

ADULT INCIDENCE IN THE RUSSIAN EUROPEAN ARCTIC WITH DEVELOPED MINING AND METALLURGICAL INDUSTRY

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The purpose of the research. The research aims to assess the adult incidence within the mining complex in the Murmansk Region (the Russian Arctic). Materials and methods. The analysis of the adult incidence change in 1989-1990, 1999-2000, 2009-2010 and 2014-2015 was carried out. To assess the population health status, the incidence data was used in this work. The research covers the territory of the municipal formations with the city-forming mining and metallurgical complex (MMC) enterprises in the Murmansk Region. Main results and conclusions. It has been established that between 1989 and 2015 the adult incidence in the MMC territories, as well as in the Murmansk Region at large, clearly tends to increase (the coefficient of determination $R^2 > 0,7$) for the following disease categories: neoplasms; endocrine diseases; diseases of the blood and blood-forming organs; diseases of the nervous system and sense organs; diseases of the circulatory system; diseases of the genitourinary system; diseases of the musculoskeletal system and connective tissue; congenital malformations. There is no doubt that a set of climatic, geographical and production factors, along with the pollution of the natural environment within the MMC territories in the Murmansk Region, has a negative impact on the health status of the adult population, including working individuals.

Key words: Arctic, adult incidence, mining and metallurgical industry

The Russian Arctic zone is an area with diverse environmental conditions that extends from its western border on the Kola Peninsula to Cape Dezhnev on the Chukchi Peninsula in the east of the country. The Russian European Arctic includes 5 federal subjects, of which the Murmansk Region is the most economically significant. Favorable geographical location and ice-free waters of the seaport provide the region's considerable advantages over the other northern regions of Russia. The region's economy is based on an industry with high export potential. The largest sources of critical mineral raw materials are located on the territory of the Kola Peninsula. An industrial complex supplying most of the country's requirements for phosphate ores, nickel, copper, cobalt, rare-earth metals, brazilite, nepheline and ceramic raw materials has been created here [2, 8].

More than 90% of the Murmansk Region's population resides in the towns that serve as sources of labor supply for the city-forming enterprises. The health status of the working-age population is characterized by the following medical demographic indicators: incidence, prevalence, disability and physical development. The incidence rates in the Murmansk Region are higher than in other regions of the Russian Federation. A significant increase of the working-age male mortality rate for the diseases that are conceivably connected with harmful industrial factors is also characteristic of this area [3, 5, 9, 12].

To assess the adult population health status in the Murmansk Region, the incidence data for the period between 1989 and 2015 was used. The research covers the territories of the municipal formations with the city-forming mining and metallurgical complex (MMC) enterprises in the region. The list of the municipal formations of this type includes the towns of Apatity and Kirovsk («Apatit» JSC),

the town of Monchegorsk and Pechengsky District («Kola Mining and Metallurgical Company» JSC), Olenegorsk («Olenegorsk Ore Mining and Processing Enterprise» JSC), Kovdorsky District («Kovdor Ore Mining and Processing Enterprise») and Lovozersky District («Lovozero Ore Mining and Processing Enterprise» CJSC) [6].

Under the changing demographics, significant «qualitative» changes in the population's state of health are occurring in the Kola North. The results of many scientific teams' researches suggest that the primary factor impeding the health maintenance of the Far Northern population is the influence of the extreme climatic and geographical conditions in high latitudes which weaken the human organism making it more sensitive to social and economic collisions. The fact that the Murmansk Region is located north of the Polar circle determines certain physical and geographical factors creating difficulties in setting the population's working and living conditions that would correspond to the physiological conditions of the environment. A high meteorological activity adversely affects the functioning of all organs and systems of the human body; an unusual night-and-day periodicity causes a variety of physiological breakdowns; the peculiar geochemical soil and water composition can't fail to have impact on a human being as well. A high migration level results in a substantial proportion of the population's being in the process of acclimatizing and adapting, while the significant seasonal migration contributes to the spread of reacclimatization processes. Poor management of social and economic changes in the northern regions has considerably increased the incidence and mortality rates, primarily via the increasing amount of stress affecting the population. Chronic diseases arise among the non-indigenous Arctic inhabitants 8-10 years earlier than average; their

