Determinants of Public Health in Arctic and Subarctic Territories of Russia

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Abstract—The paper discusses major economic risks for public health, including average income and income differentiation, living conditions, and public healthcare availability in the northern regions of the Russian Federation compared to the nationwide average.

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It is practicable to address the role of individual risk factors for public health within aggregated blocks, such as dominants. This notion was first used with regard to Arctic health in [1]. The major significant risks are aggregated to form five health dominants, including socioeconomic, environmental, institutional healthcare-related, behavioral (lifestyle-related), and genetic. Their percentage of influence can be generally described as follows: 15–50% for the socioeconomic part, 20–25% for natural, climate-related, and environmental factors, 30–50% for lifestyle, 10–20% for institutional healthcare factors, and 20–25% for the genetic part. What particular risks make up each of the dominant remains a topic of discussion, as it depends on multiple reasons. For example, the WHO Regional Office for Europe states that the environmental dominant includes health risk factors, such as the distance from the residential block to sporting facilities and recreation places (parks), though these may be associated with the lifestyle dominant. Currently, the role of diet (lifestyle dominant) is being reassessed as a risk factor of extra weight while being approached from the point that an important role in its emergence is played by the individual’s genetic patterns.

SOCIOECONOMIC DOMINANTS

Significant social health risk factors are rooted in the low economic development level and sharp social inequality as measured by such indicators as per capita gross regional product (GRP), income, employment level, poverty rate, unemployment, etc.

Income, Poverty. Recently, social inequality has more frequently come to be measured by the share of the population with incomes below the minimum subsistence level, as well as figures that indicate income differentiation between the 10% and 20% population groups, i.e., the difference between the incomes of the most affluent and the most needy population groups. To assess the influence of socioeconomic conditions on health indicators, life expectancy at birth is used.

Building on a large-scale comparison of the influence of per capita GRP and income levels in different countries, paper [4] proves that these factors would determine life expectancy in poor countries. The results of another study spanning 43 European countries, including Russia, supported the statistically significant correlation (with a 95% confidence interval) between socioeconomic indicators (the Gini ratio, economic freedom, and education levels) and mortality rate related to different causes, including cardiovascular, oncological, and infectious diseases and external factors, such as accidents and suicides [5]. A comparison of the total mortality rate for 1992–2013 in Russia against a range of economic indicators showed the strongest linkage with the share of population with incomes below the minimum subsistence level. Economic improvement and a 1% decline in the number of this high-risk group leads to a decrease in the total mortality rate (linked to all causes) by 20–25 cases per 100000 people [6]. The results of this study correspond well with the evidence from [7] on the relation between socioeconomic indicators and the total mortality rate for the age bracket of 40–59. The most significant relation ($p \leq 0.01$) is identified between the level of unemployment, housing stock floor areas,
hard-surface road density; a less-significant relationship \( (p \leq 0.05) \) was found between the share of population with incomes below the subsistence level, population decline, median salary and its relation to the price of a fixed consumer basket, and per capita GRP.

The Arctic region is rather inhomogeneous in terms of the socioeconomic development of territories and significantly falls behind the northern European countries. For example, the differences in the influence of GRP, pay levels, and social benefits on death rates and disease incidence are visible from a comparison of neighboring areas like Karelia and Finland. Karelia, which has a lower density of the population (3.8 people per sq. km) compared to Finland (15.9 people per sq. km), but a similar share of urban population at 77% vs. 85%, registered the 2010 human development index at 0.799, which is considerably lower than in Finland (0.869). Life expectancy at birth in Finland is 13.6 years higher than in Karelia, where the mortality rate is 2.6 times higher (per 100000 population) [8]. A similar relation is observed for Finland between life expectancy (in years) and per capita spending on healthcare. The overall Gini indicator for Russia stands at 42%, which is considerably higher than in European countries, including Nordic countries, where it equals 23–24%, the United Kingdom (32–34%), the majority of continental European countries (26–29%), Mediterranean countries (28–34%), and Balkan countries (31–34%) [5]. Due to the favorable economic situation until 2014, this coefficient in Russia decreased by 0.3% between 2008 and 2013 [9]. Arkhangelsk oblast in the Subarctic region registered the Gini indicator at 36–38% in 2002–2013, i.e., to achieve equality, 23% of the societal income share should be redistributed [10].

