all the clusters.

The first cluster has the smallest number of regions and the situation there is the worst.

The regions in these clusters are the Magadan region, the Nenets Autonomous Area, the Komi Republic and Chukotka. Retail alcohol sales are typically high in this cluster (the average cluster value is 238.8 thousand deciliters per 100 thousand people) and the number of crimes committed under alcohol intoxication is considerably higher than the national average (the average cluster value is 566.2 crimes per 100 thousand people). Alcohol-associated incidence is also critical in these regions (the average cluster value is 159.9 cases per 100 thousand people).

The second cluster has relatively low retail alcohol sales (the average cluster value is 86.5 thousand deciliters per 100 thousand people) but the critically high number of crimes committed under alcohol intoxication (the average cluster value is 626.6 crimes per 100 thousand people). Alcohol-associated

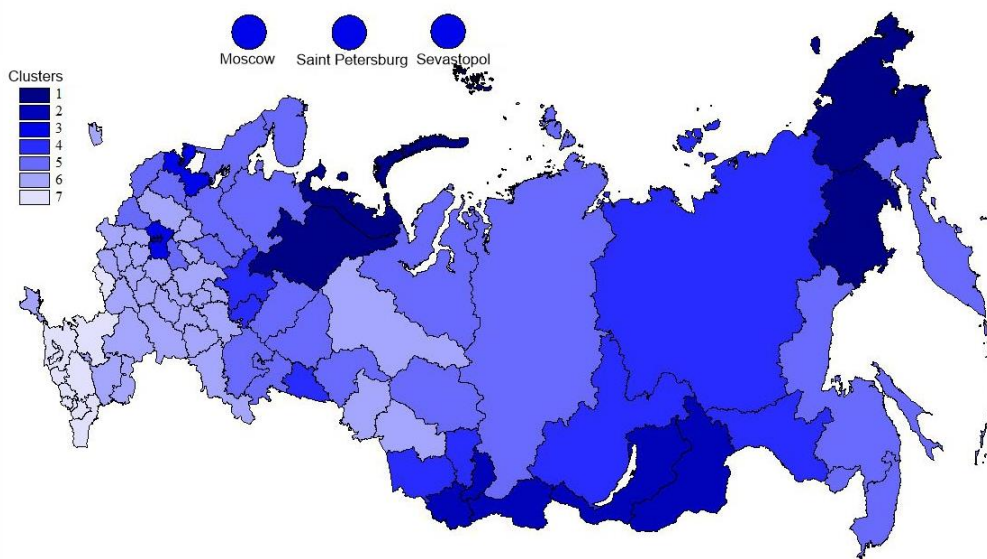


Figure 1. Clusterization of the RF regions as per indirect indicators of alcohol consumption and alcohol-associated incidence in 2017–2019

Table 1

Average indicator values as per the identified clusters of the RF regions (2017–2019)

Indicator	Cluster No.						
	1	2	3	4	5	6	7
Retail alcohol sales (thousand deciliter per 100 thousand people)	238.8	86.5	205.3	132.6	180.1	131.2	46.9
The number of crimes committed under alcohol intoxication (cases per 100 thousand people)	566.2	626.6	108.0	455.5	335.3	229.3	96.2
Incidence of the first diagnosed alcoholism and alcoholic psychosis (cases per 100 thousand people)	159.9	70.7	36.3	78.7	77.8	64.9	27.5

incidence in the cluster is close to the national average (the average cluster value is 70.7 cases per 100 thousand people). This cluster includes Transbaikalia, the Altai Republic, Buryatia, Tyva, and Khakassia.

The *third* cluster is rather peculiar as per its characteristics; it includes the Leningrad region, the Moscow region, Moscow, Saint Petersburg, and Sevastopol. Although retail alcohol sales are relatively high in the cluster (the average cluster value is 205.3 thousand deciliters per 100 thousand people), the number of crimes committed under alcohol intoxication (the average cluster value is 108 crimes per 100 thousand people) as well as alcohol-associated incidence (the average cluster value is 36.3 cases per 100 thousand people) are relatively low.

