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GROUPING OF DISTRICTS OF THE REPUBLIC OF SAKHA (YAKUTIA) BY MEDICAL AND DEMOGRAPHIC INDICATORS OF CHILDREN AND ADOLESCENTS HEALTH CARE

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The Republic of Sakha (Yakutia) is an example of a region with a low population density and underdeveloped transport infrastructure, which affects the availability of full-fledged and high-quality medical care. Specialized medical care is provided mainly in the capital of the republic, Yakutsk. The article presents a variant of the grouping of the Republic Sakha (Yakutia) districts according to medical and demographic indicators of children and adolescents health. It is shown that unfavorable indicators are observed in most of arctic districts. In these conditions, it becomes obvious that modern technologies must be widely used to ensure the availability and quality of medical care in settlements with a small population and low transport accessibility.

Keywords: children, adolescents, medical and demographic indicators, medical care, accessibility, quality, Yakutia.

Introduction. The constituent entities of the Russian Federation differ significantly in many parameters, including climate and geographic, socio-economic, ethnic structure, population settlement patterns, development of transport in-

frastructure, etc. The Republic Sakha (Yakutia) is an example of a region with a large territory, low density and ethnic heterogeneity of the population. The territory of Yakutia is divided into 36 administrative-territorial units (34 municipal districts and 2 urban districts). The healthcare system in the republic is extremely centralized, and specialized medical care is provided mainly in Yakutsk city. Transport distance from the center and low population density are the main factors that influence on availability and quality of medical care. In these conditions, it becomes obvious that it is necessary to consider the peculiarities of some territories of the republic in order to plan and organize effective medical care for the population.

One of the modern methods that allows grouping regions/districts with similar indicators is cluster analysis. This technique is successfully used in such industries as economics, ecology, healthcare [1, 4, 5, 8].

Earlier, in the Republic Sakha (Yakutia), several variations for zoning of Yakutia territory were developed and implemented, with considering of medical and demographic indicators [5, 6]. These works were carried out in the early 2000s. At present, in the conditions of the 3-level healthcare system of the Republic Sakha (Yakutia), it is necessary to clarify the directions for applying forces to achieve target indicators of efficiency for targeted projects at both the regional and federal levels. In this regard, the purpose of the study was to group the municipalities of the Republic Sakha (Yakutia) according to the degree of well-being of children's health indicators in order to determine

the directions for optimizing of medical care organizing technologies.

Materials and methods: Based on the conjunctural reports of the medical organizations of the Republic Sakha (Yakutia), the average values of indicators for a 5-year period (2016-2020) were calculated [3]. This approach is justified by the fact that the use of average values over a 5-year period will make it possible to smooth out fluctuations in the levels of the series. The city of republican significance Yakutsk was excluded from the analysis as the main center for providing specialized assistance to the child population.

The analysis includes the following indicators:

- characterizing the health status of children and adolescents: the morbidity of children per 1000, the morbidity of adolescents per 1000, infant mortality (0–12 months) per 1000 live births, child mortality per 10,000 child population (0–17 years).

- characterizing the resource provision of health care per 10,000 inhabitants: the number of doctors, nursing staff, the number of round-the-clock hospital beds, the capacity of outpatient clinics.

Statistical analysis of the data was performed using the IBM SPSS STATISTICS 22 package. The division of municipalities into groups with different levels of morbidity and mortality was carried out using cluster analysis by the K-means method. Spearman's rank correlation analysis was used to analyze the relationship between the studied variables. When comparing clusters, nonparametric Kruskal-Wallis analysis of variance was used. The critical value of the level of sta-

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tistical significance of differences (p) was taken equal to 5%.

Results. The analysis of indicators reveals the presence of significant differences between the municipalities of the republic. Thus, the proportion of chil-

dren and adolescents in the age structure of municipalities population varied from 23% (in Neryungrinsky) to 37% (in Momsky). Infant mortality rates ranged from 1 to 18 per 1000 live births, infant mortality - from 3.9 to 15 per 10000 child

population, child morbidity - from 789 to 3133 per 1000 child population (Table 1). Correlation analysis found that children morbidity positively correlated with adolescents morbidity ($r=0.64$, $p<0.001$), child mortality with the children morbid-

Table1

Grouping of municipalities according to the degree of well-being of children's health indicators