Per capita income indicators and the Gini coefficient have been proved to have a direct relationship between them and the region’s social well-being has been proposed as a measure of the integral estimate of these two indicators. The greater the incomes and the lower the degree of inequality compared to nationwide averages, the higher this index rises. Over 2004–2012, the Arctic territories saw a decline of this indicator, particularly in the Republic of Komi as a result of the slower per capita income growth compared to the Russian average (2.89 and 3.6 times, respectively), in Arkhangelsk oblast and the Republic of Karelia, which stepped down to lower positions by the social well-being index [11] (Table 1).

Income inequality used as a measure of poverty was observed to show a negative relationship with life expectancy in Russia, which is the most visible in retired women group in urban locations) [12]. Even the Khanty-Mansyisk Autonomous Okrug, one of the most affluent Russian regions, has displayed significant inequality, which is also observed in the analysis of life expectancy levels among the towns and areas of this district. The territories engaged in hydrocarbon production (Kogalym, Raduga, Langepas, Surguts and Nefteyugans districts) display maximum levels of life expectancy (from 66 to 68.2 years for men in 2004–2006 compared to an average of 63.1 for the district), while it declines to a minimum in scarcely populated and poorer districts (Berezovka, Kondinsky, Khanty-Mansi and Sovetsky) counting a population of 100000 people, which is 6% of the total population in the district [13]. A significant income inequality exists in the Sakha Republic (Yakutia), where incomes in nearly monoethnic ulus settlements are lower than in industrial towns and diamond production areas.

### Table 1. Income indicators in the Russian Arctic and Subarctic territories in 2001–2014

| Region                              | Average per capita monetary income, (thousand rubles per month) | Average pension benefits, thousand rubles | Share of population with monetary incomes below the minimum subsistence level, % |
|-------------------------------------|---------------------------------------------------------------|---------------------------------------------|---------------------------------------------------------------------------------|
| Murmansk oblast                     | 18.0                                                         | 7.0                                         | 16.0                                                                             |
| Rep. of Karelia                     | 12.1                                                         | 6.3                                         | 16.4                                                                             |
| Arkhangelsk oblast                  | 14.3                                                         | 6.4                                         | 17.5                                                                             |
| Nenets Autonomous Okrug             | 38.2                                                         | 7.8                                         | 9.9                                                                              |
| Rep. of Komi                        | 17.3                                                         | 6.5                                         | 16.0                                                                             |
| Yamal-Nenets Autonomous Okrug       | 34.5                                                         | 7.8                                         | 7.4                                                                              |
| Khanty-Mansyisk Autonomous Okrug    | 26.1                                                         | 7.7                                         | 9.5                                                                              |
| Chukotka Autonomous Okrug           | 30.1                                                         | 9.4                                         | 14.8                                                                             |
| Yakutia                             | 18.0                                                         | 7.1                                         | 19.6                                                                             |
| Magadan oblast                      | 21.4                                                         | 8.2                                         | 16.5                                                                             |
| Russia                              | 14.1                                                         | 5.1                                         | 15.8                                                                             |

Source: Rosstat data.
If another poverty indicator is taken as measured by 2–2.5 times the minimum subsistence level (60–70% of the average per capita income), then 54% of Russia’s population in 2013 experienced all limitations in opportunities to pay for education, medical services and better housing [9]. A distinctive example is Murmansk oblast, where about 30% of the population is below the poverty line, predominantly in smaller industrial monocities with high environment pollution levels [14]. One in four residents in the central agricultural areas of the Sakha republic (Yakutia) falls into the poverty bracket [15].

When the average per capita income is considered, the Nenets and Yamal-Nenets Autonomous Okrugs stand apart sharply, which exceeds the nationwide averages by almost threefold and registers lower shares of the poor population; the second group of territories with relatively high incomes includes Khanty-Mansi and Chukotka Autonomous Okrugs, while the rest show less significant differences. However, monetary bonuses paid in resource territories have started to decline, and a decline in income can be expected. Logically, Arctic areas post the lowest shares of the population with incomes below the minimum subsistence level. Pension benefits in the north are somewhat higher than the nationwide average, which is specifically the case in Chukotka, Khanty-Mansiysk, and Yamal-Nenets Autonomous Okrugs and Magadan oblast; however, high consumer prices sharply reduce the perceived high incomes. According to estimates by WHO experts based on international data, major income-related mortality causes in the countries with medium income levels, where Russia can be also designated, are not only chronic conditions, as would be the case with rich countries, but also tuberculosis; meanwhile major external mortality causes include road accidents [16].