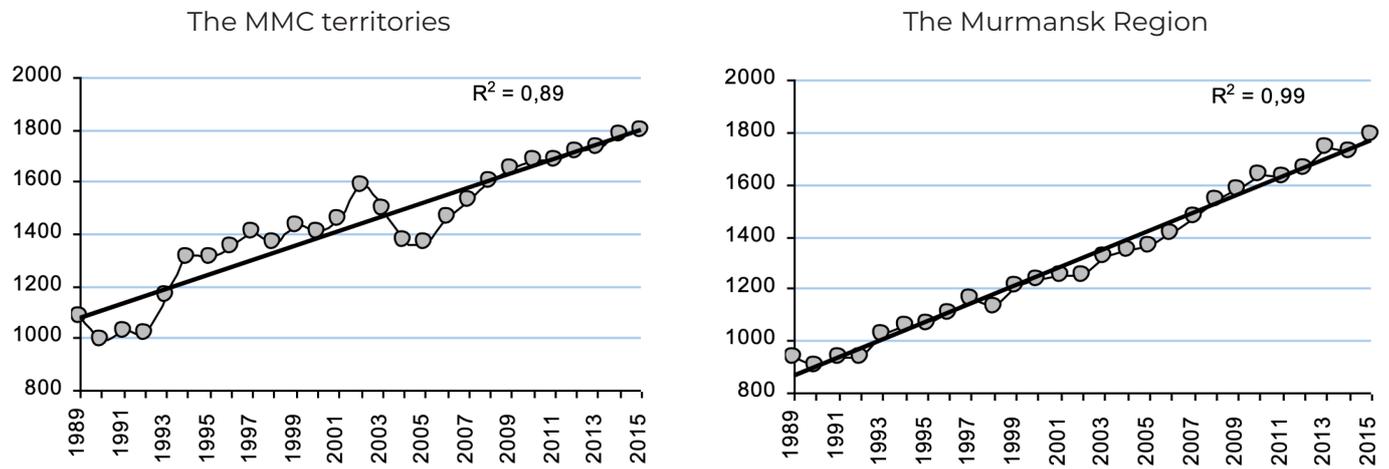


Figure 1. The adult incidence dynamics in the MMC territories and the Murmansk Region in 1989-2015.

life expectancy is reduced by 10-15 years; premature aging is observed. Furthermore, after having lived in the North for more than 15-20 years, the non-indigenous inhabitants obtain negative health characteristics that constrict the adaptability of their organisms and in some cases do not allow them to migrate back to more comfortable geographical zones unproblematically [1, 4, 7, 11, 12].

To characterize the disease incidence and spread rate among the population, the Federal statistical observation form No.12 «Report on the Number of Diseases Registered in Patients Living in the Service Area of the Medical Institution» was used.

It has been established that between 1989 and 2015 the adult incidence in the MMC territories, as well as in the Murmansk Region at large, clearly tends to increase (see Figure 1):

11 out of 14 disease categories reflect an incidence increase among the adult population in the MMC territories. Infectious and parasitic diseases reveal no changes in the incidence dynamics. For the categories «Mental and behavioral disorders» and «Diseases of the respiratory system» the adult incidence in the MMC territories for the period of 1989-2015 tends to decrease. Similar trends are observed in the Murmansk Region at large.

The adult incidence in the MMC territories has a

clear tendency to increase during the period under consideration (the coefficient of determination $R^2 > 0,7$) for the following disease categories: neoplasms; endocrine diseases; diseases of the blood and blood-forming organs; diseases of the nervous system and sense organs; diseases of the circulatory system; diseases of the genitourinary system; diseases of the musculoskeletal system and connective tissue; congenital malformations. Diseases of the skin and subcutaneous tissue show a moderate tendency to increase ($0,3 < R^2 < 0,7$). A minor increase tendency ($R^2 < 0,3$) is characteristic of diseases of the digestive system, injuries and poisonings.

