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RESOURCE PROVISION OF HEALTH CARE IN THE CENTRAL ECONOMIC ZONE OF THE SAKHA REPUBLIC (YAKUTIA) AND ITS RELATIONSHIP WITH POPULATION HEALTH INDICATORS

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To achieve the proper level of accessibility and quality of medical care to the population, the provision of the municipalities of the republic with the necessary resources (material, technical, financial, human, information, etc.) is of no small importance. In this work, we analyzed the resource provision in the Central Economic Zone (CEZ) according to the indicators included in the official statistical reporting: the availability of medical personnel (doctors, paramedics), round-the-clock hospital beds (all per 10,000 population) and the capacity of outpatient clinics institutions (OCI, in shift visits). An analysis is made of the relationship of a number of indicators characterizing public health with the resource provision of districts / uluses, by correlation coefficients calculated for the period 2007-2016.

Keywords: health care resources, resource support, medical staffing, medical staff and nursing staff, hospital beds, outpatient facilities, correlation coefficients, the relationship of resource support with the incidence of the population, Republic of Sakha (Yakutia).

Introduction. Earlier (Yakutsk Medical Journal No. 1 for 2018 and No. 1 for 2019), we covered issues related to the medical and demographic situation and the incidence of the population in the Central Economic Zone of the Republic of Sakha (Yakutia). In our opinion, the picture in the CEZ does not seem complete without data on resource provision of health care and their connection with indicators characterizing the health of the population.

Material and methods. The statistical data of Yakutsk and 9 districts / uluses

included in the Central Economic Zone were analyzed. Geographically, all municipalities are included in the central and district group of uluses, and according to the medical and economic zoning, the cities of Yakutsk and Kobyaysky district were assigned to the industrial group, and all the rest to the rural group.

The materials used are official statistics of the republic - the Territorial Authority of the Federal State Statistics Service for the Republic of Sakha (Yakutia) and the Ministry of Health (YRMIA). To analyze these indicators, the percentile (centile) method was used, which is widely used and used by us in developing the criteria for regionalization of the North of the Russian Federation and in preparing a number of articles. According to this method, areas with indicators up to the 10th percentile belonged to areas with a low level of resource provision, from 10 to the 25th percentile - below the average, from 75 to the 90th - above the average and above the 90th percentile - with a high level. Obviously, with indicators ranging from the 25th to the 75th percentile, the districts belonged to the group with average values of resource provision.

Results and discussion. I. Resource security. According to the results of 2016, the average republican indicator of the availability of medical personnel is 48.4 per 10,000 population (Table 1). Of the 9 districts and the city of Yakutsk considered that are part of the Central Economic Zone, the worst situation is for Namsky (31.1 - below the national average), Amginsky (31.7) and Kobyaysky (31.9) uluses. Throughout the entire period since 1990, there was a shortage of

medical personnel in the Namsky, Ust-Al-dan and Churapchinsky uluses. A favorable situation is noted only in the Gorniy Ulus. But good indicators until 2005 in the city of Yakutsk should be considered critically in view of the ambiguous statistical approach to staffing in the context of republican and city medical institutions. However, this also applies to subsequent calculations starting in 2007.

In 2016, the provision of nurses was higher than the national average (111.7 per 10,000 population), in the Tatta ulus (127.9 per 10,000 population, and this is above average). In the Gorniy (97.0) and Namsky (96.1) uluses, the indicators were below the national average, and were in the range below the average. During the period under review, quite good security is observed at Amginsky, Kobyaysky and Tattinsky uluses. The worst situation is noted in the Khangalassky ulus and, taking into account the above, in the city of Yakutsk - since 2007.

Consider the data on the security of municipalities of the CEZ around the clock hospital beds (table. 2). The national average for 2016 was 92.0 per 10,000 people, and only the Kobiai ulus is approaching this level. At the same time, in the Namsky (53.2), Churapchinsky (57.9) uluses and the city of Yakutsk (28.7), indicators on a national scale are low, and in the Tattinsky (68.1) and Khangalassky (67.5) uluses - below average. During the period under review, insufficient security was noted in the same mentioned uluses, with the exception of Tattinsky, where a relatively low level was first registered just in 2016.

As for the provision of outpatient facilities in visits per shift (settlement /

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Table 1

Provision of medical personnel in the city of Yakutsk and areas of the Central Economic Zone in 1990-2016 (per 10,000 us.)

