

Mortality in Russia during the pandemic in 2020 and in the first half of 2021

By Marina Lifshits

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Abstract

The report analyzes and compares data from various sources to judge mortality in Russia during the pandemic. Rosstat data on additional deaths are compared with the number of deaths of health care workers and with official data on the number of people infected and dying from COVID-19. The regions with the highest and lowest incremental death rates with the highest and lowest misinformation are identified. The attitudes of the population toward vaccination are shown. The situation of Russian hospitals is examined in detail. Demographic projections for men and women, constructed using the age-shifting method by coefficients in 2018 and 2020, are compared. If age-specific mortality rates remain the same as in 2020, there will be four million additional deaths in Russia over 25 years old until 2045. The actions of the authorities cannot be considered satisfactory.

Key words: Russia, COVID-19, pandemic, mortality, Memory List, population projections, regions of Russian Federation

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1. Introduction: the level of additional mortality and Russian data sources on mortality during the pandemic

The year 2020 was one of the worst in Russian demographic history over the past 65 years. For the 12 months of 2020, 319,574 more people (up 18.1%) died in Russia (excluding occupied Crimea) than in 2019, and this occurred in the context of a sharp decline in the available population. According to official data, the population (without Crimea) decreased by 627,385 people. In addition, there was an outflow of foreign citizens not accounted for the permanent population. If we take into account the migration background, the increase in the number of deaths in Russia in 2020 was the maximum since 1955. For the first eight months of 2021, 305,981 more people (29.2%) have died in Russia (excluding Crimea) than for the same period of 2019. Thus, the tragedy is not over.

To analyze additional mortality in Russia during a pandemic, the report considers information from the following sources.

1. Rosstat, the Federal State Statistics Service, is the most authoritative source of various statistical information. The indicators used for this report are (1) the number of deaths by months and regions of the Russian Federation in 2019-2021; (2) the number of men and women by one-year age groups in 2019 and 2020. It is convenient to download the values of indicators on the EMISS website, where statistics of various Russian departments for a long period are collected. Rosstat collects data on deaths basing on issued death certificates.

2. "Operational headquarters to prevent the import and spread of a new coronavirus infection in the territory of the Russian Federation" was established under the Government of the Russian Federation in January 2020. Data from the Operational Headquarters are distributed by Rospotrebnadzor using the specially created Stopcoronavirus website. These data (we will also call them "Rospotrebnadzor data" or "official" data) are used by the Russian authorities for international comparisons. It would be more correctly to say that this data is used for misinformation. This is shown below. The Operational headquarters takes data from reports by regional authorities, which may be far from reality. The dynamics of the official data is available on the website StopCoronaRF created by the mathematician Sergei Shpilkin (2021).

3. The Memory List of medical workers who died during the COVID-19 pandemic is the most reliable source, since each person in it is known by his name and his last place of employment. They are not only doctors and nurses, but also cleaners, ambulance drivers and other employees of medical facilities. The Memory List is compiled by colleagues of deceased health care workers. At the end of September 2021, there were 1,459 names in the Russian part of the Memory List. Unfortunately, the aforementioned list is incomplete. There are also several regional lists of died medical workers (for example, for the Sverdlovsk and Chelyabinsk regions), in which you can find an additional 2-3 dozen died health workers who are not yet included in the general list. Perhaps these names will appear in the general list later. Sometimes a name appears on the Federal Memorial List several months after a person's death.

2. Real dynamics of additional mortality: Comparison of data from Rosstat and the Memory List

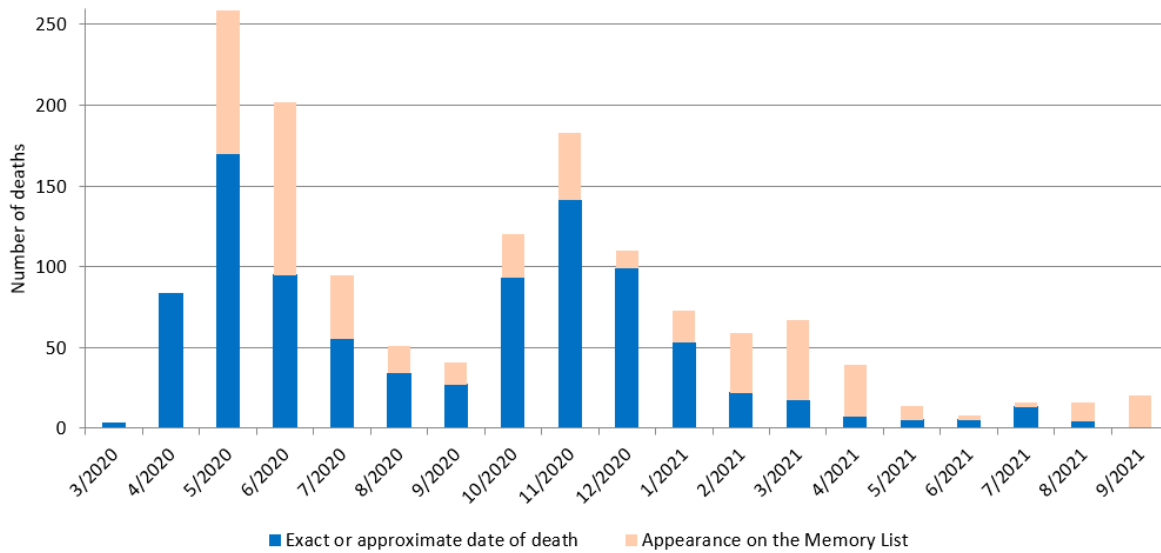
Data from the Memory List are necessary to understand the real dynamics of additional mortality during the COVID-19 epidemic in Russia. Unfortunately, there are no dates of the deaths of medical workers in the Memory List. To fill in this gap, the author did the following. First, changes to the list were regularly monitored by the author. Second, efforts were made to find on the Internet the date of death of each of the 1,459 people. As a result, the author managed to find the exact or approximate dates of deaths of 926 people (63.5%). For the rest of the deceased medical workers, the author only has the period when the name appeared on the Memory List. The result of the author's searches is shown in Figure 1.