The clusters from the *fourth to sixth* were combined in one provisional group based on values of the indicators being predominantly similar to the national average. Retail alcohol sales (the average cluster value is 132.6 thousand deciliters per 100 thousand people) and alcohol-associated incidence (the average cluster value is 78.7 cases per 100 thousand people) similar to the national average are a peculiarity of the *fourth* cluster; but the number of crimes committed under alcohol intoxication is higher in this cluster than the national average (the average cluster value is 455.5 crimes per 100 thousand people). This cluster includes the Altai region, the Amur region, the Irkutsk region, the Kemerovo region, the Kirov region, the Kurgan region, Yakutia, and Udmurtia.

The *fifth* cluster includes 22 RF regions located in the Central Federal District (the Vladimir region and the Kostroma region), the North-West Federal District (the Vologda region and the Murmansk region), the Volga Federal District (the Perm region and the Sverdlovsk region), the Siberian Federal District (the Krasnoyarsk region and the Tomsk region), and the Far East Federal District (Primorye and the Khabarovsk region). All the analyzed indicators have values similar to the national average in this cluster including retail alcohol sales (the average cluster value is 180 thousand deciliters per 100 thousand people),

the number of crimes committed under alcohol intoxication (the average cluster value is 335.3 crimes per 100 thousand people), and primary incidence of alcohol and alcoholic psychosis (the average cluster value is 77.8 cases per 100 thousand people).

The *sixth* cluster includes the greatest number of regions, namely 30, where the situation with retail alcohol sales (the average cluster value is 131.2 thousand deciliters per 100 thousand people) and alcohol-associated incidence (the average cluster value is 64.9 cases per 100 thousand people) is relatively good. This cluster also has a relatively low level of 'alcohol-associated crime' (the average cluster value is 229.3 crimes per 100 thousand people). Tatarstan, Mari El, Mordovia, the Astrakhan region, the Bryansk region, the Orel region, the Orenburg region as well as some other RF regions are included into the sixth cluster.

The most favorable situation is in the *seventh* cluster, which differs significantly from all the other RF regions due to low levels of the analyzed indirect indicators describing alcohol consumption. This cluster includes all seven regions in the North Caucasian Federal District, Adygei, the Krasnodar region, the Rostov region, and the Belgorod region. The cluster has the lowest number of crimes committed under alcohol intoxication, 96.2 cases per 100 thousand people. Retail alcohol sales and alcohol-associated incidence are also lower in this cluster than the national average (the average cluster values are 46.9 thousand deciliters and 27.5 cases accordingly).

The clusterization of the RF regions between 2020 and 2022 allowed identifying ten different clusters. Some clusters retained the same regions in this period and their structure did not change significantly. Such clusters are those from the *first to fourth* and the *seventh*. The *fifth* and *sixth* clusters redistributed and regions that were included into them created three relatively new clusters. In addition, two new groups of RF regions with similar indicators were identified (Figure 2). Table 2 provides average cluster values as per all the analyzed indicators.