Among particular groups and nosological forms of diseases comparable for the period of 1989-2015, the adult incidence increase tendency in the MMC territories is shown by diabetes mellitus ($R^2 = 0,85$), obesity ($R^2 = 0,51$), anemias ($R^2 = 0,56$), epilepsy ($R^2 = 0,90$), hypertensive diseases ($R^2 = 0,92$), ischemic heart diseases ($R^2 = 0,96$), including angina pectoris ($R^2 = 0,87$) and acute myocardial infarction ($R^2 = 0,63$); cerebrovascular diseases ($R^2 = 0,89$), asthma ($R^2 = 0,99$), diseases of pancreas ($R^2 = 0,89$) and urolithiasis ($R^2 = 0,61$).

At the same time, a clear tendency to incidence decrease was registered for particular groups and

Table 1
The incidence dynamics among adults in the MMC territories and the Murmansk Region in 1989–2015.

Territories	1989-1990	1999-2000	2009-2010	2014-2015	The increase rate from 1989-90 to 2014-15
The Murmansk Region	923,1 + 0,2	1225,4 + 0,5	1608,7 + 1,1	1760,4 + 1,3	+90,7%
Apatity	834,3 + 1,1	1347,2 + 2,6	1892,4 + 5,3	1939,7 + 5,6	+2,3 paza
Kirovsk	1268,2 + 2,6	1466,0 + 4,2	1696,0 + 6,1	1831,8 + 7,2	+44,4%
Monchegorsk	1233,9 + 2,0	1698,5 + 4,3	1721,4 + 5,0	1754,1 + 5,3	+42,2%
Olenegorsk	1065,1 + 1,2	1288,3 + 3,1	1408,8 + 4,3	1640,5 + 6,0	+54,0%
Kovdorsky District	1129,0 + 2,0	1360,3 + 4,2	1721,5 + 7,6	1956,1 + 9,8	+73,3%
Lovozersky District	1305,3 + 4,7	1171,1 + 3,8	1892,5 + 11,6	2472,6 + 18,2	+89,4%
Pechengsky District	817,8 + 1,6	1335,0 + 3,1	1362,7 + 3,4	1419,7 + 4,0	+73,6%
Total in the MMC territories	1039,1 + 0,3	1420,6 + 1,4	1668,2 + 2,1	1792,6 + 2,5	+72,5%

nosological forms of diseases for the period of 1989-2015: chronic otitis ($R2=0,89$), chronic rheumatic heart diseases ($R2=0,95$), chronic bronchitis ($R2=0,78$).

Given the fluctuations of the incidence levels in particular years, the time-series smoothing method by means of consolidation of the time periods being compared was used to estimate the incidence increase rate. The analysis of the adult incidence dynamics for the periods of 1989-1990, 1999-2000, 2009-2010 and 2014-2015 was carried out.

It has been established that between 1989-1990 and 2014-2015 the adult incidence in the MMC territories increased by 72,5%. The greatest incidence increase was observed in the 10-year period from 1989-1990 to 1999-2000 (+37%). In the next 10 years (from 1999-2000 to 2009-2010) the incidence increased by 17%; in the period from 2009-2010 to 2014-2015 the increase was 7,5%. In most of the MMC territories, the highest incidence increase was also observed in the first decade, from 1989-1990 to 1999-2000. The exceptions were Kovdorsky and Lovozersky Districts where the highest increase was registered from 1999-2000 to 2009-2010. In the town of Kirovsk the common adult incidence increase had the same level during the first and the second decade of the time period under study. The general adult incidence increase rate in the Murmansk Region remained at approximately the same level during the first two decades of the time period considered: +32,7% from 1989-1990 to 1999-2000; +31,3% from 1999-2000 to 2009-2010. In the next 5 years, from 2009-2010 to 2014-2015, the increase amounted to +9,4% (see Table 1).

