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MAIN INDICATORS IN STATE PROGRAM EFFICACY EVALUATION: MATERNAL AND CHILD HEALTHCARE IN THE ARCTIC ZONE OF THE REPUBLIC SAKHA (YAKUTIA)

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The article represents the main indicators of the maternal and child healthcare service in the Arctic regions of the Republic of Sakha (Yakutia), common data for the Republic of Sakha (Yakutia) and the Russian Federation for the period of 2000-2018. Infant and maternal mortality rates are the main indicators and the demographic indices, thus clearly reflecting the development rate of the country, region and healthcare system. The analysis of infant and maternal mortality indices in the Republic of Sakha (Yakutia), including its Arctic regions, is represented in the article. According to the official medical statistics the rate of infant and maternal mortality in the Arctic zone of the Republic of Sakha (Yakutia) has decreased to minimum.

Key words: infant mortality, maternal mortality, Yakutia, the Arctic, an Arctic zone of Russia

Introduction. A regional healthcare development program of the Republic of Sakha (Yakutia) includes the maintenance of modern infrastructure of healthcare service for the period of 2019 – 2024. The main indicators of the program, concerning infant and maternal healthcare, are:

1. Decrease of infant mortality rate to 4.2 per 1000 live births in the Republic of Sakha (Yakutia) by 2024.

2. Reduction of pre-term deliveries at 22-37 weeks of gestation to 55% in the prenatal centers by 2024; which can be achieved by improving efficacy of obstetrics and infant healthcare.

3. Decrease of child mortality rate (under-four deaths rate) to 5.9% per 1000 live births by 2024.

4. Decrease of child mortality rate (from 0 to 17) to 55.0% per 100000 children of the certain age.

The considerable positive results of the efficacy of the main indicators are being noticed at the moment of realization of the regional program.

Materials and methods: The Arctic zone of the Republic of Sakha (Yakutia) is represented by 13 circumpolar (Arctic and Subarctic) regions as: Abiyskiy, Allaikhovskiy, Anabarskiy (Dolgano-Evenkiyskiy national), Bulunskiy, Verkhnekolymskiy, Verkhoyanskiy, Zhiganskiy (Zhiganskiy Evenkiyskiy national), Momskiy, Nizhekolymskiy, Olenekskiy Evenkiyskiy national, Srednekolymskiy, Ust-Yanskiy, Eveno-Bytantayskiy national regions.

The analysis of medical and demographical indicators, concerning child and maternal healthcare in the Republic of Sakha (Yakutia) and its circumpolar regions for the period of 2000-2018, is represented in the article. The analysis is based on the special database of the state institution 'Yakut Republican medical center of informatics and analysis under the healthcare ministry of the Republic of Sakha (Yakutia)' (editions of the statistics "The main indicators of the health status of the population, activities and resources

of medical organizations of the Republic of Sakha (Yakutia)" for 2003, 2006, 2008, 2013, 2018 and 2019). This database includes all cases of births, deaths, initial and common disease incidences of the population for the period of 2000-2018. The content-analysis is carried out.

By the present times the Republic of Sakha (Yakutia) still remains most isolated and hard-to-reach regions of the Russian Federation, especially for its circumpolar regions. Among all the substantial tasks the problem of healthcare service organization for the circumpolar regions of the Republic of Sakha (Yakutia) is of principle importance. Most of the normative legal documents in the field of healthcare do not take into account the specificity of the Arctic regions. The Republic of Sakha (Yakutia) is not an exception.

A three-level system of healthcare service for pregnant and parturient women, concerning the region specificity, is described, hospital bed fund is represented.

A detailed analysis of the medical and demographic indicators enables to evaluate the efficacy of organizing the healthcare resources and positive indicators of effective realizing of large scales of federal and regional child and maternity healthcare programs.

