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TOPICAL ISSUE

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PREVENTABLE CAUSES IN THE MORTALITY STRUCTURE OF THE POPULATION OF THE SAKHA REPUBLIC (YAKUTIA) AND ITS ARCTIC ZONE

When studying a population mortality, a survey of the factors by influencing which it is possible to minimize losses are of great practical and scientific interest. The aim of the survey was to assess the population mortality from preventable causes in the Sakha Republic (Yakutia) using the Russian classification.

Materials and Methods. Using the methods of comparative and mathematical analyses, the data on the population mortality in the Sakha Republic (Yakutia) and its Arctic zone in 2020-2023 were studied, with grouping of the causes of deaths which could have been avoided either by preventing the risks of developing diseases, by timely diagnosis of a disease, or by adequate treatment.

Results and Discussion. It was found that 37.2% of the total number of deaths in the republic in 2020-2023 could have been avoided, including 71.8% of the cases by primary prevention measures (Group 1 of the causes); 3.2% – by early diagnosis of diseases (Group 2 of the causes); and 25.0% – by adequate treatment (Group 3 of the causes). In the mortality structure in the Arctic zone of the republic, these causes accounted for

75.1%, 2.6%, and 22.3%, respectively. The greatest contribution to preventable mortality of the population in Yakutia is made by lifestyle-related diseases. Losses due to injuries and poisoning account for 35.7% in the preventable mortality in the republic as a whole and for 45.0% in the Arctic zone of the region. 24.9% of fatal cases in the Arctic zone (10.5% in the republic) directly depended on the quality of medical care. To minimize these losses, it remains important to identify diseases at early stages; to address them with adequate treatment; and, for district hospitals, to refer patients to level 3 medical institutions in a timely manner.

Keywords: mortality, preventable causes, Sakha Republic (Yakutia), Arctic zone.

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Introduction. The introduction of the Rutstein concept of preventable mortality in foreign countries in the second half of the 20th century made it possible to adequately assess the performance of healthcare as a social institution and significantly increase the efficiency of investments in maintaining public health. The concept is based on the differentiation of nosological forms of diseases, death from which can be avoided through medical intervention [4,5,6,7]. There are

two lists of preventable mortality causes, where the grouping is determined by levels of prevention: "old" ("Avoidable mortality") and new ("Amenable mortality"). The first list includes the efforts of the entire public health system, the second – only healthcare institutions. The index of causes in the lists may change as medical science and practice develop, and diagnostic and therapeutic capabilities expand. The difficulty with applying this methodology as it is in the

Russian Federation is due to the lack of a universally agreed list of preventable causes of mortality. However, attempts to create it have been repeatedly made and, according to experts, the "old" list is more applicable to Russia, since the regions of the country differ significantly in both living conditions and the level of

development of the healthcare system. [1,2,3]

The aim of the survey was to assess the population mortality from preventable causes in the Sakha Republic (Yakutia) using the Russian classification.

Materials and Methods. A retrospective analysis of data from the territorial

authority of the Federal State Statistics Service for the Sakha Republic (Yakutia) for the period 2020–2023, provided at the request of the authors, was conducted. To group the causes of preventable mortality, the classification of A.E. Ivanova, V.G. Semenova and T.P. Sabgaida was used, based on which three groups of the

Table 1

Dynamics of deaths from preventable causes in the Sakha Republic (Yakutia) in 2020–2023