In most of the MMC territories, the incidence exceeds the average rates both in the Murmansk Region and in the Russian Federation at large. The only MMC territories with lower incidence levels in 2014-2015 were the town of Olenegorsk (the incidence was lower than the average rate in the Murmansk Region) and Pechengsky District (the incidence was lower than the average rates both in the Murmansk Region and in the Russian Federation).

The incidence of certain infectious and parasitic diseases was 18% higher than the average rate of these diseases in the Russian Federation, but 10% lower than their incidence in the Murmansk Region at large. The highest incidence in 2014-2015 was registered in Monchegorsk and Apatity; it exceeded the average incidence level in the MMC territories by 70% and 20%, respectively.

The incidence of neoplasms in the adult population of the MMC territories in 2014-2015 was 36% higher than the average rate in the Russian Federation and 20% lower than the average rate in the Murmansk Region. The significant difference between the incidence levels in the MMC territories and in the region at large is caused by a usual high incidence of neoplasms in Murmansk, which was 35% higher than the average rate in the region in 2014-2015 because of the established system of registration of malignant neoplasms in the Murmansk Region. The highest incidence levels of

neoplasms soundly exceeding the average rate in the MMC territories were registered in Kovdorsky District (+29%), Lovozersky District (+28%), the towns of Monchegorsk (+22%) and Apatity (+17%).

The adult incidence of endocrine, nutritional and metabolic diseases in the MMC territories was 23% higher than the average rate in the Russian Federation, but 16% lower than the average rate in the Murmansk Region. The authentic exceeding of the average incidence levels in the MMC territories in 2014-2015 was registered in Lovozersky District (+56%), the towns of Olenegorsk (+17%) and Monchegorsk (+11%).

The incidence of thyrotoxicosis in the adult population of the MMC territories was 24% higher than the average rate in the Russian Federation, but 11% lower than the average rate in the Murmansk Region. In 2014-2015 the highest incidence levels of this disease were registered in Lovozersky District (52% higher than the average rate among the MMC territories), the towns of Monchegorsk (44% higher) and Kirovsk (24% higher).

The incidence of diabetes mellitus in the MMC territories in 2014-2015 was 8,5% higher than the average rate in the Russian Federation and 8% lower than in the Murmansk Region. The exceeding of the average Russian rate is achieved through a higher incidence of type 2 diabetes (11% higher), while the incidence rate of type 1 diabetes is 27% lower. The highest incidence of diabetes mellitus soundly exceeding the average rate in all the MMC territories was registered in the towns of Monchegorsk (+25%) and Olenegorsk (+13%), as well as in Lovozersky (+9%) and Kovdorsky (+9%) Districts.

The prevalence of obesity in the adult population of the MMC territories in 2014-2015 was 19% lower than the average rate in the Russian Federation and 20% lower than the average rate in the Murmansk Region. The exceeding of the average rate among particular MMC territories was observed in Apatity (+24%), Monchegorsk (+17%) and Kirovsk (+14%).

The adult incidence of diseases of the blood and blood-forming organs and certain disorders involving the immune mechanism in the MMC territories in 2014-2015 was 44% higher than the average rate in the Russian Federation and authentically not dissimilar to the average rate in the Murmansk Region. More than 80% of diseases of this category are represented by anemias, which incidence in the MMC territories in 2014-2015 was 45% higher than in the Russian Federation and 11% higher than in the Murmansk Region. The adult prevalence rates of diseases of the blood exceeding the average rate in the MMC territories were registered in Kovdorsky (2,3 times higher) and Lovozersky (74% higher) Districts.

The incidence of diseases of the nervous system in the adult population of the MMC territories was 9,4% lower than the average rate in the Russian Federation, but 5% higher than the average rate in the Murmansk Region. The incidence level of diseases of the nervous system exceeded the average level in the MMC territories in 2014-2015 in Lovozersky (+54%) and Pechengsky (+46%) Districts,

the town of Kirovsk (+19%) and Kovdorsky District (+15%). The exceeding of the average Russian adult incidence level of epilepsy and status epilepticus is notable in the MMC territories (2,1 times higher) and in the Murmansk Region at large (2,2 times higher).

