

DYNAMICS OF BIRTH RATE AND DEATH RATE IN THE ADMINISTRATIV-TERRITORIAL FORMATIONS OF MURMANSK REGION, WHICH HAVE MINING AND METALLURGICAL COMPLEXES AS CITY-FORMING ENTERPRISES

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ABSTRACT

The birth rate and mortality of the population living in administrative-territorial formations with city-forming mining and metallurgical enterprises of the Murmansk region have their own characteristics, due not only to the conditions of the Far North, but also to the specifics of single-industry towns, socio-economic factors that have changed many times in recent decades. This circumstance confirms the dynamics of the natural movement of the population and its components over the past 30 years, the study of which was the purpose of this study. The objects of the study are the administrative-territorial formations of the Murmansk region, which have mining and metallurgical complexes as city-forming enterprises (ATF MMC). It was established that in 1989 the coefficient of natural growth of the population living in administrative territories having as city-forming enterprises of ATF MMC was higher than the average for the Murmansk region by 23%. By 1995, the coefficient of natural population growth in ATF MMC decreased to a level below the regional average and the entire subsequent analyzed period did not exceed the values for the Murmansk region, and again in 2019 it reached the indicator of 2005 – the lowest level for the entire thirty-year summer period studied. Since 1990, there has been a constant depopulation in ATF MMC, which is associated with the predominance of mortality over the birth rate and a negative balance of migration.

KEYWORDS Murmansk region, demographic processes, mortality, fertility, mining and metallurgical industry

The birth and death rates of the population living in the administrative-territorial entities of the mining and metallurgical sector (the ATEs MMS) of the Murmansk Region have their own characteristics, due not only to the conditions of the Far North, but also to the specifics of single-industry towns and socio-economic factors that have changed many times in the recent decades. Therefore, the study of fertility and mortality is an important direction in characterizing the demographic processes of the population, including those living in the territories of the Arctic zone of the Russian Federation. The Murmansk Region, located on the territory of the Kola Peninsula, is confined to the extreme Northwest of the European part of the Russian Federation, and is almost completely located beyond the Arctic Circle [3]. According to the relief nature, the Kola Peninsula is divided into two parts: the Western mainland and the Eastern peninsular. The mainland is characterized by an uneven dissected relief with significant elevation amplitudes. It is in this part of the peninsula that all the town-forming enterprises (TFE) of the mining and metallurgical sector are located: JSC «Apatit» (towns of Kirovsk and Apatity), JSC «Kovdorsky TFE» (Kovdor), JSC «Olenegorsky TFE» (Olenegorsk), JSC «Kola Mining and Metallurgical Company» (towns of Monchegorsk and Zapolyarny, Nickel village), JSC «Lovozerk

Mining and Processing Company» (Revda village) [5, 11]. Among the climatic factors of the Kola Polar Region that affect human bodies of the population living in these areas, there are low air temperatures in winter, frequent changes in atmospheric pressure and geomagnetic storms, sharp fluctuations in the Earth's magnetic intensity index, and a kind of photoperiodism – a short light day in winter and a long one in summer. The expansion of the Arctic development raises reasonable concerns about the preservation of the Arctic ecosystems, monitoring and controlling of the operational situation in the Arctic waters, responding to emergency situations, problems of human health and safety in the changing climate of the Arctic, and problems of adaptation of the population, especially of the indigenous population, to these changes [4, 7, 9, 14, 15]. The territories of demographic and medical disadvantages are places of employment in industries related to the extraction and processing of minerals, where employees of mining and metallurgical enterprises, as well as their family members (unlike those working in the oil and gas sector, mainly shift workers) make up the main part of the permanent population of the Arctic single-industry towns. So, in the town of Monchegorsk (the Murmansk Region) compared with Russia, the death rate among working age people was 49.0% higher as because of circulatory

system diseases, 35.5% higher from digestive system diseases, and 34.7% higher from malignant diseases, which confirms the negative impact of production factors on the mortality of the population of this single-industry town [1, 2, 6, 8, 10, 12, 13].

The purpose of the research is to study the dynamics of the birth and death rates in the administrative-territorial entities with town-forming mining and metallurgical enterprises of the Murmansk Region over a 30-year period.