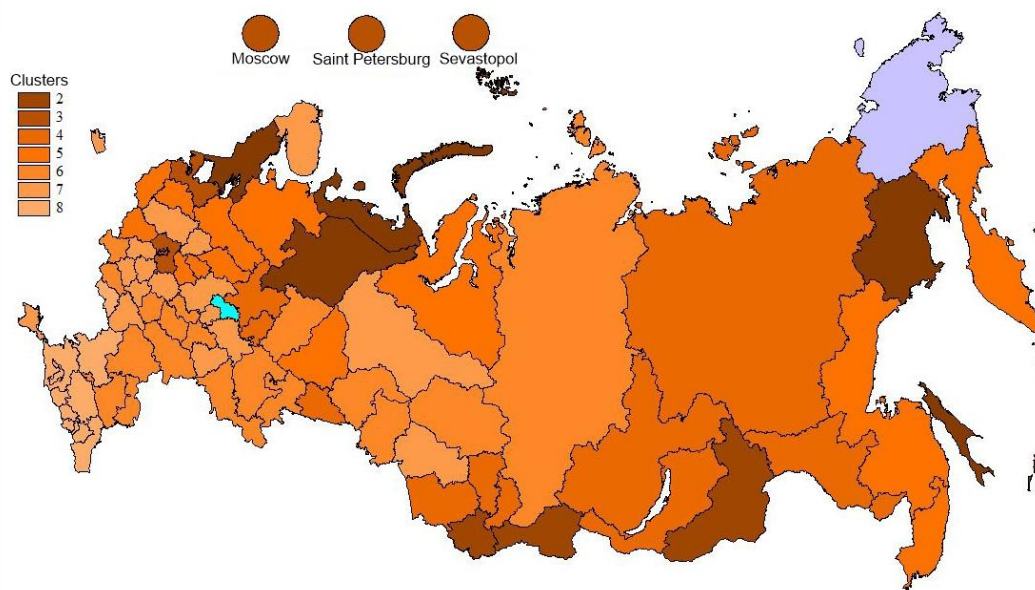


Figure 2. Clusterization of the RF regions as per indirect indicators of alcohol consumption and alcohol-associated incidence in 2020–2022

Table 2

Average indicator values as per the identified clusters of the RF regions (2020–2022)

Indicator	Cluster No.*									
	1	2	3	4	5	6	7	8	9	10
Retail alcohol sales (thousand deciliter per 100 thousand people)	256.4	87.5	216.1	136.6	191.5	119.8	160.4	54.0	150.9	178.1
The number of crimes committed under alcohol intoxication (cases per 100 thousand people)	395.3	597.3	101.1	378.1	259.0	243.4	173.6	81.3	210.3	514.4
Incidence of the first diagnosed alcoholism and alcoholic psychosis (cases per 100 thousand people)	93.5	58.6	18.1	69.0	72.0	52.2	47.5	19.1	219.3	287.7

Note: * cluster No. 9 is Mari El; cluster No. 10 is Chukotka.

The situation with alcohol consumption estimated as per indirect indicators was the worst in the *first* cluster in the previous period and remained so in the second one. The cluster added new regions between 2020 and 2022 such as Karelia and the Sakhalin region that were previously included into the fifth cluster with a relatively good situation. The ‘crisis’ period did not involve any significant or drastic deterioration of indicators describ-

ing either alcohol consumption or alcohol-related incidence. It was rather absence of any positive dynamics of these indicators that moved these RF regions into the group with the lowest wellbeing⁶. Chukotka that was also included in this cluster was assigned into another separate cluster. Just as in the period between 2017 and 2019, the regions included in this cluster have considerable retail alcohol sales (the average cluster value is 256.4 thou-

⁶ For reference, the Murmansk region was included in the same fifth cluster as Karelia and the Sakhalin region in 2017–2019 but in 2020–2022 there was a significant decline in this region in both the number of crimes committed under alcohol intoxication and alcohol-associated incidence (but retail alcohol sales remained at the same level). This allowed us to assign the Murmansk region into a group of regions with relatively normal wellbeing in the ‘crisis’ period included into the seventh cluster.

sand deciliters per 100 thousand people) and concerning numbers of crimes committed under alcohol intoxication and high levels of alcohol-associated incidence (the average cluster values are 395.3 crimes per 100 thousand people and 93 disease cases per 100 thousand people).

The number of regions included into the *second* cluster went down to three. Only Transbaikalia, the Altai Republic and Tyva remained in it. This cluster still has relatively low retail alcohol sales (the average cluster value is 87.5 thousand deciliters per 100 thousand people) and excessively high levels of 'alcohol crime' (the average cluster value is 597.3 crimes per 100 thousand people). Primary incidence of alcoholism and alcoholic psychosis is similar to the national average in this cluster (the average cluster value is 58.6 cases per 100 thousand people). It is noteworthy that retail alcohol sales are three times lower in Tyva against the other regions in this cluster; however, alcohol-associated incidence and crime correspond to the average cluster values⁷.