The adult incidence of diseases of the eye and adnexa in the MMC territories in 2014-2015 was 59% higher than the average rate in the Russian Federation and 24% higher than in the Murmansk Region. The prevalence of myopia in the adult population of the MMC territories was 2,6 times higher than the average rate in the Russian Federation and 38% higher than in the Murmansk Region. The adult incidence of cataract in the MMC territories was 54% higher than the average rate in the Russian Federation and 38% higher than in the Murmansk Region. The highest levels of the common incidence of diseases of the eye were registered in Lovozersky District (2,0 times higher than the average level in the MMC territories), the towns of Apatity (+48%) and Kirovsk (+16%).

The incidence of diseases of the ear and mastoid process in the adult population of the MMC territories in 2014-2015 was 12,4% higher than the average rate in the Russian Federation and authentically not dissimilar to the average regional rate. The incidence level of diseases of this category exceeded the average level in the MMC territories in Apatity (+27%), Monchegorsk (+17%) and Kirovsk (+7%). At the same time, the adult prevalence of chronic otitis in the MMC territories was 21% lower than the average rate in the Russian Federation, but statistically not dissimilar to the average rate in the Murmansk Region.

The incidence of mental and behavioral disorders in the adult population of the MMC territories was 16% and 45% higher than the average rates in the Russian Federation and in the Murmansk Region, respectively. At that, the incidence rates of mental disorders exceeding the average level in the MMC territories were observed in Kovdorsky District (+57%), Monchegorsk (+43%), Olenegorsk (26%) and Kirovsk (+10%).

The adult incidence of diseases of the circulatory system in the MMC territories in 2014-2015 was 10% higher than the average rate in the Russian Federation and 4% higher than in the Murmansk Region. Among the particular nosological groups of diseases of the circulatory system, the common incidence rates of hypertensive diseases were 17% higher than the average levels in the Russian Federation and 11% higher than the average rate in the Murmansk Region. Ischemic heart diseases were registered among adult inhabitants of the MMC territories 4% more often than in the Russian Federation and in the Murmansk Region as a whole; at that the common incidence of acute myocardial infarction was 50% higher than the average rates in the Russian Federation and 24% higher than in the Murmansk Region, while the incidence of recurrent myocardial infarction was 7% higher than the average levels in Russia and 6% higher than the rates in the Murmansk Region. At the same time, the adult prevalence of angina

pectoris in the MMC territories was 12% lower than in the Russian Federation, but 16% higher than in the Murmansk Region. The incidence of chronic rheumatic heart diseases in the MMC territories was 22% and 8% lower than the average rates in the Russian Federation and in the Murmansk Region, respectively; the incidence of cerebrovascular diseases was 13% lower than the average rate in Russia, but 9% higher than the average level in the Murmansk Region.

The average incidence level of diseases of the circulatory system in the MMC territories in 2014-2015 was exceeded in Lovozersky District (58% higher) and the town of Kirovsk (23% higher). The incidence of chronic rheumatic heart diseases in Lovozersky District was 86% higher than the average level in the MMC territories; in Olenegorsk it was 50% higher. Hypertensive diseases were most frequently registered in Lovozersky District (68% more often), the town of Kirovsk (24% more often) and Kovdorsky District (11% more often). Ischemic heart diseases (IHD) were observed more frequently than in the MMC territories on average in Kirovsk (+53%), Lovozersky District (+25%) and Apatity (+9%). Among IHD exceeding the average incidence level, the common incidence of angina pectoris was 2,2 times higher in Olenegorsk and 2,1 times higher in Lovozersky District; the incidence of acute myocardial infarction was higher in the towns of Monchegorsk (+31%), Apatity (26%) and Kirovsk (+13%); the incidence of recurrent myocardial infarction was 2,2 times higher in Apatity and 52% higher in Kirovsk. Cerebrovascular diseases were authentically most often registered among the adult population of Lovozersky District (38% more often than in the MMC territories on average), Kirovsk (25% more often), Monchegorsk (7% more often) and Olenegorsk (5% more often). The common incidence of endarteritis and thromboangiitis obliterans was higher than average in the following MMC territories: the town of Kirovsk (+35%), the town of Monchegorsk (+18%) and Kovdorsky District (+11%).