Materials and methods

The objects of the research are the administrative-territorial entities of the Murmansk Region, which have town-forming enterprises of mining (enriching, processing) and metallurgical sector. Such administrative-territorial entities include towns of Apatity, Kirovsk, Monchegorsk and Olenegorsk, as well as districts of Kovdorsky, Lovozerky and Pechengsky. The materials of the reports on demographic rates made by the Territorial Office of the Federal State Statistics Service for the Murmansk Region were used to characterize the demographic processes. For the analysis of medical and demographic processes, the period from 1989 to 2019 was chosen. 1989 was taken as the starting year for comparing further changes since it was the last year of population census in the USSR. In addition, the end of the eighties

characterized the end of one socio-economic formation in our country and transition to another in the 1990s. The years 1999 and 2009 were taken for comparison as 10-year intervals from the original 1989. The last five years from 2015 to 2019 were studied in order to identify changes in the trends in medical and demographic situation that developed in recent years in the Murmansk Region.

Discussion

At the beginning of 2019, there were 225.0 thousand people living in the studied ATEs MMS, which was 30.1% of the total population of the Murmansk Region. If in 1989 the share of the ATEs MMS population was 32.3% of the total population of the Murmansk Region, then in the early 1990s it was observed to decrease, and by the beginning of 1996 it was 29.5%. Since the beginning of the 2000s, the share of population of the ATEs MMS gradually increased and amounted to 30.5% in 2009, after which it began to decline. For the period 2015-2019, the share of the ATEs MMS population, in the total population of the region, was consistently equal to 30,1%.

By 2019, compared to 1989, population of the Murmansk Region decreased by 398.5 thousand people (-34.8%). During the same period, depopulation rate in the ATEs MMS was higher than the regional average rate and amounted to -39.2% in general, and from -36.5% to -50.1% in certain administrative entities (Table 1). In the Murmansk Region and in the ATEs MMS, an unprecedented decrease in the population was noted. Thus, from 1991 (the year of maximum population rate of the Murmansk Region) to 2019, population reduction amounted to 411 thousand people in the whole region (-36%), and 148 thousand people in the studied ATEs MMS (-40%).

During the period from 1989 to 2019, the absolute number of live births in the ATEs MMS decreased by 2.9 times, while in the Murmansk Region on average by 2.2 times and by 31.5% on average in the Russian Federation. The highest rates of births reduction during the studied period were noted in the Lovozersky district (by 3.9 times), Kovdorsky district (by 3.6 times), and Apatity (by 3.4 times). If in 1989 the share of newborns in the

ATEs MMS was 37.1% of all those born in the Murmansk Region, then in 2019 it was 28.5%, but with a constant increase in this indicator over the past five years.

In 1989, the level of the total birth rate in the ATEs MMS did not significantly differ from the average for the Russian Federation and was 15.0% higher than the average in the Murmansk Region. At the same time, significant excess of the regional average level in 1989 was noted in all the ATEs MMS except for the town of Apatity, where the birth rate was equal to the average for the region. From 1989 to 1999, the rate of decline in the birth rate in the ATEs MMS was 47.0%, with an average of 43.0% in the Russian Federation and 39.0% in the Murmansk Region. As a result, in 1999, birth rate in the ATEs MMS was already at the average regional level and was 6.0% lower than the average for the Russian Federation. Despite the increase in the birth rate in the next ten years, by 2009, the differences in birth rate in the ATEs MMS increased even more and amounted to 9.0% compared to the Murmansk Region and 17.0% compared to the Russian Federation. In the next five years (2010-

Table 1

Population dynamics of the administrative territories of the Murmansk Region, at the beginning of the corresponding year (thousand people)

| Administrative territory | 1989 | 1999 | 2009 | 2015 | 2016 | 2017 | 2018 | 2019 |
|--------------------------|--------|--------|-------|-------|-------|-------|-------|-------|
| The Murmansk Region | 1146,5 | 1018,1 | 842,5 | 766,3 | 762,2 | 757,6 | 753,6 | 748,1 |
| The ATEs MMS | 369,9 | 300,9 | 257,2 | 230,8 | 229,1 | 228,1 | 226,7 | 225,0 |

2014), birth rate in the ATEs MMS ranged from 10.8% to 11.3%, but in 2015 it again decreased almost to the level of 2009 and amounted to 10.4%, which was lower by 12.0% than the average levels in the Murmansk Region and by 21.0% than in the Russian

Federation. As a result, in 2015, birth rate in the ATEs MMS was lower than the average in the Murmansk Region, except for the town of Kirovsk. In the ATEs MMS, from 2015 to 2019, there was annual decrease in the birth rate. At the same time, an even greater

decrease in the birth rate was noted in the Murmansk Region as a whole, which led to the fact that in 2019, three ATEs MMS (Olenegorsk, Kirovsk, Pechengsky district) exceeded the average regional level of the total birth rate (Table 2).