To estimate the influence of poverty on health, the PYLL indicator is used (potential years of life lost), which significantly depends on infant mortality levels. In Russia, its average value in 2013 stood at 201853 years per 100000 population, which is twice the level of Canada (8546) and Finland (9050). Based on this indicator, the Arctic and Subarctic areas could be divided into several groups as follows: the values came close to the national average loss in Murmansk and Arkangelsk oblasts, the Yamal-Nenets and Khanty-Mansi Autonomous Okrugs; significantly higher levels were observed in the Republics of Karelia, Komi, and Sakha (Yakutia), the Nenets Autonomous Okrug, Magadan oblast; meanwhile, the maximum is achieved in the Chukotka Autonomous Okrug (35262 years) [17].

Among the Arctic territories, the most detailed profile of life standards is available for Murmansk oblast, which was studied by the Institute of Economic Problems of the Kola Science Center of the Russian Academy of Sciences. The main outcomes of this work [3] show that low salary levels significantly influence the emergence of poverty while generating low social transfer levels as long as major income growth is limited to high-income population groups, which is also typical of the country overall. Food expenses remain one-third of the total consumer spending, which is twice the average value for European countries (13.8%) [18].

Unemployment. Higher unemployment levels are accompanied by increased risks of mental disorders and drug addiction in a particular population group, with higher incidence of major body system disruptions and acute chronic conditions. The European Arctic part saw a sharp increase in unemployment in 2000–2006 (by 30%), followed by a decline to 6–9% [19]. Between 2010 and 2014, the level of unemployment went up in Arkhangelsk and Murmansk oblasts and in Chukotka, while it declined in the Republics of Komi, Karelia, and Sakha (Yakutia) and especially in hydrocarbon territories of the Nenets, Khanty-Mansi, and Yamal-Nenets Autonomous Okrugs and Magadan oblast. Mining closures in the coal-producing towns of the Republic of Komi led to a considerable population outflow; the territory is characterized by a relatively high share of the economically inactive population, and more than half of unemployed individuals have only primary or general secondary education.

High unemployment levels are observed among the minor indigenous Arctic ethnic groups. For example, the share of the unemployed reaches 20–25% in the Nenets Autonomous Okrug, which is significantly higher than the district average [20].

Living Conditions. According to WHO experts, the concept of housing conditions includes four interrelated aspects, i.e., the physical structure of housing, household patterns, surrounding infrastructure, and social environment including the availability of services. With regard to health indicators, a comprehensive overview by the European Center for Environment and Health [21] provides proof of evidence of the influence of wet and moldy conditions in homes and smoking indoors on the incidence of asthma in children; the influence of low temperatures inside on mortality rates caused by blood circulation and respiratory systems’ illnesses; and the influence of habitual overcrowding on the incidence of tuberculosis [21]. In Russia, studies of these aspects are rather few. We are not aware of any conclusive evidence-based studies for Arctic territories; however, we should point out the inferior quality of the housing stock and low access to utility services.

Considering the rates of housing availability, the Arctic territories can be divided into three groups. Areas with high level of this indicator compared to the Russian average are in the Chukotka Autonomous

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3 95% confidence interval: 19272–21029.
Okrug and Magadan oblast, which is a result of many years of intensive population outflows; areas matching the national average are Arkhangelsk and Murmansk oblasts, the Republic of Komi, and Nenets Autonomous Okrug, while areas with relatively low results are the Republic of Sakha (Yakutia) and Yamal-Nenets and Khanty-Mansi Autonomous Okrugs [22]. Table 2 shows data on residential stock improvement over 2001–2014 for Arctic territories and on average for the country.

The situation in improving the housing stock in the discussed areas is quite complex. On one hand, they are characterized (with the exception of Murmansk oblast) by significantly higher ratios of distressed housing, while the degree of improvement by several measures is close to (or even exceeds) the national average, which is the case in, e.g., Murmansk oblast and the Republic of Karelia. Other territories, including Arkhangelsk oblast, the Republic of Komi, and especially Nenets Autonomous Okrug register much lower levels of improvement compared to the averages for Russia.