Causes of death	2020	2021	2022	2023	Bcero
Causes leading to losses that can be avoided through primary prevention measures (Group 1)					
Lip, oral cavity and throat cancers	29	37	40	29	135
Esophageal cancer	38	31	42	36	147
Liver and intrahepatic bile duct cancers	120	154	131	156	561
Laryngeal cancer	19	14	14	25	72
Tracheal, bronchial and lung cancers	293	244	250	291	1078
Cancers of other and not-localized respiratory and thoracic cage organs	12	16	6	10	44
Bladder cancer	18	25	19	21	83
Cancers of other and not-identified urinary organs	4	5	2	4	15
Subarachnoid hemorrhage	53	73	64	32	222
Intracerebral and other intracranial hemorrhages	180	210	166	141	697
Cerebral infarction	192	236	179	171	778
Stroke not diagnosed as hemorrhage or infarction	8	12	2	15	37
Other cerebrovascular diseases	15	19	5	5	44
Alcoholic liver disease (alcoholic cirrhosis, hepatitis, fibrosis)	52	49	59	30	190
Liver fibrosis and cirrhosis (not alcohol-related)	147	159	120	122	548
Other liver diseases	49	35	25	28	137
Injuries, poisoning and some other consequences of external impact	1206	1098	1113	1329	4746
Causes leading to losses that can be avoided through timely diagnosis of diseases (Group 2)					
Cutaneous malignant melanoma	5	8	6	9	28
Other skin cancers	5	4	1	4	14
Breast cancer	54	50	56	43	203
Cervical cancer	28	26	45	15	114
Cancers of other and non-specified parts of uterus	12	18	20	14	64
Causes leading to losses that can be avoided through improved treatment and medical aid (Group 3)					
Prostate cancer	35	17	27	35	114
Male genital cancers	1	2	3	3	9
Hodgkin lymphoma	0	0	3	4	7
Non-Hodgkin lymphoma	20	13	16	13	62
Leukemia	22	29	18	24	93
Chronic rheumatic heart diseases	25	13	14	11	63
Arterial hypertension	161	149	132	90	532
Gastric ulcer	23	20	22	13	78
Duodenal ulcer	9	10	17	17	53
Diseases of the appendix	1	2	0	1	4
Hernias	3	3	8	9	23
Cholelithiasis	13	20	29	18	80
Cholecystitis	8	10	6	6	30
Infectious and parasitic diseases *	110	111	109	81	411
Respiratory diseases	400	466	416	475	1757
Pregnancy, delivery and postpartum complications	1	8	5	0	14
Total	3371	3396	3190	3330	13287

causes were identified depending on the stage of the process: Group 1 combines the causes avoidable by primary prevention; Group 2 – by efficient diagnosis; and Group 3 – by adequate treatment at all stages of aid. The authors used the methods of comparative and mathematical analyses.

Results and Discussion. Following the classification, individual forms of diseases that resulted in deaths in Yakutia in 2020–2023 were divided into three groups (Table 1). Group 1 includes malignant neoplasms (MN) of the digestive and respiratory organs; cerebrovascular accidents and cerebrovascular diseases; alcoholic damage and other diseases of the liver; as well as all accidents, the occurrence and development of which are largely influenced by lifestyle, diet, bad habits (smoking, alcohol abuse), and behavioral factors. In these cases, death can be avoided by primary prevention measures. Group 2 includes MN of the skin, mammary gland, cervix and other parts of the uterus, the outcomes of which depend on timely detection and early diagnosis of the disease. Group 3 of the causes includes MN of the prostate gland and male genital organs, lymphoma, leukemia, chronic rheumatic heart diseases, hypertension, gastric ulcer and duodenal ulcer, appendix diseases, hernias, cholecystitis, infectious and parasitic diseases, respiratory diseases and conditions associated with pregnancy and childbirth, deaths from which can be avoided by high-quality medical care and proper treatment.

According to the analysis, of the total number of deaths from all causes in the republic over the four years (35,697), the share of preventable deaths was 37.2% (13,287 cases). By years, in the period 2021–2023, a decrease in the number of deaths was noted; it is partly explained by tackling the pandemic of the new coronavirus infection COVID-19, which had led to a sharp increase in fatalities at the height of its spread in 2021. The dynamics of the number of deaths that could have been avoided by primary prevention measures, timely detection of diseases and high-quality treatment was relatively stable (Figure 1). The change in their share in the total number of deaths in 2021–2023 is characterized by an upward trend (Figure 2).