Uluses	1990	1995	2000*	2005	2010	2011	2012	2013	2014	2015	2016
Provision of doctors											
Amginsky	33	26	29	31	35.8	32.6	32.7	32.3	33.6	31.2	31.7
Gorniy	34	29	28	37	40.2	41.8	39.7	40.6	39.0	41.2	40.1
Kobiai	30	29	25	28	38.2	33.0	32.2	31.8	33.4	31.4	31.9
M-Kangalassky	34	25	27	25	31.0	30.7	35.9	37.8	37.0	37.5	37.6
Namsky	33	31	31	30	28.4	27.1	29.1	30.7	31.8	32.3	31.1
Tattinsky	32	26	31	39	38.8	34.3	37.2	38.7	36.6	37.3	36.1
U-Aldan	30	24	25	26	31.5	28.0	30.7	30.9	32.8	34.8	34.8
Hangalass	29	32	32	27	31.8	30.6	32.4	32.1	31.5	33.1	34.4
Churapchinsky	34	29	24	31	30.1	29.9	29.1	28.2	31.0	34.3	34.3
City of Yakutsk	83	101	91	97	35.1	33.6	30.7	31.6	32.3	32.0	32.2
In the RS (Y)	42	44	46	50	52.6	48.3	47.7	47.9	48.5	48.1	48.4
Provision of nursing staff											
Amginsky	125	146	124	149	138.8	128.8	131.3	124.0	127.1	131.3	121.4
Gorniy	135	121	107	120	117.8	109.1	105.3	103.5	100.9	96.0	97.0
Kobiai	113	109	125	142	138.9	135.7	131.8	139.7	114.1	115.2	121.9
M-Kangalassky	121	114	99	99	98.2	96.3	97.8	100.8	101.9	105.5	104.0
Namsky	138	121	108	105	104.9	101.9	101.6	100.1	95.9	95.9	96.1
Tattinsky	151	145	146	135	141.0	128.3	135.9	132.0	127.5	128.5	127.9
U-Aldan	127	134	116	109	118.5	118.0	119.6	123.1	120.9	121.5	107.7
Hangalass	91	100	100	102	99.3	99.7	103.2	99.4	102.9	100.0	101.3
Churapchinsky	136	136	128	126	121.5	121.2	116.5	115.7	113.9	109.6	107.2
City of Yakutsk	152	201	189	180	51.7	50.4	45.8	49.4	49.6	49.9	49.3
In the RS (Y)	118	130	133	136	121.5	117.3	116.0	115.1	113.3	112.7	111.7

Note. Legend (In the Tables 1-3): 29.0 low security, 31.5 level below average, 43.2 level above average, 46.6 high security

cm.), This indicator on average in RS (Y) reached 267.0 in 2016 (Table 3). In Namsky and Churapchinsky Uluses, OCI security indicators turned out to be the worst (166.6 and 166.8 towns / cm,

respectively). It should be noted that years with insufficient OCI power were observed in these uluses for almost the entire period under consideration. In other uluses, average values prevailed.

II. The characteristic of the relationship of resource provision with some indicators of public health. This section provides an analysis of the possible relationship of a number of indicators characterizing public health with the resource supply of districts / uluses, according to correlation coefficients calculated for the period 2007-2016. The following population health indicators were analyzed:

1) medical and demographic - birth rate, mortality, natural population growth (NPG), infant mortality (InM);

2) incidence - general and primary (of the entire population, as well as adult and child);

3) primary disability (adult and child).

In this case, only those indicators were evaluated whose dynamics was distinct either upward or downward. Correlation coefficients with an average (0.30-0.69) and strong (0.70 and higher) degree of connection were taken into account.

Amginsky ulus. The period 2007-2016 characterized by a decrease in the provision of medical personnel and round-the-clock hospital beds, and this was combined with an increase in the overall incidence rate of the entire population ($r = -0.46-0.57$), and the general and primary incidence of the child population ($r = -0.56-0.75$).

Gorniy ulus. The provision of nurses decreased from 117.6 per 10,000 population in 2007 to 97.0 in 2016, and the provision of round-the-clock hospital beds from 114.1 to 73.6, respectively. During the same years, the primary incidence of the child population increases from 1686.4 ‰ to 2247.6 ‰ ($r = -0.42$ and $r = -0.63$, respectively). In addition, an inverse average correlation is traced between the deterioration in the availability of nurses and OCI with the dynamics of the general mortality rate.

Table 2

Provision of round-the-clock hospital beds in the city of Yakutsk and areas of the Central Economic Zone in 1990, 1995, 2000, 2005, 2010-2016. (per 10,000 population)

Uluses	1990	1995	2000	2005*	2010	2011	2012	2013	2014	2015	2016
Amginsky	173.0	161.8	134.7	146	101.7	91.5	93.3	94.0	94.1	85.8	83.7
Gorniy	164.0	137.6	130.4	130	102.6	98.0	99.3	97.5	91.6	82.5	73.6
Kobiai	142.0	126.4	142.0	179	121.3	107.1	111.9	112.6	112.6	98.0	86.8
M-Kangalassky	160.0	123.1	109.1	117	92.0	91.2	97.8	98.5	98.3	83.3	76.8
Namsky	151.0	159.0	140.6	117	72.6	71.4	71.2	70.7	69.5	59.5	53.2
Tattinsky	207.0	169.5	163.6	167	110.0	98.7	101.8	102.5	101.9	84.5	69.8
U-Aldan	184.0	156.4	142.9	123	109.4	103.5	95.0	95.6	95.6	80.5	68.1
Hangalass	146.0	153.1	132.9	126	95.2	94.1	94.6	94.8	94.9	80.8	67.5
Churapchinsky	175.0	158.2	136.6	134	86.4	84.4	83.5	83.6	83.3	70.5	57.9
City of Yakutsk	205.0	179.4	184.4	186	31.9	31.0	28.8	30.2	29.5	29.0	28.7
In the RS (Y)	156.0	150.4	142.0	153	109.8	107.5	106.8	106.9	106.4	98.1	92.0