Considerable territorial variations by the level of comfort in housing are observed in nearly every Arctic region. According to the surveys, only 5% of residential stock in the rural areas of the Republic of Sakha (Yakutia) is fully equipped. A sociological poll among the residents of a small settlement in the Chukotka Autonomous Okrug showed that the ratio of shabby and dilapidated dwellings exceeded the Russian average by a factor of 1–4, with sewage mostly unavailable, as well as appropriate heating in apartments due to wearing heating grids [23, 24].

It is worth pointing out that, while there is a mild dynamics of improvement in the level of housing comfort over the 12 years (4% for tap water and sewage access, 9% for heating, and 5% for hot water availability), the only region showing a sharp improvement is the hydrocarbon-rich Nenets Autonomous Okrug. It has recorded a nearly twofold increase in residential stock with hot water supply, a 50% increase for housing equipped with bathtubs, and a 20% increase for heating availability. This significant growth is due to very low comfort levels prior to the beginning of hydrocarbon production. However, the Okrug’s economic focus on solely hydrocarbon extraction is fraught with threats associated with oil price volatility and potential production problems in the future, which may influence a reduction in the budget and, subsequently, the perspectives of housing degradation. Other Arctic territories of the region saw increases at the rate of less than 2%, while the share of housing with gas supplies even declined (in the republic of Karelia and Arkhangelsk oblast). Due to the aging of the population, which is particularly visible in the Barents region (the territories of Russia, Finland, Norway, and Sweden around the Barents Sea) and Magadan oblast, the need for a comfortable microclimate is becoming more pronounced, particularly in homes; therefore, the expectation is for an increase in power consumption for heating systems.

The influence of socioeconomic conditions in the North on health is indicated well by the example of Finland, where the state of public health has been improving over the years; two-thirds of Finnish people consider their health to be in good or satisfactory shape. Finnish public healthcare is funded by the state; however, the share of municipal investment (which is not there in Russia) exceeds the share of state funding, thus leading to significant variation in the

| Indicator | Relative share of shabby and dilapidated housing stock | Utility facilities |
|-----------|------------------------------------------------------|--------------------|
|           | Tap water | Sewage | Shower/bathtub | Hot water | Gas |
| Murmansk oblast | 2.1 | 97.7 | 97.5 | 95.6 | 91.5 | 39.4 |
| Rep. of Karelia | 3.7 | 69.6 | 68.2 | 62.3 | 57.5 | 49.3 |
| Arkhangelsk oblast | 8.0 | 59.7 | 57.3 | 53.1 | 52.5 | 54.9 |
| Nenets Autonomous Okrug | 8.2 | 38.4 | 35.6 | 31.6 | 28.5 | 63.8 |
| Rep. of Komi | 8.1 | 74.1 | 72.2 | 65.9 | 65.5 | 49.6 |
| Yamal-Nenets Autonomous Okrug | 9.5 | 95.3 | 93.6 | 91.0 | 78.0 | 47.5 |
| Khanty-Mansi Autonomous Okrug | 7.0 | 91.2 | 90.2 | 86.3 | 81.9 | 23.5 |
| Chukotka Autonomous Okrug | 5.0 | 89.9 | 88.7 | 82.7 | 80.6 | – |
| Yakutia | 13.2 | 53.1 | 51.5 | 49.5 | 49.3 | 25.8 |
| Magadan oblast | 9.7 | 91.6 | 90.7 | 86.0 | 85.0 | – |
| Russia | 3.1 | 76.5 | 72.3 | 65.9 | 63.6 | 69.1 |

Source: Rosstat data.
level of medical services by territory. Municipalities spend approximately a quarter of their revenues on healthcare. Childhood death rate in Finland is among the lowest in the world, while life expectancy is among the highest [8].