Table 2

Dynamics of the total birth rate in Russian Federation, Murmansk Region at all and ATF MMC in 1989-2019, (‰)

| Administrative territory | 1989 | 1999 | 2009 | 2015 | 2016 | 2017 | 2018 | 2019 |
|-----------------------------------|------|------|------|------|------|------|------|------|
| the Russian Federation (thousand) | 14,7 | 8,3 | 12,4 | 13,3 | 12,9 | 11,5 | 10,9 | 10,1 |
| the Murmansk Region | 12,9 | 7,9 | 11,3 | 11,9 | 11,2 | 10,3 | 9,8 | 9,0 |
| Apatity | 12,9 | 7,7 | 10,1 | 10,0 | 10,2 | 9,0 | 9,4 | 7,8 |
| Kirovsk | 15,2 | 7,9 | 10,7 | 12,0 | 10,0 | 10,9 | 10,4 | 9,2 |
| Monhegorsk | 13,3 | 8,4 | 11,1 | 10,1 | 10,7 | 9,4 | 9,0 | 7,8 |
| Olenegorsk | 14,2 | 7,3 | 11,4 | 11,4 | 9,8 | 9,5 | 10,1 | 10,0 |
| Kovdorsky distrit | 13,2 | 8,7 | 9,5 | 10,8 | 10,2 | 8,9 | 9,2 | 7,5 |
| Lovozersky district | 16,9 | 8,2 | 11,1 | 8,6 | 10,3 | 10,5 | 7,5 | 7,2 |
| Pechengsky district | 14,4 | 8,0 | 12,0 | 10,2 | 9,8 | 9,9 | 10,0 | 9,4 |
| TOTAL for ATEs MMS | 14,9 | 7,8 | 10,3 | 10,4 | 10,2 | 9,6 | 9,5 | 8,5 |

Table 3

The rate of increase (loss) of the total fertility rate in Russian Federation, Murmansk Region at all and ATF MMC in 1999, 2009, 2019 compared to 1989, (%)

| Administrative territory | 1999 | 2009 | 2019 |
|-----------------------------------|--------|--------|--------|
| the Russian Federation (thousand) | -43,4% | -15,4% | -31,1% |
| the Murmansk Region | -38,8% | -12,4% | -30,2% |
| Apatity | -40,3% | -21,7% | -39,5% |
| Kirovsk | -48,0% | -29,6% | -39,5% |
| Monhegorsk | -36,8% | -16,5% | -41,4% |
| Olenegorsk | -48,6% | -19,7% | -29,6% |
| Kovdorsky distrit | -34,1% | -28,0% | -43,2% |
| Lovozersky district | -51,5% | -34,3% | -57,4% |
| Pechengsky district | -44,4% | -16,7% | -34,7% |
| TOTAL for ATEs MMS | -47,3% | -30,9% | -42,9% |

In general, for the period from 1989 to 2019, the rate of decline in the birth rate in the Russian Federation was -31%, in the Murmansk Region -30.0%, and in the ATEs MMS -43.0%. Among certain ATEs MMS, the rate of decline in the birth rate from 1989 to 2019 was as of -57.0% in the Lovozersk district and up to -30.0% in Olenegorsk (Table 3).

During the period from 1989 to 2019, the absolute number of deaths in the ATEs MMS increased by 27.6%, with an average increase by +26.5% in the Murmansk Region and by +20.5% in the Russian Federation. Among certain administrative territories, the largest increase in the absolute number of deaths in 1989-2019 was registered in Olenegorsk (+53.0%), Kovdorsky (+52.0%) and Lovozersky districts (+49.0%). At the same time, the share of the number of deaths in the ATEs MMS practically did not change from the total number of deaths in the Murmansk Region in 1989 and 2019 and amounted to 33.4% and 33.7%, respectively. The absolute number of deaths in the ATEs MMS had been growing since 1989 throughout the 1990s and early 2000s, reaching its maximum values in 2001-2005, with a decrease in the next 5 years, and in 2011-2019 the number of deaths remained approximately at the same level.