Table 3

Provision of outpatient facilities in the city of Yakutsk and areas of the Central Economic Zone in 1990, 2000, 2005, 2010-2016.
(power in visits per shift)

Uluses	1990*	2000*	2005*	2010	2011	2012	2013	2014	2015	2016
Amginsky	188	278	277	289.5	268.9	272.8	275.0	276.3	276.4	276.1
Gorniy	267	286	285	291.8	280.2	281.3	282.2	279.7	276.3	274.4
Kobiai	179	237	253	264.1	253.1	262.4	266.9	268.6	270.0	273.4
M-Kangalassky	193	193	203	297.1	294.2	303.8	305.8	306.6	305.8	304.0
Namsky	183	193	182	177.0	175.3	174.0	173.0	171.0	168.5	166.6
Tattinsky	278	326	303	320.2	287.3	298.6	302.8	302.9	302.5	302.5
U-Aldan	276	289	297	310.6	293.5	304.4	308.2	309.2	309.5	309.5
Hangalass	208	248	250	253.4	252.6	260.5	264.0	265.7	266.1	266.1
Churapchinsky	137	178	171	170.4	170.0	167.9	167.6	167.4	166.8	166.8
City of Yakutsk	322	287	281	124.6	121.7	111.1	115.1	112.9	112.4	131.6
In the RS (Y)	214	272	274	258.6	255.8	258.2	259.7	260.2	260.6	267.0

Kobiai ulus. Reduced availability of medical personnel and round-the-clock hospital beds for the period 2007-2016 was accompanied by an increase in all considered types of general and primary morbidity, with the exception of the primary morbidity of the adult population. Strong feedback was observed between the availability of doctors and the overall incidence of the child population ($r = -0.75$). And here we can see the inverse average correlation between the deterioration in the availability of round-the-clock hospital beds and OCI with the dynamics of the general mortality rate ($r = -0.69$).

Megino-Kangalassky ulus. The deterioration in the availability of round-the-clock hospital beds is correlated with the growth of all types of general and primary morbidity under consideration (inverse mean relationship). But for other types of resource provision in this ulus, the dynamics are more than favorable. And here you can clearly see the positive dynamics of medical and demographic indicators - fertility, mortality and NPG. Moreover, we see a direct strong connection between the provision of doctors and OCI with fertility and NPG population ($r \geq 0.7$).

Namsky ulus. It was not possible to identify any patterns in the correlation coefficients, although there was a nega-

tive dynamics in the provision of nurses, round-the-clock hospital beds and OCI.

Tattinsky ulus. A decrease in the supply of nurses is correlated with an increase in the general and primary morbidity of both the whole and the children's population, and children have a strong relationship ($r = -0.79$ and -0.82). It is noteworthy that a significant decrease in the availability of round-the-clock hospital beds for the period under review (from 127.3 per 10,000 population to 69.8) is also combined with an increase in the general and primary morbidity of both the entire and the child population.

Ust-Aldan ulus. An increase in the availability of doctors from 29.4 per 10000 population in 2007 to 34.8 in 2016 is combined with a slight improvement in the disability indicators of both the adult and children's population. In turn, a decrease in the availability of round-the-clock hospital beds correlates with an increase in the overall incidence of both the whole and the adult population.

Hangalass ulus. The decrease in the availability of round-the-clock hospital beds is striking (101.4 per 10,000 population in 2007, 67.5 in 2016). At the same time, there is an increase in all types of general and primary morbidity considered by us, and in children, the relationship is strong ($r = -0.73-0.76$). And the

improvement in OCI security indicators is correlated with an increase in birth rates and NPG.

Churapchinsky ulus. The decrease in the resource provision of nurses, round-the-clock hospital beds and OCI correlates with the primary incidence of the child population ($r = -0.38-0.53$). In addition, a decrease in OCI coverage is combined with an increase in the primary incidence of the entire population.

The city of Yakutsk. For the period 2007-2016 There is a dynamic decline in the provision of nurses and around-the-clock hospital beds, and this is combined with an increase in childhood disability.

Conclusion. Thus, it becomes obvious that in a number of CEZ uluses, the situation with the provision of medical personnel, round-the-clock hospital beds and general medical facilities is generally unfavorable, with the exception of the provision of secondary medical personnel in 3 uluses (Amginsky, Kobysky and Tattinsky).

In almost all uluses, there is a clear connection between a decrease in the level of resource provision with an increase in the general morbidity of the population. In some uluses there are correlation links with medical and demographic indicators. Another example: an increase in the supply of doctors from 29.4 per 10,000 population in 2007 to 34.8 in 2016 in the Ust-Aldan ulus is combined with a slight improvement in disability indicators, both for adults and children.

We conclude that the planned "optimization of health care" in the form of a reduction in the number of medical personnel, hospital beds and OCI without taking into account the dynamics of indicators characterizing the health of the population, can lead to a deterioration in public health.

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