ENVIRONMENTAL DOMINANT

This dominant includes two components, i.e., natural and climate-related factors, and environment quality affects mostly urban population. Many papers by Russian researchers have addressed the effects of Arctic climate for human health, but ignored the actual socioeconomic conditions in which people lived. A complex combination of natural factors like contrasting temperatures, strong winds, geomagnetic disturbances, insufficient ultraviolet exposure, contrasting photoperiodic patterns, etc., causes serious changes in the hormonal state with subsequent health disruptions. The Arctic health profile is not only characterized by numerous specific northern conditions and illnesses, but also by the specific patterns of their clinical development and pathoanatomical manifestation, and the stretching of adaptation mechanisms tension. The impact of the severe Arctic climate is most of all affecting the high-risk social groups, e.g., poor, unemployed, or socially insecure people. Quantitative estimates of the Arctic climate effects for public health depend on the indicator discussed and the population group in question. Over the last 10 years, due to global climate change, which is especially consequential for the Arctic, studies began into the potential health effects of this phenomenon. For example, the method of time-series analysis was used to assess the influence of heat and cold waves on the mortality rates in four cities in the Arctic or Subarctic areas, particularly Murmansk, Arkhangelsk, Yakutsk, and Magadan. In these cities, cold waves have a more pronounced influence on mortality rates than heat waves. The consequences of cold waves show a statistically significant increase in the mortality rate linked to five causes, while for heat waves, this is only for two causes (cerebrovascular diseases in people aged over 65 and external causes of mortality within the age bracket of 30–64) [25].

The exposure of polluted air and water is most clearly manifested in industrial centers of the Russian Arctic, especially in the Kola peninsula, the coal-producing towns of Komi, Norilsk, and other major industrial hubs. The results of these ecological and epidemiological studies are laid out in full detail in our monographs [2, 26]. The main conclusion of these papers highlights the apparent changes in the health conditions of child populations living in the towns of Monchegorsk, Nadvoitsy, Kostomuksha, Vorkuta, Inta, and other places, as well as the elevated carcinogen risk of the atmosphere air in Monchegorsk and Norilsk.

HEALTHCARE INSTITUTIONAL DOMINANT

The paper [27, p. 210] points out that “the super-mortality of the active population linked to diseases for which there are well-known and globally employed methods of treatment is more than 80% the result of the timeliness, level, and quality of medical aid.” This argument is supported by the implementation results of the program to bring down (by 28–29%), the mortality from circulatory diseases. However, the total mortality has slightly increased after 2013. One of the possible reasons is decreasing healthcare funding. According to estimates based on comparable-price analysis by deflating spending by budget classification items, public expenses on healthcare is constantly declining. In Russia, this spending category as a percentage of the GDP is lower than in the Czech Republic, which stands at 2.8% vs. 6.7%, respectively, which is a 2.4-fold difference. A regression analysis of the model of average life expectancy based on a sample from 12 European countries showed that the greatest contribution to the population mortality is linked to the variations in the share of public spending on healthcare (57%) and the availability of medicines (up to 30%) [28]. State spending on healthcare has been steadily declining since 2013 with a decrease reaching 10% in 2015 [29]. The share of state-funded spending on healthcare in Russia equals just 61% of the consolidated budget in this direction, while it stands at 82% in Japan and between 70–80% in many European countries.

The feature activities of healthcare system in the Arctic region are much influenced by the natural conditions and the population distribution patterns. The lack of secure transport routes, and the low levels of logistic links and access to medical institutions, as well as the lack of specialist practitioners and the necessary laboratory facilities in some places would certainly influence the quality of medical care. A detailed analysis of the level of medical services was conducted in Yakutia, where more than 200 settlements and towns are located more than 1000 km from Yakutsk, and distances of more than 300 km from the central hospital are observed for 15% of settlements and towns. As the distance of up to 1300 km from Yakutsk, the overall disease incidence and hospitalization rate become lower (the correlation coefficient equals 0.4888) [30].

The low population density, nomadic lifestyle, and detached distribution of localities at distances from medical institutions, as well as many other aspects of life in the Far North call for new methods of arranging medical care. For example, telemedicine has developed significantly. For example, the Nenets regional hospital houses a telemedicine station linked through a special system to the local hospitals and outpatient units. Telemedicine consultations (which are more than 250 per year) have helped to reduce the financial costs of healthcare services for patients in the district [31]. For most Arctic regions, aeromedical service is
vital, as, for example, the distance between the farthest points of Yakutia in the east and west exceeds 2300 km, which is just 300 km less in the stretch from north to south. In 2015, ambulance calls were served using aircraft, particularly planes and helicopters of various air companies, but there is a problem of gradual wear, and some helicopter modifications (MI-2) are no longer available from the makers, and fuel becomes more expensive, and accidents are constantly happening [32]. There will be little progress in the quality of medical care and especially emergency care without a radical improvement of transport links.