The *third* cluster retained the same regions as in the previous period, namely, the Leningrad region, the Moscow region, Moscow, Saint-Petersburg, and Sevastopol. Retail alcohol sales grew insignificantly over the analyzed period against the previous one (the average cluster value grew from 205.3 to 216.1 thousand deciliters per 100 thousand people); this trend is in line with the national dynamics. Other indirect indicators describing alcohol consumption by people living in these regions still have relatively low values and negative dynamics. Thus, there was a slight decrease in the number of crimes committed under alcohol intoxication (the average

cluster value went down from 108 cases to 101.1 cases per 100 thousand people). Primary incidence of alcoholism decreased considerably (the average cluster value went down by two times).

The *fourth* cluster retained all the regions included into it over the previous period and 'added' the Jewish Autonomous Area, Buryatia, and Khakassia⁸. Even with this new structure, the cluster still has retail alcohol sales (the average cluster value is 136.6 thousand deciliters per 100 thousand people) and alcohol-associated incidence (the average cluster value is 69 cases per 100 thousand people) that are similar to the national average. The number of crimes committed by people living in these regions under alcohol intoxication raises considerable concern (the average cluster value is 378.1 cases per 100 thousand people).

The *fifth* cluster has lost a lot of RF regions previously included into it. Between 2017 and 2019, it had 22 regions but only 13 remained in it in the period between 2020 and 2022. Ten regions left the cluster but the Ivanovo region was included into it⁹. The analyzed indirect indicators of alcohol consumption are very similar to the national average in the Arkhangelsk region, the Vologda region, the Nizhniy Novgorod region, the Smolensk region, and other RF regions in the fifth cluster. Thus, the average retail alcohol sales equaled 191.5 thousand deciliters per 100 thousand people in the cluster. Alcohol-associated incidence and crime were also close to the national average (the average cluster value is 72 cases per 100 thousand people and 259 cases per 100 thousand people accordingly).

The *sixth* and *seventh* clusters include the greatest number of regions in the period

⁷ Tyva and Transbaikalia also typically have high levels of mortality caused by accidental alcohol poisonings. In 2021, 17.2 cases per 100 thousand people were registered in Tyva and 15.6 cases per 100 thousand people were registered in Transbaikalia (the national average is 6.36 cases per 100 thousand people). Mortality due to accidental alcohol poisoning was also high in the Altai Republic in 2020 (16.3 cases per 100 thousand people); in 2021, the level went down to 4.52 cases per 100 thousand people.

⁸ Buryatia and Khakassia moved to the fourth cluster from the second 'before crisis' one with a less favorable situation since alcohol-associated crime went down during the 'crisis' period in both regions and alcohol-associated incidence also decreased in Khakassia. The Jewish Autonomous Area, on the contrary, faced a decrease in its wellbeing due to growing levels of alcohol-associated crime and relatively high alcohol consumption.

⁹ The Ivanovo region was included into the six cluster with relatively favorable conditions in the 'before crisis' period; in the 'crisis' period, retail alcohol sales grew in the region although alcohol-associated crime and incidence went down.

between 2020 and 2022. The *sixth* cluster includes 18 RF regions: seven regions located in the Volga Federal District¹⁰, such as the Perm region, the Saratov region, Bashkortostan and others; three regions located in the South Federal District (the Astrakhan region, the Volgograd region, and the Kalmyk Republic) and the Central Federal District (the Bryansk region, the Kursk region, and the Tambov region); two regions located in the Ural Federal District (the Tyumen region and the Chelyabinsk region) and the Siberia Federal District (the Omsk region and the Tomsk region). Retail alcohol sales are slightly lower than the national average (the average cluster value is 119.8 thousand deciliters per 100 thousand people). Alcohol-associated incidence and crime are within the national trends. The average cluster number of crimes committed under alcohol intoxication equals 243.4 cases per 100 thousand people; the average cluster primary incidence of alcoholism and alcoholic psychosis is 52.2 cases per 100 thousand people.