In 1989, the total mortality rate of the ATEs MMS population did not significantly differ from the average level in the Murmansk Region and

was 44.0% lower than the indicator for the Russian Federation. A further increase in the absolute number of deaths, with a simultaneous decrease in the population, led to the fact that in 2019 the total mortality rate of the ATEs MMS population was 11.4% higher than the average for the Murmansk Region and did not significantly differ from the average for the Russian Federation. It should be noted that during the entire research period from 1989 to 2015, the differences in the overall mortality rates of the ATEs MMS population and the Murmansk Region as a whole, were constantly increasing, and, conversely, the difference with the average levels for the Russian Federation was decreasing. Over the past five years, from 2015 to 2019, the differences in the overall mortality rate in the Murmansk

Region and the ATEs MMS remained approximately at the same level. In 1989, the total mortality rate of the population of only two out of seven ATEs MMS exceeded the average level in the region (the towns of Monchegorsk and Kirovsk). In 2019, such an excess was registered in four territories (the towns of Apatity, Kirovsk, Monchegorsk and Kovdorsky district), where the mortality rate was also higher than the average for the Russian Federation. There is an obvious higher rate of increase in the total mortality rate of the population of the Murmansk Region, including in the ATEs MMS, compared with the average for the Russian Federation. Thus, in 2019, compared to 1989, the death rate of the ATEs MMS population increased by 2.1 times, in the Murmansk Region by 97.0%, in the Russian Federation

Table 4
The rate of increase in the overall mortality rate in Russian Federation, Murmansk Region at all and ATF MMC in 1999, 2009, 2019 compared to 1989, (%)

| Administrative territory | Growth (decrease) rate | | |
|-----------------------------------|------------------------|--------|--------|
| | 1999 | 2009 | 2019 |
| the Russian Federation (thousand) | 36,7% | 31,2% | 14,4% |
| the Murmansk Region | 81,0% | 115,5% | 96,6% |
| Apatity | 84,2% | 159,6% | 152,6% |
| Kirovsk | 100,0% | 146,0% | 123,8% |
| Monhegorsk | 65,8% | 80,8% | 84,9% |
| Olenegorsk | 113,0% | 163,0% | 137,0% |
| Kovdorsky distrit | 140,0% | 197,8% | 206,7% |
| Lovozersky district | 137,0% | 150,0% | 148,1% |
| Pechengsky district | 106,7% | 153,3% | 97,8% |
| TOTAL for ATEs MMS | 78,3% | 111,6% | 110,5% |

by 14.0%. In addition, unlike the Russian Federation as a whole, where in recent years (2010-2019) there has been an undetected, but still a reduction tendency of overall mortality, in the Murmansk Region, including the ATEs MMS. Such a reduction stopped in 2013, and until 2019 there was a stagnation of the overall mortality rate. The highest rates of increase in the total mortality rate in 1989-2019 among certain ATEs MMS were registered in the Kovdorsky district by +3.1 times, in the Lovozersky district by +2.5 times, in the towns of Apatity by +2.5 times, in Olenegorsk by +2.4 times, and in Kirovsk by +2.2 times (Table 4).

Unfavorable trends in the birth and death rates of the ATEs MMS population led to the fact that in the early 1990s, mortality began to prevail over the birth rate. A similar pattern in the ATEs MMS continues to be observed to the present time, which, along with other reasons, contributes to the depopulation of the studied territories of the Far North (Fig. 1).

It was in 1993, when for the first time, the predominance of the number of deaths over the number of births, was registered in the Murmansk Region, including in the ATEs MMS, which led to negative values of natural population growth. In general, positive natural population growth was recorded in the Murmansk Region from 2012 to 2015, in the Russian Federation from 2013 to 2015, and in the ATEs MMS it had

been remaining negative since 1993. Meantime, in the Pechenga district the positive value of population natural increase had been recorded since 2009 to 2019, in the city of Olenegorsk in 2010-2015, but in the other five studied ATEs MMS there had been still registered negative natural population growth. During the period from 1989 to 2019, several peaks were recorded with a minimum absolute natural increase in the ATEs MMS: in 1994-1995, when the population was decreasing by 1.3 thousand annually due to natural loss, and in 2001-2005 with an average annual loss of 1.1 thousand people. Since 2015, there appeared again a tendency of increase in the natural decline of the ATEs MMS population, which remained and in 2019.

The absolute natural population decline in the

ATEs MMS, in comparison with 1989, had the highest values in 2019 and was -5.2 thousand people. At the same time, it should be borne in mind that over the past 30 years there has been a sharp decline in the population of the studied territories, which somewhat smooths the absolute natural decline. Accordingly, the maximum growth rate of absolute natural loss in the ATEs MMS (-2.6 times) was observed in 1989-2019.