Results and discussion. The organization and work of the obstetric and medical healthcare for children of the Republic of Sakha (Yakutia) is represented this way. There are 741 obstetric beds in the Republic of Sakha (Yakutia), obstetric bed provision is 31.0 per 10000 women at the fertile age (31.3 in 2017): among them 339 beds for pregnant and parturient women, with the provision of 14.2 per 10000 (15.0 in 2017)

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Table 1

The dynamics of the birth rate in the Arctic regions of the Republic of Sakha (Yakutia), the Republic of Sakha (Yakutia) proper and the Russian Federation in 2000 – 2018 [1-6]

Regions	2000	2005	2010	2015	2016	2017	2018
Abiyskiy	15.4	10.6	15.1	13.6	9.6	13.6	12.5
Allaikhovskiy	15.3	17.3	12.4	19.6	18.1	14.7	13.6
Anabarskiy	19.7	20.3	17.9	20.5	20.8	21.8	16.2
Bulunskiy	14.6	11.9	15.2	14	14.1	14.3	11.4
Verkhnekolymskiy	10.0	10.1	10.3	11.7	12.0	11.0	8.8
Verkhoyanskiy	15.0	15.5	18.7	19.8	18.3	16.8	13.5
Zhiganskiy	12.6	19.9	22.4	22.8	17.9	18.0	16.9
Momskiy	17.3	19.2	17.9	23.2	18.0	17.6	14.4
Nizhnekolymskiy	11.6	12.8	14.3	17.9	15.5	12.9	14.5
Olenyokskiy	11.6	13.7	24.1	22.1	22.5	22.8	23.6
Srednekolymskiy	13.9	12.8	17.5	19.3	15.1	16.3	13.4
Ust-Yanskiy	9.0	10.3	11.9	17.9	17.6	15.5	13.2
Eveno-Bytantaiskiy	22.6	11.5	16.8	16.1	18.3	17.9	22.0
Mean number by the Arctic regions	14.5	14.3	16.5	18.3	16.6	16.2	14.3
The Republic of Sakha (Yakutia)	13.5	14.3	16.8	17.1	16.0	14.5	13.7
The Russian Federation	8.7	10.2	12.4	13.3	12.9	11.5	10.9

Примечание. Показатели в табл. 1-5 взяты из упомянутых статистических сборников.

Table 2

Dynamics of absolute numbers of the births in the Arctic regions of the Republic of Sakha (Yakutia), the Republic of Sakha (Yakutia) proper, and the Russian Federation for the period of 2000-2018 [1-6]

Regions	2000	2005	2010	2015	2016	2017	2018
Abiyskiy	64	40	57	15	14	21	13
Allaikhovskiy	50	45	27	13	13	5	5
Anabarskiy	51	65	31	15	29	32	6
Bulunskiy	135	107	118	66	74	54	33
Verkhnekolymskiy	57	51	47	23	37	25	21
Verkhoyanskiy	246	184	214	133	115	79	39
Zhiganskiy	42	58	69	59	50	37	34
Momskiy	68	69	54	39	24	33	6
Nizhnekolymskiy	98	68	51	38	42	19	24
Olenyokskiy	58	34	58	16	17	10	12
Srednekolymskiy	117	78	123	89	57	61	30
Ust-Yanskiy	100	78	80	72	50	61	30
Eveno-Bytantaiskiy	26	9	8	3	3	2	2
Total number for the Arctic regions	1112	886	937	581	525	439	255
Part, %	8.4	6.4	5.9	3.5	3.4	3.2	1.9
The Republic of Sakha (Yakutia)	13147	13656	15905	16379	15425	13686	13375

and 402 beds for obstetric pathology patients, with the provision of 16.8 (16.3 in 2017). The gynecological profile beds number is 402, the gynecological bed provision is 8.1 per 10000 of female population (8.0 in 2017).

The obstetric bed provision in the Republic of Sakha (Yakutia) by 01.01.2018 was 31.0; the numbers increase a mean index for the Russian Federation (17.99 in the Russian Federation in 2017). It is associated with the huge territory of the Republic of Sakha (Yakutia), remote and hard-to-reach villages located far from healthcare services and absence of transport infrastructure, especially in the Arctic regions of it.

The obstetric and gynecological medical staff provision was 5.7 per 10000 of female population by 2018 (5.6 in 2017). There are 284 obstetricians and gynecologists, 62.7% of them have the qualified category of the specialist (62.7% in 2017), among them the highest category of the specialist is in 38.4% (35.9% in 2017), the first category in 16.2% (14.9% in 2017), and second category in 8.1% (12% in 2017). There are 99.6% certified obstetricians and gynecologists (99.3% in 2017).

Since 2011 the Republic of Sakha (Yakutia) practices a three-level system of healthcare service assistance for pregnancy, birth and neonatal periods, according to the Republic of Sakha (Yakutia) Ministry of healthcare order #808n dated 02.10.2009 "On maintenance of obstetric and gynecological medical assistance procedure". According to the Russian Federation Ministry of healthcare order #572n dated 12.11.2012, the obstetric and gynecological medical assistance is performed by the levels since 2013:

I-st level – 29 maternity departments with 283 beds, which compose 38.2% of the obstetric bed fund.