The adult incidence of diseases of the respiratory system in the MMC territories in 2014-2015 was 6% higher than the average rate in the Russian Federation and 16% higher than the average rate in the Murmansk Region. Among them, pneumonias were registered 9% more often than in the Russian Federation and 17% more often than in the Murmansk Region; asthma was recorded 66% more often than in Russia and 17% more often than in the Murmansk Region. At the same time, the prevalence of chronic diseases of tonsils and adenoids in the adult population of the MMC territories was 33% lower than in the Russian Federation, and authentically not dissimilar to the average rate in the Murmansk Region. The incidence of chronic bronchitis was 45% lower than the average rate in the Russian Federation and, again, authentically not dissimilar to the average regional rate.

Among the individual administrative MMC territories, the incidence levels soundly exceeding the average rate in the MMC territories in 2014-2015

were registered:

- in the category of diseases of the respiratory system in total – in the towns of Apatity (+11%), Monchegorsk (+8%) and in Lovozersky District (+5%);
- chronic diseases of tonsils and adenoids – in Monchegorsk (+70%) and Apatity (+15%);
- pneumonias – in Kovdorsky District (+75%), the towns of Monchegorsk (+17%) and Apatity (+9%);
- chronic bronchitis – in Lovozersky (+2,4 times) and Pechengsky (+2,0 times) Districts;
- asthma – in Monchegorsk (+81%);
- other chronic obstructive pulmonary disease and bronchiectasis – in the town of Monchegorsk (+80%), Lovozersky District (+39%) and the town of Apatity (+7%).

The incidence of diseases of the digestive system in the adult population of the MMC territories in 2014-2015 was authentically not dissimilar to the rate in the Russian Federation and 16% lower than the average rate in the Murmansk Region. Yet, the incidence levels of certain diseases from this category were higher in this area: gastritis and duodenitis (26% higher compared with the Russian Federation and 22% higher than in the Murmansk Region); peptic ulcer disease (37% higher than in the Russian Federation and 10% higher than in the region); noninfective enteritis and colitis (68% higher than the average rate in the Russian Federation and 6% higher than the average rate in the region); diseases of pancreas (31% higher than in Russia, but 12% lower than in the Murmansk Region). The incidence of diseases of liver in the MMC territories was 9% lower than in the Russian Federation, but 6% higher than the average rate in the Murmansk Region.

The exceeding of the average incidence level of diseases of the digestive system in the MMC territories in 2014-2015 was registered in Lovozersky (+29%) and Kovdorsky (+21%) Districts and in the town of Apatity (+17%). Among particular groups and nosological forms of diseases, the incidence in the MMC territories is authentically higher than the average rate for:

- gastritis and duodenitis – in Lovozersky District (+17%) and the town of Monchegorsk (+8%);
- peptic ulcer disease – in the town of Apatity (+33%) and Lovozersky District (+29%);
- noninfective enteritis and colitis – in the towns of Apatity (+2,1 times) and Kirovsk (+96%);
- diseases of liver – in the town of Apatity (+83%) and Lovozersky District (+57%);
- diseases of pancreas – in the town of Monchegorsk (+61%).

The incidence of diseases of the genitourinary system in the adult population of the MMC territories in 2014-2015 exceeded the average rate in the Russian Federation by 19%, but it was 18% lower than the average rate in the Murmansk Region. Renal glomerular and tubulointerstitial diseases were registered in the MMC territories 43% more often than among the adult population of the Russian Federation and 13% less often than in the Murmansk Region on average. Urolithiasis was recorded in the MMC territories 40% more often than in the

Russian Federation, without any sound distinction from the average incidence rate in the Murmansk Region. The highest incidence levels soundly exceeding the average rate in the MMC territories were registered for the category of diseases of the genitourinary system as a whole: in Lovozersky (+96%) and Kovdorsky (+34%) Districts, and in the town of Olenegorsk (+38%); for renal glomerular and tubulointerstitial diseases: in Lovozersky (+71%) and Kovdorsky (+35%) Districts, and in the town of Olenegorsk (+13%), for urolithiasis: in Pechengsky District (+24%), Lovozersky District (+12%), the towns of Kirovsk (+20%) and Apatity (+9%).

