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Healthcare characteristics in the Yakut Arctic

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ABSTRACT
An analysis of the current healthcare issues in the Arctic zone of the Republic of Sakha (Yakutia) has been conducted based on materials from state statistics, data provided by the regional Ministry of Health, and a survey of managers of central district hospitals. The Yakut Arctic comprises 13 districts, and the entire territory occupying over 1.6 million km² is characterized by extremely specific and highly unfavorable ecological and socioeconomic conditions. According to statistical data, since the end of the last century the Yakut Arctic has experienced a negative demographic trend; between 1989 and 2023 the population decreased by nearly 2.5 times (from 146,000 to 65,000 inhabitants). One of the primary causes is the low standard of living, including dissatisfaction with the quality of received medical services. Accordingly, this paper devotes considerable attention to the issues of material and technical support for central district hospitals and the shortage of qualified personnel particularly, narrowly specialized physicians such as infectious disease specialists, psychiatrists specializing in addiction, ophthalmologists, neurologists, etc. The paper outlines the activities of the regional Ministry of Health in addressing several pressing issues, including the operation of mobile medical teams and medical aviation. Practical recommendations are proposed for improving healthcare provision and for attracting medical professionals to work in the remote areas of the republic, including through the provision of preferential conditions for the appointment of labor pensions. The authors emphasize that the organization of healthcare in the Yakut Arctic must be comprehensive, with mandatory support from federal programs and the involvement of the region's fundamental economic sectors, primarily industry. The integration of new technologies, improvement of infrastructure, and development of programs for retaining and attracting healthcare workers are not only vital for the enhancement of the healthcare system in the Arctic zone of the Republic of Sakha (Yakutia) but also should contribute to reducing population outflow.

KEYWORDS
Yakut Arctic, Population migration, Low population density, Organization of healthcare, Medical services

1. INTRODUCTION

The Arctic zone of the Republic of Sakha (Yakutia) covers approximately 1.6 million km² and represents not only a territory of strategic importance to Russia but also the settlement area of indigenous small-numbered northern peoples whose language and unique culture are preserved through the continuation of traditional lifestyles and economic activities. The Arctic zone is also rich in mineral resources and, owing to its diverse natural conditions, possesses significant recreational potential. The Yakut Arctic includes 13 districts (Abyysky, Allaihovsky, Anabarsky, Bulunsky, Verkhnekolymsky, Verkhoyansky, Zhigansky, Momsky, Nizhnekolymsky, Olenyoksky, Srednekolymsky, Ust-Yansksky and Eveno-Bytantaysky), in which approximately 64,000 residents live, corresponding to 6.4% of the region's total population.

However, the remoteness from the regional center, the dispersion of settlements, a large number of small and medium rural localities, the focal nature of industrial and economic development, and the poorly developed social and transport infrastructure-combined with an extreme climate-determine the Arctic zone's heavy dependence on the regional center, high resource intensity, and low living standards for the local population. Consequently, since the end of the last century, there has been a continuous decline in population. The loss of residents has increased expenditures for social and medical services and education, created a shortage of personnel (especially highly qualified professionals), threatened traditional economic activities, and generated a noticeable imbalance in the regional capital, to which the economically active segment of the population from the Far North mainly migrates.

Thus, the aim of this study is to analyze the problems of modern healthcare in the Yakut Arctic as a territory with exceptionally specific socioeconomic and environmental conditions.

2. RESEARCH METHODS

For the comparative analysis of the long-term population dynamics in the Yakut Arctic, official statistical data from open sources were utilized, including materials from the All-Russian Population Censuses (2002 and 2020). Information regarding the quantity and technical condition of healthcare facilities' buildings, staffing levels of physicians and other medical personnel, and the most common problems encountered in the work of Yakutian Arctic medical institutions was obtained from the managers of the central district hospitals of the Arctic zone of the Republic of Sakha (Yakutia). The results regarding the work of mobile medical teams and medical aviation were provided by the Yakutia Ministry of Health.