The *seventh* cluster includes 17 RF regions. The hierarchical clusterization allowed including eight regions located in the Central Federal District (the Voronezh region, the Lipetsk region, the Yaroslavl region and others), four regions from the Volga Federal District, two regions from the North-West Federal District (the Murmansk region and the Kaliningrad region), one region from the Ural (the Khanty – Mansi Autonomous Area), Siberia (the Novosibirsk region) and South (Crimea) Federal Districts. Retail alcohol sales are slightly higher than the national average in the cluster (the average cluster value is 160.3 thousand deciliters per 100 thousand people). On the contrary, alcohol-associated incidence and crime are slightly lower than the national average. The average cluster number of crimes committed under alcohol intoxication is 173.6 cases per 100 thousand people; average

primary incidence of alcohol and alcoholic psychosis is 47.5 cases per 100 thousand people.

The *eighth* cluster with the most favorable conditions is similar to the seventh cluster identified as per the clusterization over the period between 2017 and 2019. It includes all the regions located in the North Caucasian Federal District, the Belgorod region, the Rostov region, Adygei, and the Krasnodar region. Retail alcohol sales remained low between 2020 and 2022 in comparison with the previous period (the average cluster value grew insignificantly from 46.9 thousand to 54 thousand deciliters per 100 thousand people); the average cluster number of crimes committed under alcohol intoxication went down slightly from 96.2 to 81.3 cases per 100 thousand people; alcohol-associated incidence also decreased (the average cluster value declined from 27.5 to 19.1 cases per 100 thousand people).

And finally, Chukotka and Mari El were assigned into two separate clusters. In Chukotka, retail alcohol sales are relatively higher than the national average. The levels of other indirect indicators also raise considerable concern. Thus, the number of crimes committed under alcohol intoxication is more than two times higher than the national average; alcohol-associated incidence is more than five times higher (the average cluster values are 514.4 crimes per 100 thousand people and 287.7 disease cases per 100 thousand people accordingly). In Mari El, the poorest situation is with alcohol-associated incidence (the average cluster value is 219.3 cases per 100 thousand people). It is noteworthy that primary incidence of alcoholism grew by more than five times between 2020 and 2021 (from 66.5 to 364.6 cases per 100 thousand people) and then decreased slightly by 2022 (down to 226.67 cases per 100 thousand people). The other analyzed indirect indicators that describe alcohol consumption are similar to the national average in Mari El.

¹⁰ Out of 14 RF regions included into the Volga Federal District (the second biggest in the RF as per its population after the Central Federal District), the overwhelming majority were included into clusters with favorable conditions in the ‘crisis’ period; seven regions were in the sixth cluster, the other four (the Nizhniy Novgorod region, Tatarstan, and Chuvashia) were in the seventh cluster. Out of the remaining three, two regions (the Kirov region and Udmurtia) were included in the fourth cluster and only Mari El, which creates its own separate cluster, has an extremely poor situation as regards alcohol consumption.

At present, the socioeconomic situation in the country is rather unstable and this creates elevated public health risks [23] including those caused by harmful use of alcohol. Patterns of alcohol intake mediated by effects of social contexts become especially apparent mediators of public health deterioration during economic crises. Moreover, negative health outcomes are often delayed and appear after a certain time lag.

This study describes RF regions over the periods between 2017 and 2019 and between 2020 and 2022. They are combined in clusters as per similarity in the markers of alcohol consumption and therefore regions in different clusters are different from each other as per these markers. The results indicate there is regional specificity and considerable differences in the analyzed indirect indicators of alcohol consumption.

The most alerting situation as regards alcoholization of population occurred in the period between 2017 and 2022 in Chukotka. Thus, primary incidence of alcoholism and alcoholic psychosis per capita is stably high in this RF region (in 2021, 306.9 cases per 100 thousand people were diagnosed in Chukotka and this level is more than 6.5 times higher than the national average over the analyzed period). Experts conventionally explain this situation by a low living standard, high unemployment rates, and other socioeconomic factors affecting the indigenous people of the Far North who live under harsh natural and climatic conditions [24]. In addition, the most burning issue is a growth in primary incidence of alcoholism and alcoholic psychoses among children and adolescents in Chukotka; this is largely due to substantial sales of illegal alcohol [25].