A study on the contribution dynamics of the three groups of causes to the total number of deaths in 2020–2023 revealed that the largest share (from 22.9% to 31.3%) was made by Group 1 causes, which can be amended by preventing the risks of developing pathological con-

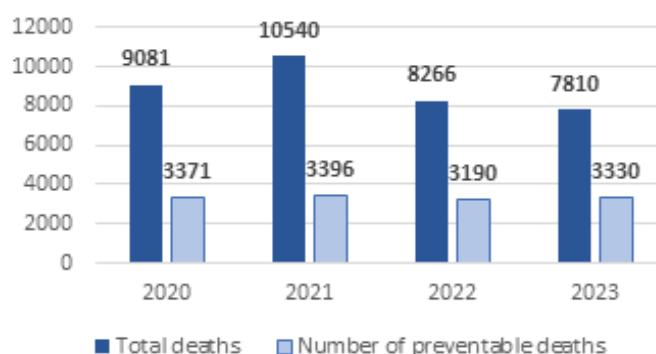


Fig. 1. Total number of deaths and the number of preventable deaths in 2020–2023

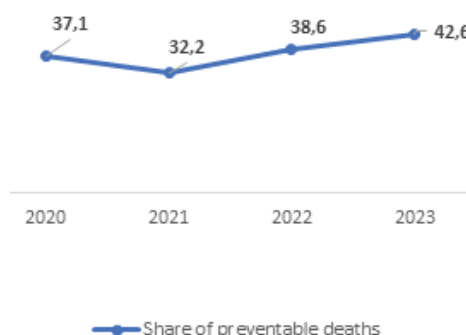


Fig. 2. Dynamics of the share of preventable deaths in 2020–2023

Table 2

Dynamics of the number and share of preventable causes of mortality in 2020–2023

Years	Total number of deaths	Group 1 causes		Group 2 causes		Group 3 causes	
		abs.num	share	abs.num	share	abs.num	share
2020	9 081	2435	26.8	104	1.1	832	9.2
2021	10 540	2417	22.9	106	1.0	873	8.3
2022	8 266	2237	27.0	128	1.5	825	10.0
2023	7 810	2445	31.3	85	1.1	800	10.2

ditions before the onset of the disease (Table 2).

The stable and small share of Group 2 causes indicates an improvement in diagnostic capabilities in healthcare institutions of the region (the material and technical base meeting modern requirements, the level of professional training of personnel). The share of Group 3 causes, losses from which could have been avoided by high-quality treatment, demonstrated an increasing trend, which is worth paying attention.

The bulk of Group 1 was made by losses from external causes. Mortality from injuries and poisoning in 2020–2022 ranked third in the structure of mortality of the population in the republic and was characterized by a decrease during the pandemic in 2021–2022 (from 123.4 to 111.2–111.6 per 100,000 population).

The subsequent increase in the indicator to 133.0 per 100,000 people moved this class of causes of death up to second place (Figure 3).

By years, in 2020, 3,371 deaths or 37.1% of the total number of deaths (9,081) could have been avoided, including 2,435 cases (72.2%) through primary prevention measures, 104 cases (3.1%) – through timely detection of the disease, 832 cases (24.7%) – through high-quality appropriate treatment.

In 2021, the total share of preventable mortality was 32.2% (3,396 out of 10,540 deaths from all causes), including effective primary prevention could have prevented 71.2% of deaths (2,417), early detection of the disease – 3.1% (106), high-quality treatment – 25.7% (873).