Apart from the amount spent on healthcare, the major factors behind the efficiency of healthcare systems include population density and the density of hard-surface road network. A comparison of these indicators conducted for Russia against developed economies shows that the share of the total spending on healthcare as a percentage of GDP in Russia is just half or one-third of the comparable indicator (for developed economies), the share of per capita spending (in 2010) calculated using purchasing power parity is down to one-quarter of the comparison, and the road network density is just one-twentieth or less [33]. There will be little progress in the quality of medical care and especially emergency care without a radical improvement of transport links.

The number of appointments at (visits to) medical outpatient institutions and the number of physicians in the majority of Arctic territories are higher than across Russia on average. The number of physicians of all specializations varies considerably from a minimum in the Nenets Autonomous Okrug to the maximum levels in Chukotka and Magadan oblast. As for the amount of consolidated healthcare budgets per 1000 people, the maximum levels are attained in autonomous districts, while minimum levels are observed in the northwest territories.

The density of public hard-surface motorway network is significantly lower in the Arctic and Subarctic territories compared to averages for Russia, Finland, and other northern countries. The highest level for this indicator is registered in Karelia, which is apparently a result of the 1930s. Between 2001 and 2013, the figure at the nationwide level grew by 20%, while in the Arctic region, it only increased sharply in Arkhangelsk oblast and Khanty-Mansi and Yamal-Nenets Autonomous Okrugs, that is probably due to the construction of technological roads in the resource deposit fields being developed. The availability of these motorways is very important for public health, as there is a proven link with both mortality [7] and life expectancy in men and women [12].

Contemporary medical aid in accordance with international treatment protocols for most complex diseases is based on the application of high technologies in medicine, the use of various screening methods for the early detection of diseases, including diabetes, cancers, and circulatory diseases in many areas of the Arctic, however underdeveloped. Advanced public health examinations of the public have indicated underperformance of healthcare facilities in

\begin{table}[h]
\centering
\begin{tabular}{|l|c|c|c|c|}
\hline
\textbf{Region} & \textbf{Capacity of outpatient organizations, appointments per shift, per 10000 population} & \textbf{Number of doctors of all specializations (as of year-end) per 10000 population} & \textbf{Spending on healthcare from consolidated budgets of the Russian Federation per 1000 population, million rubles*} & \textbf{Motorway density (hard-surface public roads), km/10000 km²} \\
\hline
Murmansk oblast & 272.58 & 51.94 & 7.58 & 19.00 \\
Rep. of Karelia & 244.24 & 49.81 & 6.69 & 39.36 \\
Arkhangelsk oblast & 343.29 & 53.94 & 5.98 & 16.48 \\
Nenets Autonomous Okrug & 236.10 & 41.09 & 24.93 & 1.09 \\
Rep. of Komi & 350.26 & 45.84 & 7.74 & 13.82 \\
Yamal-Nenets Autonomous Okrug & 212.96 & 48.51 & 19.43 & 1.73 \\
Khanty-Mansi Autonomous Okrug & 258.45 & 50.90 & 19.97 & 6.11 \\
Chukotka Autonomous Okrug & 543.97 & 74.99 & 26.96 & 0.91 \\
Yakutia & 276.36 & 53.09 & 11.17 & 2.82 \\
Magadan oblast & 395.73 & 56.01 & 19.93 & 4.87 \\
Russia & 256.49 & 49.01 & 5.73 & 39.93 \\
\hline
\end{tabular}
\caption{Average indicators of healthcare and motorway density in the Russia Arctic and Subarctic territories, 2001–2014*}
\end{table}

* On average for 2003—2014.

* Methods of detecting problems using diagnostic tests.
mass health examinations and the identification of patients with chronic conditions. For example, an advanced health examination showed that the number of people developing circulatory diseases is actually nine times higher according to dispensary registration, with similar discrepancies for endocrinopathies and illnesses of musculoskeletal system at 28x and 11x respectively [34]. A comparison of the results of advanced health examination against medical statistics reveals discrepancies between them in other territories as well, but not as big as in the north. Despite the better-developed healthcare structures in the localities of the indigenous Arctic ethnic groups, the general disease incidence in this group in some regions is higher than the average in the Republic of Sakha (Yakutia) by approximately 20% [35]. However, it remains unclear, whether this is a result of better disease detection or indeed of a higher incidence rate. The new economic reality, which emerged in 2014, led to even more complicated problems in health rehabilitation of northerners, as there is no availability of regular spa and resort treatment and rehabilitation in comfortable climate. However, the previously implemented national project Zdorovie (Health) produced certain results; for example, the accessibility of high-tech medical aid for the public improved, as well as the material and technical resources of healthcare institutions and pay levels of the staff at primary medical aid level, additional immunization of people was conducted and maternal certificates were introduced.