3. RESULT AND DISCUSSION

The maximum population in this vast territory was recorded in 1989, when 146,000 people lived here. However, ever since then, an ongoing outflow of residents has occurred; by 2000 the permanent population had decreased to 90,000, and by 2023 to 64,000. For comparison, Mongolia, with a similar area, has a population exceeding 3.5 million-an increase of 67% since 1989 [1].

Our studies conducted in the northeastern part of the region revealed that dissatisfaction with the quality of medical services was the most significant predictor for the anticipated migration of the local population, with severe climatic conditions and unemployment playing secondary roles [2]. It is evident that a similar situation prevails in all Arctic uluses, as nearly half of the 84 settlements in the Arctic zone of the Republic of Sakha (Yakutia) are located more than 100 km from their ulus centers, and over 80% have no ground connection with these centers for six months or longer. For instance, the village of Kharyialakh in the Olenyok ulus, which is located only 2 km from the ulus center, remains isolated from the central district hospital during the spring-autumn period. A comparable situation exists in the villages of Suturuokha in the Abyy ulus, Buor-Syss in the Momsky ulus, and others. Considering the low population density of the Arctic zone, it is evident that standardized indicators of healthcare personnel or bed availability should not be used as proxies for the state of healthcare in this area. For the same reason, due to the law of small numbers, even relatively minor annual changes in the number of cases or deaths per 100,000 population exhibit significant fluctuations when analyzed by district.

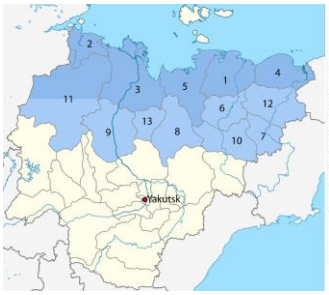
For the average resident of the Arctic living outside the district center (which is about half of the population), the primary issue is overcoming the distance to the central district hospital. Similar difficulties also arise for medical personnel who must travel to remote locations. In addition, many local medical facilities face problems due to the absence or malfunction of transportation appropriate for the area, as well as a lack of diagnostic and therapeutic equipment. Difficulties in delivering medications are common. The low speed and instability of internet connections, coupled with high communication

service costs, pose significant obstacles for medical facilities, hindering their full utilization of modern technologies.

It is important to note that the Arctic zone of the Republic of Sakha (Yakutia) differs markedly not only from the rest of Yakutia but also from other Arctic regions of the Russian Federation in terms of territorial and demographic indicators. For example, a significant part of the population here consists of rural residents, with a population density of 0.04 persons per km² and the largest settlement-a work settlement, Tiksi having no more than 4,500 inhabitants. In contrast, Murmansk Oblast has about twenty settlements with more than 5,000 residents, including the cities of Murmansk (266.6 thousand), Apatity (48.7 thousand), Severomorsk (43.3 thousand), Monchegorsk (39.5 thousand), among others. The density of rural settlements in the Yakut Arctic is 0.005 per 100 km², whereas the Russian average is 0.9, i.e. higher by a factor of 180. Therefore, it is clear that relying on the healthcare resource norms and standards recommended for Russia is inappropriate for the territory of the Yakut Arctic (Table 1).

According to a zoning scheme based on the multifactorial consideration of various environmental parameters proposed by M.K. Gavrilova, E.N. Fedorova, and O.A. Lazebnik, the coastal uluses and the northern part of the Olenyok ulus are classified as part of the Eastern Siberian sector of the absolutely uncomfortable northern zone, characterized by strong winds, prolonged polar night and day phenomena, and a period of approximately 6-7 months of ultraviolet deficiency (Figure 1). The landscape is that of an Arctic desert, tundra, and forest-tundra. The heating season lasts 320–365 days. The remaining portion of the Arctic zone of the Republic of Sakha (Yakutia)-namely, the Abyy, Verkhnekolymsky, Verkhoyansky, Zhigansky, Momsky, Srednekolymsky, Eveno-Bytantaysky uluses, and the southern part of the Olenyok ulus is classified as an extremely uncomfortable zone, where the period of ultraviolet deficiency lasts up to 6 months. The landscape here is that of mountainous forest-tundra with scarce forests, and the heating season lasts 250–275 days [3].