The stably unfavorable situation with alcohol consumption, alcohol-associated crime and incidence is observed in the Magadan region, the Nenets Autonomous Area and the Komi Republic. This is an apparent marker indicating that the socioeconomic situation is rather poor in these regions [26]. Overall, life quality in a region is associated with alcohol consumption (especially with alcohol-associated crime and incidence). In 2021, the top 20 RF regions as per life quality were identified by the Agency for Strategic Initiatives¹¹; among them, 18 regions were assigned by our analysis into the ‘top’ or the most favorable clusters in the ‘crisis’ period. The only exceptions were Moscow with high retail alcohol sales (but low levels of alcohol-associated crime and incidence) and Udmurtia where retail alcohol sales were similar to those in Moscow but alcohol-associated crime and incidence were substantially higher than in the capital.

High levels of alcohol consumption with negative outcomes persist in the Southern Siberia in such regions as Transbaikalia, the Altai Republic¹², Buryatia, Tyva, and Khakassia. This is also due to extremely unfavorable socioeconomic situation in these regions both in the ‘before crisis’ and ‘crisis’ periods [27]. Thus, for example, according to the data provided by Rospotrebnadzor, 26 % of all the alcohol poisonings in the Altai Republic in 2022 were caused by unspecified alcohol; 4.5 % of cases, methyl alcohol. In these RF regions, the human development index tends to be low [28] and risky behavior is widespread [29]. In addition, levels of unregistered alcohol consumption also tend to be high in these regions¹³ [8].

¹¹ Reiting kachestva zhizni [Life quality rating]. *Agency for Strategic Initiatives: official web-site*. Available at: https://asi.ru/government_officials/quality-of-life-ranking/ (March 21, 2023) (in Russian).

¹² Po itogam 2022 goda otravleniya alkogolem zanimayut vedushchee mesto v strukture otravlenii khimicheskoi etologii v Respublike Altai: press-reliz [As per the results of 2022, alcohol poisonings occupy the leading place among chemical poisonings in the Altai Republic: press-release]. *Rospotrebnadzor's Regional Office in the Altai Republic*. Available at: <http://www.04.rospotrebnadzor.ru/index.php/san-nadzor/2015-10-01-05-48-10/17906-16012023.html> (March 21, 2023) (in Russian).

¹³ Alkogolizm i narkomaniya v regionakh RF. Otsenka masshtaba problemy na osnove dostupnykh statisticheskikh dannykh, 2019 g. [Alcoholism and drug addiction in RF regions. Assessment of the problem scope based on available statistical data, 2019]. *Esli byt' tochnym: the informational platform*. Available at: <https://static.tochno.st/files/analytical/a95ec80f72d0a36b08753a9e6484a644.pdf> (March 21, 2023) (in Russian).

Regions included in the North Caucasian Federal District (Dagestan, Ingushetia, Chechnya, North Ossetia, the Karachai-Cherkess Republic and others) are predominantly populated with Muslims and are constantly assigned into the so called ‘light-drinking’ category [30]. Religion as a social factor thus compensates for the low level of socioeconomic development in these regions as a factor able to stimulate higher alcohol consumption. In our opinion, an insignificant growth in retail alcohol sales can be due to intensified inter-regional migration and is caused, in particular, by sporadic alcohol purchases by tourists¹⁴.

High retail alcohol sales in some large and wealthy RF regions (Moscow, Saint Petersburg, the Moscow region, and the Leningrad region) do not have severe social outcomes (high alcohol-associated incidence and crime). This is probably due to low consumption of unregistered alcohol (homemade drinks, illegal alcohol, and various surrogates) in these regions since consumption of alcohol surrogates is usually determined by such factors as a social status, education, and incomes [31].