II-nd level – 6 maternity departments with 218 beds, which compose 29.4% (Aldanskaya central regional hospital, Lenskaya central regional hospital, Megino-Kangalasskaya central regional hospital, Mirminskaya central regional hospital, Nerungrinskaya central regional hospital, Khangalasskaya central regional hospital).

III-rd level – 2 perinatal centers based on Republican hospital #1 National health center, Yakutsk Republican clinical hospital with 240 beds (32.4%).

The pediatric bed fund of the Republic of Sakha (Yakutia) is represented by somatic (pediatric) 719 beds, and 703 specialized day-and-night service beds for each 22 medical profiles. In 2018 the

numbers of pediatric beds increased by 3 % from 1380 beds to 1422, if to compare it with 2017. In 2019 the number of somatic pediatric beds increased by 4.8% up to 719 beds; specialized beds number increased by 1.3% up to 703 beds. Thus, a quota of pediatric beds total number has increased to 50.6%, specialized to 49.4%.

The pediatric (somatic) hospital bed provision was 27.2 per 10000 of children population (26.3 in 2017). The specialized

pediatric bed provision was 26.6 (26.6 in 2017).

The table 1 shows that the indicators of birth in the Arctic zone of the Republic of Sakha (Yakutia) and the Republic of Sakha (Yakutia) proper are higher than in the Russian Federation. Moreover, the indicator is by 31% higher in the Arctic regions of the Republic of Sakha (Yakutia), than in the Russian Federation. In 2018 the highest indicators of the birth rate were noticed in Olenyokskiy region

Table 3

Dynamics of the part of the normal delivery in the Arctic regions of the Republic of Sakha (Yakutia), and the Republic of Sakha (Yakutia) proper (2000-2018) [1-6]

Regions	2000	2005	2010	2015	2016	2017	2018
Abiyskiy	50.0	75.0	43.9	86.7	78.6	95.2	76.9
Allaikhovskiy	98.0	71.1	51.9	100.0	53.8	20.0	60.0
Anabarskiy	70.6	49.2	71.0	73.3	75.9	56.3	33.3
Bulunskiy	31.1	37.4	65.3	39.4	75.7	81.5	81.8
Verkhnekolymskiy	71.9	68.6	74.5	43.5	89.2	72.0	71.4
Verkhoyanskiy	78.5	23.4	39.7	85.7	85.2	77.2	33.3
Zhiganskiy	80.9	82.8	71.0	83.1	84.0	78.4	79.4
Momskiy	52.9	26.1	46.3	30.8	45.8	69.7	83.3
Nizhnekolymskiy	81.4	58.8	68.6	84.2	78.6	52.6	91.7
Olenyokskiy	82.8	43.8	79.3	100.0	82.4	70.0	83.3
Srednekolymskiy	81.2	38.5	71.5	67.4	40.4	32.8	26.7
Ust-Yanskiy	15.0	25.6	73.8	94.4	72.0	75.4	90.0
Eveno-Bytantaitskiy	42.3	88.9	100.0	100.0	66.7	100.0	50.0
Total for the Arctic regions	64.3	53.0	65.9	76.0	71.4	67.8	66.2
The Republic of Sakha (Yakutia)	33.7	42.7	50.0	52.3	51.2	48.6	47.9

Table 4

The dynamics of infant mortality rate in the Arctic regions of the Republic of Sakha (Yakutia), and the Republic of Sakha (Yakutia) proper (2000-2018) [1-6]

Regions	2000	2005	2010	2015	2016	2017	2018	%
Abiyskiy	25.0	20.4	14.9	15.2	25.6	0	0	
Allaikhovskiy	30.8	38.6	0	18.9	0	25.0	0	
Anabarskiy	95.9	47.5	18.2	13.3	0	13.0	0	
Bulunskiy	13.8	17.9	16.0	0	16.0	0	10.5	
Verkhnekolymskiy	15.9	0	0	0	19.6	0	0	
Verkhoyanskiy	20.4	15.4	12.5	8.8	0	5.2	0	
Zhiganskiy	12.5	0	20.8	0	26.3	0	0	
Momskiy	22.7	0	12.0	51.5	10.3	0	0	
Nizhnekolymskiy	22.5	0	41.5	12.7	14.7	0	0	
Olenyokskiy	27.4	17.9	20.2	11.4	22.2	0	0	
Srednekolymskiy	7.1	22.7	7.2	20.7	0	8.2	10.0	
Ust-Yanskiy	22.5	0	20.8	0	17.9	18.0	10.8	
Eveno-Bytantaitskiy	54.1	0	0	0	0	0	0	
The mean number for the Arctic regions	28.5	13.9	14.2	11.7	13.1	5.3	2.4	-26.1
The Republic of Sakha (Yakutia)	17.6	10.6	7.2	7.6	7.2	5.1	5.0	-12.6
The Russian Federation	15.3	11.0	7.5	6.5	6.0	5.6	5.1	-10.2