Undoubtedly, the specific conditions of the Arctic have a substantial impact on the human body insufficient exposure to biologically active ultraviolet radiation, increased electromagnetic activity, strong winds, low air temperatures, and other northern features may exacerbate chronic diseases, contribute to the onset of so-called “polar tension syndrome,” and cause other significant health disturbances, as well as increasing mortality from external causes [4, 5]. It should be underscored that the climatic changes observed over recent decades have led to the thawing of permafrost, which in turn intensifies methane emissions a catalyst for global warming. This not only poses a direct threat to the entire Arctic infrastructure but also creates new environmental challenges, including the potential expansion of the range of vectors and pathogens and the liberation of dangerous infections from long-frozen soils [6].



N	Arctic districts	Average annual air temp., °C	Average January temp., °C	Bodman's Weather Severity Index
	Absolutely uncomfortable northern zone (Arctic zone)			
1	Allaihovsky	-12.8	-34.0	2.6
2	Anabarsky	-13.5	-34.7	3.0
3	Bulunsky	-12.7	-30.8	3.6
4	Nizhnekolymsky	-10.9	-32.3	2.8
5	Ust-Yansky	-14.2	-37.8	2.7
	Extremely uncomfortable zone (Subarctic zone)			
6	Abyysky	-12.8	-38.9	2.3
7	Verkhnekolymsky	-10.8	-36.5	2.4
8	Verkhoyansky	-14.8	-46.2	2.2
9	Zhigansky	-11.2	-38.6	3.1
10	Momsky	-13.7	-43.6	2.1
11	Olenyoksky	-12.1	-38.1	2.3
12	Srednekolymsky	-11.6	-36.2	2.3
13	Eveno-Bytantaysky	-14.0	-38.7	2.1
	Uncomfortable zone			
	Yakutsk	-9.3	-40.3	2.1

Note: the indicators were derived for 1961-2023 by research fellow of the Permafrost Institute R.N. Ivanova based on data from meteorological stations located in district's centers.

Figure 1. Brief climatic characteristics of the Arctic zone of Yakutia

It is also important to remember that the Arctic has long attracted the interest of scholars from various fields medical professionals, geneticists, biologists, sociologists, etc. due to its vast potential for multidisciplinary research. For example, continued research into human adaptive features and associated pathologies, including genetic factors, under complex natural and climatic conditions holds considerable promise.

A number of diverse problems have led to low staffing levels in the Yakut Arctic for both physicians (59.7%) and other medical personnel (69.7%), resulting in specialists in some districts being compelled to fulfill two or three roles concurrently. It should also be noted that the effect of the “Country Doctor” and “Country Paramedic” programs, implemented since 2012, is only temporary most specialists are initially predisposed to short-term assignments. Overall, as of early 2024, there are 250 physicians and 702 other staff with secondary medical education employed in the Yakut Arctic.

Although various measures for the social support of newly arrived medical personnel are actively practiced in some uluses (for example, the provision of service apartments and full or partial compensation for rental expenses), the living and working conditions do not always meet the specialists’ needs, especially during the cold season.

Table 1. Brief information about the subjects of the Arctic zone of the Russian Federation

Subject of the Russian Federation	Indicator						
	Area of Arctic zone, km²	Population (2020)		Rural population share, %	Population density, number of people	Number of rural settlements	Density of rural settlements, number of per km²
		Total	incl. rural population				
Republic of Sakha	1608800	64207	41008	63,9	0,04	85	0,005
Yamalo-Nenets Okrug*	769250	510994	78265	15,3	0,66	72	0,01
Chukotka*	721500	47490	15101	31,8	0,07	38	0,01
Arkhangelsk Region	222926	584835	69337	11,9	2,62	475	0,21
Nenets Okrug*	176700	41438	10769	26	0,23	40	0,02
Murmansk Region *	144902	667744	46105	6,9	4,6	98	0,07
Komi Republic	127397	137951	16219	11,8	1,08	65	0,5
Republic of Karelia	71400	101670	17396	17,1	1,42	115	0,16
Krasnoyarsk Krai	1094	230266	23824	10,3	210,48	60	5,48
Total	3843969	2386595	318024	13,3	0,62	1048	0,03

*Note: *Region, entirely included in the Arctic Zone of the Russian Federation*

As of early 2024, approximately 65% of all buildings at central district hospitals either require major repairs or are in an emergency state, as they were constructed more than thirty years ago. Moreover, aside from participants in the "Country Doctor" and "Country Paramedic" programs, visiting medical workers do not have permanent registration, thereby depriving them of benefits available to residents of the Arctic zone of the Republic of Sakha (Yakutia), such as the purchase of air tickets at subsidized prices. All of these issues contribute to the high turnover of transient staff a trend that was particularly pronounced during the COVID-19 pandemic.