We put forward a hypothesis in this study in an effort to explain dynamics of alcohol consumption in RF regions. This hypothesis emphasizes different influence exerted by the factors related to the pandemic and ‘sanction’ crisis on the socioeconomic situation in different regions, different levels of stressors in the environment and different social tension. Studies that addressed economic resistance to the COVID-19 pandemic reported greater vulnerability of developed and large economies and mining regions and greater resistance of poorly developed predominantly agricultural regions with substantial governmental support [32]. Sanctions have affected the industrially developed RF regions most seriously since their economies have tight connections with the global market and their predominant branches are extraction of hydrocarbons and metals and civil engineering [21]. Therefore, it

was in these regions where we could expect a growth in alcohol consumption in the ‘crisis’ period. The study results confirm this only partially. Thus, in 2022, the greatest decline in industrial production among all the RF regions was observed in the Sakhalin region (it dropped by 38 % against its level in 2021) and there was also a significant drop in tax payments of the income tax (by 11 % in May 2022 against May 2021) [21]. In addition, retail alcohol sales in the Sakhalin region were among the highest in the country in 2022, 258.4 thousand deciliters per 100 thousand people (comparably high retail alcohol sales were also registered in Karelia, 258.9 thousand deciliters per 100 thousand people, and in the Magadan region, 257.6 thousand deciliters per 100 thousand people). In 2022, a significant decline in industrial production was also detected in the Tula region, Kaliningrad region, Samara region, and Ulyanovsk region; however, none of these regions were included into the clusters unfavorable as per alcohol consumption in the ‘crisis’ period.

Conclusions. The analysis has revealed that the regional differentiation as per indirect indicators describing alcohol consumption identified in the ‘before crisis’ period persists also in the ‘crisis’ one. We have not established any fundamental trends either in ‘unfavorable’ or ‘favorable’ groups of regions. We can identify three separate sub-groups of RF regions where the situation with alcohol consumption is rather poor. The first sub-group includes regions with high retail alcohol sales, high levels of alcohol-associated incidence and crime (the Magadan region, the Nenets Autonomous Area, the Komi Republic, and Chukotka). The second sub-group includes regions with relatively low retail alcohol sales but high levels of alcohol-associated crimes and incidence (Transbaikalia, the Altai Republic, Tyva, and Khakassia). The third sub-group is made of regions with high retail alcohol sales but relatively low levels of alcohol-associated crime and incidence (Moscow and Saint Petersburg, the Moscow region and the Leningrad region).

¹⁴ The greatest growth in retail alcohol sales between 2017 and 2022 was identified in Dagestan, from 12.6 thousand deciliters to 20.7 thousand deciliter per 100 thousand people.

grad region). Relatively high retail alcohol sales as well as their positive dynamics can be evidence of both intensive alcohol consumption by population and a small share of illegal or surrogate alcohol and homemade drinks in the structure of alcohol consumption.

Crisis processes related to the tense epidemiological (2020–2021) and socioeconomic (2022) situation have not had any substantial influence on alcohol consumption in most regions that were considered the most vulnerable to pandemic and sanction-related challenges. This might be due to a delayed effect produced by macroeconomic factors. Those RF regions where the socioeconomic situation was rather poor in the ‘before crisis’ period have not gained any additional sources of resistance that would allow improving the situation with alcohol consumption including its most severe negative outcomes.

Some additional factors able to influence alcohol consumption and associated health risks include availability and prevalence of moonshining and production of other homemade alcohol in a region; prevalence of strong alcohols in the structure of consumption; sex, age, national and occupational structure of population in a region (a share of male population, a share of young people and working age people, a share of people with physical labor, etc.). Institutional factors also have their importance, for example, how effectively regional authorities fight against surrogate alcohol, how successful the anti-alcohol policy is in a region, how well organs and authorities responsible for preven-

tion of alcohol-associated incidence cope with their functional tasks.

The development of the contemporary Russian society is non-linear in its essence; it is rather difficult to predict dynamics of the social, political and economic situation; the level of social tension is still high. All this requires constant monitoring of various health risk factors including alcohol consumption at the regional and national level for timely decision-making in the sphere of public health protection.

The study limitations. The study relies only on indirect indicators of alcohol consumption and does not consider illegal alcohol sales. Since there are no sufficient statistical data available in the UIISS on specific regions, alcohol consumption is not described using such indicators as ‘mortality caused by accidental alcohol poisonings’ or ‘incidence of poisoning with ethanol and alcohol surrogates’.

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