District	Medico-social zone	Infant mortality per 1000*	Child mortality per 1000*	Morbidity in children per 1000*	Morbidity in adolescents per 1000*
1 cluster n=15					
Abyisky	Arctic	5.1	11.9	2170.5	1370.3
Momsky,	Arctic	7.4	9.4	2143.9	1250.5
Eveno-Bytantaysky	Arctic	3.4	6.6	1849.6	1511.5
Lensky	Industrial	6.7	6.1	2378.4	1446.1
Neryungrinsky	Industrial	4.5	8.0	2412.3	1577.1
Oymyakonsky	Industrial	17.9	12.0	2505.9	1440.1
Mirninsky	Industrial	4.1	4.8	2138.8	1505.9
Amginsky	Agricultural	14.2	13.9	2448.1	1422.5
Vilyuisky	Agricultural	5.1	7.0	1935.4	1541.1
Gorny	Agricultural	0.8	4.4	2292.6	1550.2
Namsky	Agricultural	4.0	6.3	2093.7	1783.0
Suntarsky	Agricultural	8.0	6.5	2160.4	1321.3
Ust-Aldansky	Agricultural	7.0	5.5	1903.8	1344.5
Churapchinsky	Agricultural	1.5	3.9	1774.8	1520.0
Khangalassky	Смешанная	4.4	4.6	2343.9	1587.7
2 cluster n=11					
Allaikhovsky	Arctic	5.0	12.3	2902.7	1888.1
Bulunsky	Arctic	9.8	8.0	2583.1	1788.4
Nizhnekolymsky	Arctic	2.9	7.6	3133.4	2251.9
Oleneksky	Arctic	6.4	15.1	2922.5	1494.3
Srednekolymsky	Arctic	3.6	6.7	2929.5	1733.8
Ust-Yansky	Arctic	12.0	5.8	2812.4	1784.1
Aldansky	Industrial	3.9	5.0	2757.5	1718.8
Tattinsky	Agricultural	4.7	7.7	2491.1	1769.2
Kobyaisky	Mixed	3.1	4.2	2650.5	1643.9
Olekminsky	Mixed	9.6	9.1	2577.5	1906.3
Ust-Maysky	Mixed	11.7	7.5	2816.9	2128.7
3 cluster n=8					
Anabarsky	Arctic	2.6	4.9	1334.8	1216.8
Verkhoyansky	Arctic	3.6	5.1	789.2	1015.4
Zhigansky	Arctic	7.6	5.6	1619.0	1147.6
Verkhnekolymsky	Arctic	3.9	4.1	1256.2	1948.3
Verkhnevilyuisky	Agricultural	7.0	10.3	1137.9	1049.8
Nyurbinsky	Agricultural	6.5	4.5	1614.5	950.6
Megino-Kangalassky	Agricultural	4.3	12.6	1669.1	1549.1
Tomponsky	Mixed	4.8	4.8	1707.7	1073.9

Note: *— average values of indicators for a 5-year period (2016-2020)

ity ($r=0.37$, $p=0.032$), children morbidity with the number of nursing staff ($r=0.35$, $p=0.043$) and the capacity of outpatient clinics ($r=0.34$, $p=0.047$). No statistically significant correlation was found between the share of the child population and children morbidity.

High morbidity rates may be a reflection of the availability of medical care. In this regard, the formation of clusters was carried out according to the average values for a 5-year period of infant mortality per 1000 live births, the morbidity of children and adolescents per 1000 of the population. Infant mortality was included as an integral indicator of the level of the health care system. During the analysis, three clusters were formed with a sufficient number of observations (Table 1). Cluster 1 included 15 municipalities, cluster 2 - 15 municipalities, cluster 3 - 8 municipalities.

Considering the medical and social zones according to the classification of M.A. Tyrylgina and the list of territories classified as the Arctic zone in accordance with the Decree of the President of the Russian Federation dated May 13, 2019 No. 220 "On Amendments to the Decree of the President of the Russian Federation dated May 2, 2014 No. 296 "On the land territories of the Arctic zone of the Russian Federation", then the territory of the republic can be conditionally divided into 5 zones [6, 7]: Yakutsk is a city of republican significance (urban districts of Yakutsk and Zhatay); Arctic zone - Abyysky, Allaikhovskiy, Anabarsky, Bulunsky, Zhigansk, Momsky, Nizhnekolymsky, Oleneksky, Srednekolymsky, Ust-Yansky, Eveno-Bytantaysky, Verkhoyansk, Upper Kolymsky; Industri-

al zone - Aldansky, Lensky, Mirninsky, Neryungriysky, Oymyakonsky; Agricultural zone - Amginsky, Verkhnevilyuysky, Vilyuysky, Gornyy, Megino-Kangalassky, Namsky, Nyurbinsky, Suntarsky, Tattinsky, Ust-Aldansky, Churapchinsky; Mixed zone - Kobyaisky, Olekminsky, Tomponsky, Ust-Maysky, Khangalassky.

With considering of these two approaches, an analysis of the results of clustering was carried out (Table 2). The most prosperous in terms of the totality of indicators of mortality and morbidity in children is the 3rd cluster, it includes 8 districts. Of these, 4 are arctic, 3 are agricultural, and 1 is a region of mixed economy. Cluster 1 occupied an intermediate position between clusters 2 and 3. It was characterized by relatively high rates of mortality and morbidity in children. It includes 15 districts, including 3 arctic, 4 industrial, 7 agricultural, 1 area of mixed economy. The most unfavorable situation in relation to the quality of children's health was observed in the municipalities assigned to the 2nd cluster. This cluster has the highest rates of mortality and morbidity in children. Of the 11 municipalities of this cluster, 6 are regions of the Arctic zone, 1 is industrial, 1 is agricultural, 3 are mixed (Table 1). However, this group is characterized by high rates of staffing and beds, which reflects the low population density in most of these areas. Thus, the clusters with unfavorable indicators (1 and 2) of children's health over the past 5 years (2016-2020) included 9 out of 13 Arctic districts of the RS (Y).