The continued commercialization of healthcare creates considerable problems in obtaining competent and especially highly specialized medical aid, as well as obtaining medicines and access to rehabilitation resources, which leads to the chronization and aggravation of diseases.

The organization of healthcare in the Arctic zone reflects the general problems of the industry, and the discussion has now intensified as to the ways of reforming it. According to many researchers, the low density and unevenness of population distribution, weak transport network, low production levels, relatively low per capita GDP, and many other factors prevent the attainment of an appropriate efficiency level of the used method of funding based on insurance mechanisms, that indicates the need for a publically funded model [33].

LIFESTYLE: BEHAVIORAL AND PERSONAL RISK FACTORS

In the discussed region, lifestyle patterns are more dependent on socioeconomic factors than in other territories of Russia. First, this applies to unbalanced diets low in fruit and vegetables and the reliance of some regions on the so-called northern supply. Personal behavioral risk factors (smoking, alcohol, drugs, low activity profile, etc.) are closely linked to economic conditions.

An important medical and social problem in the North is excessive alcohol consumption. In 2001—2014, sales of alcohol (vodka etc.) in the Arctic and Subarctic territories were 30–60% above the national average (excluding Khanty-Mansi and Yamal-Nenets Autonomous Okrugs as data for these regions is only available for 2010–2014), even as alcohol consumption in Russia is considered to be excessively high compared to other countries, including the Nordics. The highest values are observed in Arkhangelsk oblast (20.3 L per capita), Magadan oblast (18.3 L per capita), and Murmansk oblast (16.9 L per capita), which compares to a national average of 12.5 L per capita. Epidemiological studies carried out in Arkhangelsk oblast have proved that, besides causes of death linked directly to alcohol, there is also alcohol-attributable mortality due to chronic conditions, such as hypertension, coronary heart disease, and hemorrhagic or ischemic stroke, which can be additional risk factors [36].

The state program “Socioeconomic Development of the Arctic Zone of the Russian Federation up to 2020” charts considerable improvements in the socioeconomic sphere including healthcare development, in efficiency, sustainability and reliability of the functioning of utility systems, and in supplying residents with fresh water of appropriate quality. With squeezing budget funding, the attainment of these goals is quite uncertain. Given the current economic situation, doubts emerge regarding the feasibility of the 2020 income forecast, under which the share of low-income groups would rapidly decline against slow growth of the high-income category and thus entail a narrowing of income differentiation [37].

Falling prices of hydrocarbons can rapidly affect the stability of developing resource regions. Within autonomous districts, there is considerable differentiation in values of social indicators. For example, taking into account unemployment, sufficiency of medical staff, living conditions and other indicators, life standard index varies by a factor of tens over municipalities in Khanty-Mansi Autonomous Okrug [3]. In unfavorable economic conditions, these territories will be prone to the rapid growth in unemployment, which is now at a low level. Northern poverty quickly transforms into a marginal lifestyle entwined with alcohol abuse, antisocial behavior, and other problems. Logically, this situation can lead to a decline in life expectancy. As can be seen from an analysis of the influence of social risk factors on public health in the European region, living in poverty is associated with low life expectancy; high infant mortality; unsatisfactory reproductive health; high levels of contagious diseases, particularly tuberculosis and HIV; and higher values of consumption of psychoactive substances (tobacco, alcohol, and drugs) [38], which is actually the case in some Arctic territories.

Costs of supporting the health of the working population not only justify, but also support economic
growth. This has been proved by examples of some countries in the European region, where improved prosperity as a result of a 29–39% increase in GDP led to an increase in the average life expectancy [39]. The socioeconomic crisis requires a consolidation of the inner resources of the Arctic and Subarctic regions to prevent the deterioration of public health.

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