Considering the significant changes in the population of the studied territories, it would be more correct to assess the levels and dynamics of natural population growth not by absolute values, but by relative indicators per 1000 population. In 1989, the natural population growth rate in the ATEs MMS was 23.0% higher than the

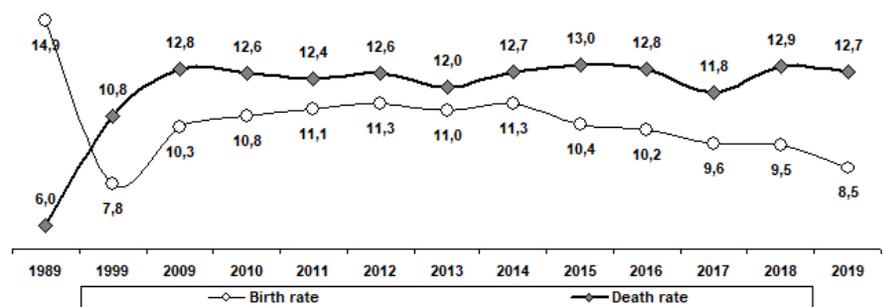


Figure 1. Dynamics of total fertility and mortality rates in ATF MMC in 1989-2019 (%)

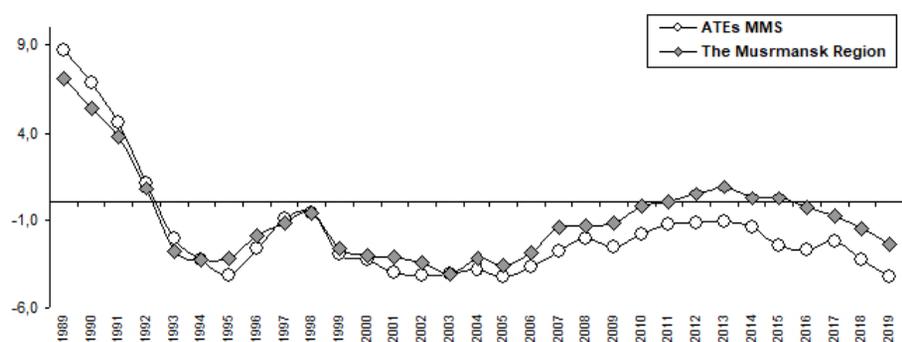


Figure 2. Dynamics of the coefficient of natural population growth in Murmansk Region and ATF MMC in 1989-2019 (%)

average in the Murmansk Region. In subsequent years, there was a sharp decrease in natural growth, which since 1993 has taken negative values. In 1995, the natural growth rate decreased to a level below the regional average and for the entire subsequent analyzed period did not exceed the values for the Murmansk Region. Since 2005, there has been a tendency of increase in the natural growth rate in the ATEs MMS, but since 2014, natural growth has begun to decline, reaching in 2019 the indicator of 2005 – the lowest level for the entire studied period 1989-2019. (fig. 2).

Thus, the natural population decline in the ATEs MMS from 1989 to the mid-1990s was more dramatic than in the Murmansk Region as a whole. In addition, unlike the Murmansk Region as a whole, where from 2011 to 2015 there was a positive natural

increase in the population, and in the ATEs MMS from 1993 to 2019 there was a constant excess of mortality over birth rate. Over the last 10 years of the research, the differences in the coefficient of natural growth in the Murmansk Region as a whole and in the ATEs MMS have increased.

The stagnating total mortality and declining birth rate in the ATEs MMS have a more pronounced negative character in comparison with the average values for the Murmansk Region, which has affected the natural growth rate in the last decade. This circumstance is due to the structural changes in the ATEs MMS population, whose average age by 2019 has become higher than the average in the Murmansk Region. In all the studied ATEs MMS, the rate of decline in the population younger than the working age and in the population of working

age exceeds the average for the Murmansk Region. Negative trends in the natural movement of the population in the ATEs MMS are also likely to have socio-economic roots: reduction in income differences in the Far North and in the «mainland» zone of the Northwestern part of the European part of Russia, changes in the reproductive attitudes of the population due to reduction in real incomes, decrease in the availability of medical care, practice of expanding shift methods for attracting labor to enterprises of the mining and metallurgical enterprises of the Kola Peninsula. In the ATEs MMS, in comparison with the Murmansk Region as a whole, higher rates of population decline were noted. The predominance of mortality over fertility and the negative balance of migration provide firm depopulation regime in the ATEs MMS.

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