A specific concern is the shortage of narrowly specialized physicians, including infectious disease specialists, psychiatrists specializing in addiction, ophthalmologists, neurologists, etc. Unfortunately, due to the low population size of the Arctic, it is not feasible to organize a fully functioning geriatric service, despite the fact that over the past two decades the number of people over 60 in the Arctic zone of the Republic of Sakha (Yakutia) has increased from 6.2 thousand to 10 thousand. Another significant social problem in the Arctic remains the extremely high mortality rate from suicides. For example, from 2010 to 2023 the suicide mortality rate in the Yakut Arctic was on average twice as high as the comparable indicator for the entire region [7].

It should be noted, however, that in recent years the provision of comprehensive medical care to residents of the Arctic zone of the Republic of Sakha (Yakutia) has been significantly improved as a result of a large-scale project implemented by the Republic of Sakha (Yakutia) Ministry of Health, developed and introduced with the active support of several other regional agencies the Ministry for Arctic Development, the Ministry of Transport, and the Ministry of Innovations of the Republic of Sakha (Yakutia). For instance, in 2023 a Regional Center for Mobile Medical Teams was established on the basis of the Republican Centre for Public Health and Medical Prevention. At present, the center comprises seven multidisciplinary teams staffed with narrowly specialized professionals and equipped with all the necessary apparatus.

The implementation of such projects in practical healthcare not only enhances the quality of medical services, facilitates timely diagnosis of diseases, and helps foster a culture of health among the population, but it is also evident that they significantly reduce the financial burden on residents of remote uluses. At the same time, however, it must be acknowledged that the creation of mobile teams is an interim measure, as their role does not include the provision of emergency care and they cannot exercise full control over the treatment process of individual patients.

With regard to emergency medical care in the Arctic zone of the Republic of Sakha (Yakutia), the role of medical aviation is undoubtedly invaluable. According to data from the Republican Centre for Disaster Medicine, between 2020 and 2023 a total of 2,510 sanitary aviation flights were conducted in the Yakut Arctic, providing assistance to 3,833 patients.

It is important to emphasize that the national “Healthcare” project has made a significant contribution to strengthening the material and technical base of the Arctic central district hospitals. Thanks to this project, between 2021 and 2024, 14 healthcare facilities were constructed in the Arctic zone of the Republic of Sakha (Yakutia).

Nonetheless, the issue of low physician staffing in the Arctic zone of the Republic of Sakha (Yakutia) currently requires focused attention. This problem is multifaceted and its resolution necessitates the consolidation of various regional authorities. Efforts must be intensified to improve working and living conditions for medical personnel as well as to enhance the material and technical base of healthcare facilities, implement new technologies, emphasize career orientation among schoolchildren, and strengthen scientific research and medico-social projects in the field of Arctic medicine. In light of the temporary nature of the “Country Doctor” and “Country Paramedic” programs, the provision of preferential conditions for the appointment of labor pensions for healthcare workers in the Arctic zone is deemed appropriate.

4. CONCLUSION

In summary, considering the above discussion and the results of long-term medico-social research and without diminishing the role of natural and climatic conditions it must be stated that the most significant factor determining the nation’s health is, above all, the socioeconomic and environmental well-being of the people. This includes the accessibility and timeliness of medical services that meet modern standards. Many of the issues can only be resolved at the state level, particularly since Russia, as a member of the leading intergovernmental forum “Arctic Council,” has undertaken the obligation to improve the living conditions in this vast and strategically crucial territory. In this respect, it is advisable to involve fundamental sectors of the national economy, primarily industry, in these efforts.

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