Table 5

Dynamics of maternal mortality cases in the Arctic regions of the Republic of Sakha (Yakutia), the Republic of Sakha (Yakutia) proper for 2000-2018. [1-6]

Regions	2000	2005	2010	2015	2016	2017	2018
Abiyskiy	-	-	-	-	-	-	-
Allaikhovskiy	-	-	-	-	-	-	-
Anabarskiy	-	-	-	-	-	-	-
Bulunskiy	1	-	-	-	-	-	-
Verkhnekolymskiy	-	-	-	-	-	-	-
Verkhoyanskiy	-	-	-	-	-	-	-
Zhiganskiy	-	-	-	-	-	-	-
Momskiy	1	-	-	-	-	-	-
Nizhnekolymskiy	-	-	-	-	-	-	-
Olenyokskiy	-	-	-	-	-	-	-
Srednekolymskiy	-	1	-	-	-	-	-
Ust-Yanskiy	-	-	-	-	-	-	-
Eveno-Bytantaitskiy	-	-	-	-	-	-	-
Total for the Arctic regions	2	1	-	-	-	-	-
The Republic of Sakha (Yakutia)		4	4	4	-	1	2

(23.6%), Eveno-Bytantaitskiy (22.0%) and Zhiganskiy (16.9%) regions. The indicators of the birth rate are twice or more higher than in other regions of the Russian Federation.

Despite the high indicators of the birth rate in the Arctic regions of the Republic of Sakha (Yakutia) the numbers have decreased from 8.4% to 1.9% since 2000; it corresponds to the number of migration from these regions (table 2).

As it is shown in the table 3, the part of the normal delivery in the Arctic regions of the Republic of Sakha (Yakutia) is quite stable, so 64.3% in 2000 is a mean number for the Arctic regions of the Republic of Sakha (Yakutia); 66.2% in 2018. While in the Republic of Sakha (Yakutia) proper the mean number is considerably low, it was 33.7% in 2000, and 47.9% in 2018.

The index of the infant mortality rate for the period of 2000-2018 in the Republic of Sakha (Yakutia) was higher than the indices in the Russian Federation till 2017, since 2018 the indices decreased and became 5.1% in 2017, and 5% in 2018 (see table 4).

If we analyze the only 13 Arctic regions of the Republic of Sakha (Yakutia), taking into account difficulties in transport infrastructure, absence of a neonatologist in the medical staff of the Central regional hospitals, the index of the infant mortality rate will be high till 2016; these numbers will be higher than the ones for the whole Republic. In 2018 this index has decreased its historical minimum of 2.4%. It is well-known that the density of population in the Arctic regions is less than 10000, and when we calculate the indices of the infant mortality rate the law of small numbers makes sense, so even 1 case of the infant mortality will show high numbers in total. Besides that we should underline the positive fact of the absence of the infant mortality cases in 2018 in the following regions of the Arctic zone: Abiyskiy Allaikhovskiy, Anabarskiy, Verkhnekolymskiy, Verkhoyanskiy, Zhiganskiy, Momskiy, Nizhnekolymskiy, Olenyokskiy, and Eveno-Bytantaitskiy regions. It is doubtless that this is the result of a huge work of the whole team of the medical staff in the local regional hospitals, the Perinatal center of the maternity and child welfare, Pediatric center of the Republican hospital #1, National health center, Yakutsk Republican clinical hospital and the air medical service.

As it is shown in the table 5, the maternal mortality rate has sharply decreased in the Arctic regions of the Republic of Sakha (Yakutia) since 2000.

Since 2010 there are no registered cases of maternal mortality. This is also the result of the effectively organized three-level system of healthcare service for pregnant and parturient women; monitoring pregnant and parturient women. While there were 2 cases of the registered maternal mortality in the other regions of the Republic in 2018.