When comparing clusters by the level of healthcare development, it was found that cluster 1 was statistically significantly

different from clusters 2 and 3 in terms of the number of round-the-clock beds per 10,000 population.

Conclusion. The performed analysis showed that there are significant differences between the municipalities of the Republic of Sakha (Yakutia) in terms of children's health. Unfavorable indicators are observed in most of Arctic districts, where sufficiently high rates of staffing, beds and outpatient clinics do not provide the necessary availability and quality of medical care due to the remoteness of some settlements from regional centers. For areas with very low population density and limited transport accessibility, it is necessary to search for and use organizational technologies that increase the availability of medical care for the population. In these conditions, one of the leading is the organization of regular on-site medical examinations of the population with the widespread use of instrumental and laboratory methods of research at the 1st stage, the organization of one-day hospitals, the using of new information technologies: remote audio advisory centers, telemedicine technologies and others. Along with this, planned measures are needed to improve the medical literacy of the population.

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Table 2

Mean scores (with 95% CI) by cluster*

Indicator	1 cluster n=15	2 cluster n=11	3 cluster n=8	p
Infant mortality per 1000 live births	6,3 (3,8-8,8)	6,6 (4,3-9,0)	5,1 (3,6-6,6)	0,791
Child mortality per 10,000 child population	7,4 (5,7-9,1)	8,1 (5,9-10,2)	6,5 (3,8-9,1)	0,282
Children morbidity per 1000 population	2170,1 (2043,7-2296,6)	2779,7 (2651,3-2908,2)	1391,1 (1121,6-1660,7)	<0,001
Adolescents morbidity per 1000 population	1478,1 (1405,8-1550,5)	1828,0 (1685,0-1970,9)	1243,9 (960,6-1527,0)	<0,001
Provision with doctors per 1000 population	34,6 (32,2-37,1)	38,9 (32,3-45,5)	36,4 (30,4-42,9)	0,350
Provision of nursing staff per 1000 population	108,3 (96,3-120,2)	121,2 (110,3-132,0)	106,9 (92,7-121,2)	0,126
Number of round-the-clock beds per 10,000 population	73,8 (65,1-82,5)	92,2 (80,6-103,8)	87,8 (79,9-95,2)	0,011
Capacity of outpatient clinics per 1000 population	320,0 (233,9-406,0)	448,4 (332,5-564,3)	386,6 (241,6-531,4)	0,050

Note: * — average values of indicators for a 5-year period (2016-2020); p - achieved level of significance of differences (Kruskal-Wallis test).

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THE CONTRIBUTION OF VIRUSES TO THE STRUCTURE OF ACUTE RESPIRATORY DISEASES IN THE POPULATION OF YAKUTSK IN 2019-2020

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The aim of the study was to identify the viral etiology of acute respiratory diseases in patients hospitalized to the infectious hospitals in Yakutsk. **Methods:** nasal and pharyngeal swabs were obtained from the examined patients. The presence of the genetic material of the respiratory viruses was determined by real-time PCR. **Results:** During the study, 178 patients admitted to the infectious hospitals in Yakutsk from November 2019 to April 2020 were selected according to the inclusion criteria. 99/178 (55.6%) samples were positive for at least one of the studied viruses, 79/178 (44.4%) samples were negative. Respiratory syncytial virus; rhinoviruses; metapneumovirus; parainfluenza viruses of types 1, 2, 3 and 4; coronaviruses NL-63, 229E, HKU-1 and OC-43; adenoviruses groups B, C and E; bokavirus, as well as influenza A and influenza B viruses were identified. The results of the study are necessary to improve and optimize diagnostic tactics, for control and prevention of respiratory viral infections.

Keywords: human viruses, acute respiratory viral infections, influenza, respiratory syncytial virus, rhinovirus, bronchiolitis, fever.

Introduction. Acute respiratory viral infections (ARVI) occupy a leading place in infectious pathology, accounting for about 90% in the structure of infectious diseases, which is associated with high contagiousness and rapid spread of infections by airborne transmission, while the most susceptible to infection is the child population and the elderly [14,15]. In addition, cases of severe course of the disease are more often observed in young children, the risk of complications and deaths is higher[10]. The diverse etiological structure of ARVI is characterized by heterogeneity and variability

of pathogens not only in time, but also in space [2,5]. In the distribution of ARVI diseases among the population, the territory of his residence is of great importance. The presence of territorial differences in the circulation of pathogens and the incidence of respiratory diseases (in particular, pneumonia, chronic bronchitis, bronchial asthma, etc.) have been studied by various authors. It has been shown that the severity of these diseases is due to the climatic and socio-demographic features of the habitat [1].

Materials and methods. The study was organized on the basis of infectious