The incidence of diseases of the skin and subcutaneous tissue in the adult population of the MMC territories in 2014-2015 was 27% higher than the average rate in the Russian Federation, but 11% lower than its rate in the Murmansk Region. The highest incidence levels of the diseases of this category soundly exceeding the average rate in the MMC territories were registered in Lovozersky (+59%) and Kovdorsky (+36%) Districts, and in the town of Monchegorsk (+28%).

The adult incidence of diseases of the musculoskeletal system and connective tissue in the MMC territories in 2014-2015 exceeded the average rate in the Russian Federation by 78% and in the Murmansk Region by 10%. The common incidence was authentically higher than the average rate in the MMC territories in the towns of Kirovsk (+16%), Apatity (+7%) and in Lovozersky District (+7%).

A high prevalence of injuries, poisonings and certain other consequences of external causes stands out among the adult population of the MMC territories: in 2014-2015 they were registered 17% more often than in the Russian Federation and 24% more often than in the Murmansk Region on average. Among the MMC territories, the exceeding of the average incidence level was recorded in Kovdorsky (+52%) and Lovozersky (+15%) Districts, and in the town of Apatity (+9%).

From 1989-1990 to 2014-2015 the incidence in the adult population of the MMC territories has increased by 73%. For most of the disease categories, the common incidence increase rates have the following values:

- neoplasms – +3,2 times
- endocrine, nutritional and metabolic diseases – +3,9 times;
- diseases of the blood and blood-forming organs – +3,2 times;
- diseases of the nervous system and sense organs – +2,0 times;
- diseases of the circulatory system – +3,3 times;
- diseases of the genitourinary system – +3,1 times;
- diseases of the skin and subcutaneous tissue – +2,9 times;
- diseases of the musculoskeletal system and connective tissue – +2,9 times.

The highest incidence increase in the adult population of the MMC territories is registered in the first decade of the time period under study, from 1989-1990 to 1999-2000. At that, the common

incidence increase for most of the disease categories is also observed in the first 10 years. The incidence of certain infectious and parasitic diseases, which overall increase in the period from 1989 to 2015 was only 6%, also reached its maximum value from 1989-1990 to 1999-2000, and started to decrease afterwards. This fact confirms once again that it was the population of the Russian Arctic zone, and of the MMC territories in the first place, that has been especially severely affected by the abrupt negative social and economic changes of the 1990s. The exceptions were the diseases of the circulatory system and the diseases of the musculoskeletal system and connective tissue; these categories of diseases have been showing the incidence increase throughout the whole period under study, from 1989-1990 to 2014-2015.

In most of the MMC territories, the maximum increase of the adult incidence was also registered in the first decade of the time period under study. The town of Kirovsk was an exception; the incidence increase was more or less uniform there from 1989-1990 to 2014-2015. In Kovdorsky and Lovozersky Districts, the maximum incidence increase was observed in the second decade of the period under study, from 1999-2000 to 2009-2010. To certain extent, this is due to crisis changes at the city-forming enterprises in these territories.

An extremely negative tendency towards the incidence increase in the adult population of the MMC territories from 1989-1990 to 2014-2015 stands out for the following particular nosological forms of diseases compared over the period under study:

- diabetes mellitus – +2,5 times;
- obesity – + 3,1 times;
- epilepsy – + 5,6 times;
- hypertensive diseases – + 2,8 times;
- ischemic heart diseases – + 3,1 times;
- cerebrovascular diseases – + 5,8 times;
- asthma – + 6,8 times;

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