In 2022, out of 3,190 preventable deaths, 2,237 (70.1%) depended on pri-

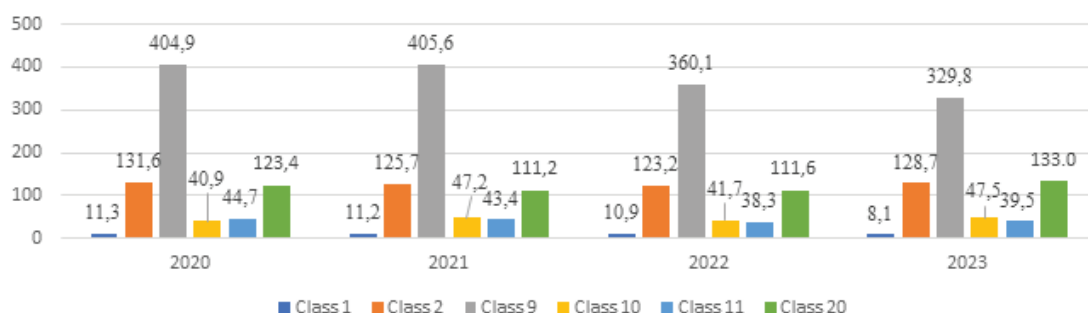


Fig. 3. Dynamics of the indicators of mortality from main classes of causes in the Sakha Republic (Yakutia) in 2020–2023 (per 100,000 population)

Table 3

Dynamics of deaths from preventable causes in the Arctic zone of the Sakha Republic (Yakutia) in 2020-2023

Causes of death	2020	2021	2022	2023	Bcero
Causes leading to losses that can be avoided through primary prevention measures (Group 1)					
Lip, oral cavity and throat cancers	1	3	1	2	7
Esophageal cancer	4	1	5	6	16
Liver and intrahepatic bile duct cancers	7	20	13	8	48
Laryngeal cancer	2	0	1	1	4
Tracheal, bronchial and lung cancers	24	19	22	25	90
Cancers of other and not-localized respiratory and thoracic cage organs	2	2	0	1	5
Bladder cancer	4	2	1	3	10
Cancers of other and not-identified urinary organs	0	0	0	0	0
Subarachnoid hemorrhage	3	4	4	1	12
Intracerebral and other intracranial hemorrhages	19	14	8	11	52
Cerebral infarction	15	17	9	8	49
Stroke not diagnosed as hemorrhage or infarction	1	4	2	6	13
Other cerebrovascular diseases	1	2	0	2	5
Alcoholic liver disease (alcoholic cirrhosis, hepatitis, fibrosis)	3	2	3	1	9
Liver fibrosis and cirrhosis (not alcohol-related)	14	4	8	9	35
Other liver diseases	8	2	2	4	16
Injuries, poisoning and some other consequences of external impact	148	138	111	157	554
Causes leading to losses that can be avoided through timely diagnosis of diseases (Group 2)					
Cutaneous malignant melanoma	0	0	0	2	2
Other skin cancers	0	1	0	0	1
Breast cancer	3	3	3	2	11
Cervical cancer	4	1	8	1	14
Cancers of other and non-specified parts of uterus	0	0	2	2	4
Causes leading to losses that can be avoided through improved treatment and medical aid (Group 3)					
Prostate cancer	2	2	1	1	6
Male genital cancers	0	1	0	0	1
Hodgkin lymphoma	0	0	0	0	0
Non-Hodgkin lymphoma	0	1	0	2	3
Leukemia	0	1	0	2	3
Chronic rheumatic heart diseases	1	3	1	2	7
Arterial hypertension	14	16	21	15	66
Gastric ulcer	0	1	1	0	2
Duodenal ulcer	0	0	1	0	1
Diseases of the appendix	0	1	0	0	1
Hernias	0	1	1	0	2
Cholelithiasis	2	0	1	2	5
Cholecystitis	2	3	0	0	5
Infectious and parasitic diseases *	9	6	9	7	31
Respiratory diseases	47	35	28	31	141
Pregnancy, delivery and postpartum complications	0	0	0	0	0
Total	340	310	267	314	1231

mary prevention, 128 (4.0%) – on early detection of the pathological condition, 825 (25.9%) – on the quality of treatment. The total share of the preventable component in the mortality structure was 38.6% (3,190 out of 8,266).

According to the 2023 data, 2,445 deaths (73.4%) could have been avoided by primary prevention measures, 85 cases (2.6%) – through timely detection, and 800 cases (24.0%) – through adequate medical care. Thus, 42.6% of deaths were preventable (3,330 out of 7,810 deaths from all causes).