Conclusions. Having analyzed medical and demographic indicators for the period of 2000-2018 in the Arctic

zone of the Republic of Sakha (Yakutia), we can constitute the following positive tendencies as:

1. High mean indices for the birth rate (18.4%);
2. Great portion of the normal delivery (66.2%);
3. Permanent decrease of the mean number in infant mortality rate to 2%;
4. No cases of maternal mortality;
5. Ways of effective organizing the healthcare service resources

and positive indicators of its efficacy.

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INDICATORS OF THE CARDIOVASCULAR SYSTEM AND HEART RATE IN YOUNG MALE RESIDENTS OF MAGADAN REGION AT LOCAL EXPOSURE TO COLD

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The aim of this work was to study the alterations of cardiohemodynamics and the variability of the heart rhythm at rest and under local cold effects in individuals with different initial types of autonomic regulation.

Methods: In 54 young male people aged 17 to 19, background records of cardiac rhythm and hemodynamics were registered both at rest (lying on the couch) and during immersion of the contact hand in a container with water at a temperature of 4 ° C for 4 minutes.

Results of the work. It was found that the analyses of heart rate variability in vagotonic young men can neither at rest nor at the peak of the cold test provide an opportunity to adequately analyze the changes in the cardiorythm index in response to the test. Whereas in the differentiation of the examined subjects according to their initial types of autonomic balance it was shown that in the sample of young men with the initial normotonic type of autonomic regulation at rest, higher values of arterial blood pressure and heart rate were observed with a pronounced hypertensive reaction in response to the cold test. In this case, the pattern of changes in the indices of the heart rate variability at a cold test indicates a statistically more pronounced activation of the sympathetic link of the autonomic nervous system. In the meantime, in the vagotonics group, the local cold effect did not change the character of autonomic regulation of cardiac rhythm against the background of significant dynamics of systolic and diastolic arterial pressure.

Conclusions: The obtained results indicate that young men with a predominance of parasympathetic orientation in the heart rhythm regulation demonstrate high stability of autonomic regulation to the presented cold test, which was manifested by the absence of statistically significant shifts in all studied cardiorythm indicators and may indicate the cold resistance of this contingent.

Keywords: young men, cold test, cardiovascular system indicators, heart rhythm.

The significant material on the physiology of humans and animals with various forms of adaptation to low ambient temperatures [4, 10, 14] has been available now. Cold test is one of the common tests used for functional assessment of the microvascular state. It is associated with the creation of local tissue hypothermia in the zone of its contact with a cooling object of a small area, the low temperature of which is maintained for the required period of time [11]. Analysis of the references indicates a sufficient degree of study of the structure of the peripheral component of vasomotor reactions to relatively short-term acute local cooling of various body segments, as well as neurohumoral

and local mechanisms of vascular tone regulation [3]. Also, at a sufficiently high level, the physiological mechanisms of the response of the cardiovascular system to the cold have been studied [5]. Moderate general cooling usually leads to an increase in systemic arterial blood pressure, cardiac output, and heart rate, which is associated with increased sympathetic ANS activity and general vaso-spasm at the periphery of the body [9]. In this regard, the peculiarities of rearrangements of systemic cardio hemodynamic parameters and heart rate variability at rest and during local cold exposure in individuals with different initial autonomic regulation types were studied.

Materials and methods. In total, 54 young men aged 17 to 19 years old, students of Northeastern State University (Magadan) were surveyed. Background records of heart rate, hemodynamic parameters were carried out while lying on the couch. After that, another contact brush was immersed in a container with

water at a temperature in the range of 4 ° C for 4 minutes.

The cardiac rhythm was recorded using the Varicard instrument and the VARICARD-KARDi software, taking into account the guidelines of the group of Russian experts [1]. The following indicators of HRV were analyzed: mode (Mo, ms) - the most common value of the R-R interval; the difference between the maximum and minimum values of cardiointervals (MxDMn, ms); the number of pairs of cardiointervals with a difference of more than 50 ms in% of the total number of cardiointervals (pNN50, ms); standard deviation of the complete array of cardiointervals (SDNN, ms); mode amplitude with a class width of 50 ms (AMo50%, ms); index of tension of regulatory systems (SI, standard units); the total power of the heart rate spectrum (TP, ms²), the power spectrum of the high-frequency component of heart rate variability in the range of 0.4-0.15 Hz (respiratory waves) (HF, ms²); spectrum power of the low-fre-

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