Consequently, in total in the period 2020–2023, of those who died from all causes (35,697), 26.7% of deaths depended on primary prevention measures (9,534), 1.2% – on the quality of disease diagnosis (423), 9.3% – on the quality of treating diseases and pathological conditions (3,330); therefore, 10.5% of deaths could have been avoided by the efforts and resources of the healthcare system (3,753).

A similar analysis of the mortality structure of the population in the Arctic group of districts of the republic for 2020–2023 established that in the period, the share of preventable deaths was higher (1,231 cases out of 3,128 deaths) than in the region as a whole: 39.4% versus 37.2%. In the causal profile, 75.1% of the cases depended on primary prevention measures (925 deaths out of 1,231), 2.6% (32 cases out of 1,231) – on the quality of disease diagnosis, 22.3% (274 out of 1,231) – on the quality of treatment (Table 3). The main contribution to Group 1 of preventable causes was made by external causes – 59.9% (554 out of 925), followed by subarachnoid, intracerebral and other intracranial hemorrhages, strokes – 13.6% (126 out of 925), malignant neoplasms of the trachea, bronchi and lungs – 9.7% (90 out of 925).

Group 2 of preventable causes, determined by the quality of diagnosis, consisted mainly of visualized forms of neoplasms: malignant neoplasms of the cervix and mammary gland (43.8% and 34.4%, respectively).

In Group 3 of preventable causes dependent on the quality of treatment, respiratory diseases accounted for the

main share (51.5%, or 141 out of 274 cases), hypertension – for 24.1% (66 out of 274), and infectious and parasitic diseases – for 11.3% (31 out of 274). In this group of causes, it is worth noting the zero values for pregnancy, delivery and postpartum complications. This is a result of the centralization of obstetric care in the republic, when women from all districts with any complicated pregnancies and predicted difficult deliveries are transported to the perinatal centers in Yakutsk. Such a system led to a significantly reduced maternal and infant mortality in the region. Thus, the medical component (causes of Groups 2 and 3) of the total array of preventable deaths for the period 2020–2023 amounted to 24.9% (306 deaths out of 1,231).

Conclusion. Naturally, the data present an approximate idea of the number of cases when the death of citizens could have been avoided rather than an exact one. However, the absolute dominance of the number of deaths from injuries and poisonings once again confirms the severity of the problem with mortality from external causes in the region, especially in its Arctic zone. Unlike Groups 2 and 3 of preventable causes, the direct medical component in preventing deaths from Group 1 causes is of little importance, since they are primarily due to the level, quality and way of life, diet, and behavioral habits. Yet in terms of reducing mortality from malignant neoplasms of the lip, oral cavity, pharynx, larynx, respiratory organs, liver, and bladder, the most important role is played by the alertness of primary health care workers, proper and complete examination of the cases of suspected malignant neoplasms, high-quality medical preventive examinations. For districts of the region with less equipped medical institutions, timely referral of patients with suspected malignant neoplasms for diagnosis verification to level 3 institutions in Yakutsk remains relevant. In the preventable mortality of the Arctic zone of the republic, 24.9% of fatal outcomes depended directly on the quality of medical care (in the republic, as a whole – 10.5%).

A more accurate assessment of the effectiveness of the regional healthcare

can be made based on mortality rates from causes of Groups 2 and 3, which depend on the quality of diagnosis and treatment. The impact on the causes of these groups can lead to a real reduction in mortality through the efforts of the healthcare system. Of great importance in the early detection of these diseases is the attention of citizens to their health, their awareness and timely seeking of medical help. Among the causes that depend on the adequacy and proper conduct of treatment, attention is drawn to the highest figures for losses from respiratory diseases and hypertension, with their minimization depending on all stages of the process: timely consultation, early diagnosis, adequate treatment, effective medical examination, and patient devotion to treatment.

The authors declare no conflict of interest in the submitted article.

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