In Figure 1, we see two distinct waves of deaths. The first wave peaked in May 2020, and the second wave peaked in November 2020. Vaccination of all Russian medical personnel was fully completed in May 2021. Therefore, we can hope that there will be no third wave of deaths among medical staff.

For a comparison, let us consider the dynamics of additional mortality among the total population of Russia (Figure 2). The basis for calculating additional mortality is selected as follows. First, for each particular month the average number of deaths was calculated based on the data in 2011-2019. Then these numbers were proportionally reduced so that their sum was the same as in 2019. That is, in fact,

2019 was chosen as a base for a comparison, with some adjustments by months. We should not take the average number over five years as a base, due to the peculiarities of the statistical accounting of migrants in Russia and changes in the rules of this accounting. Usually, there are about ten million foreign citizens in Russia, mostly labor migrants. Due to changes in the rules of statistical accounting, there are less and less foreign citizens, who are not accounted as the permanent population for each year after 2006. Therefore, the total population of Russia is declining faster than the permanent population according to Rosstat. This is one of the reasons for the downward trend in the number of deaths until 2020.

Figure 1. Dead health workers by month of death or appearance on the Memory List

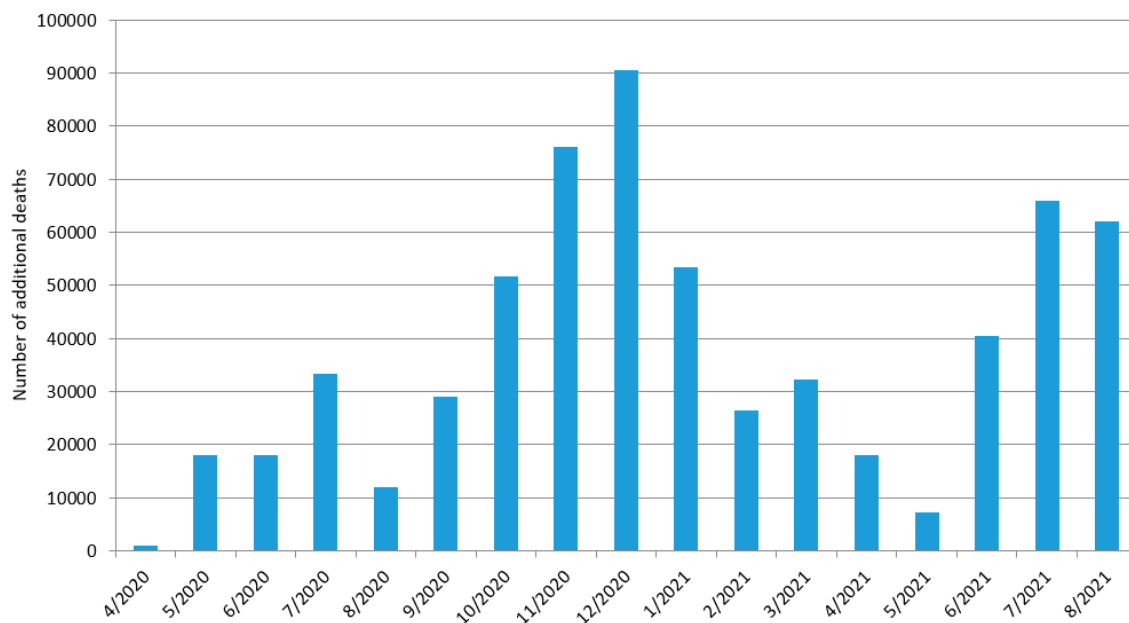


Source: The Memory List; the author's searches on the Internet

Figure 2 gives the impression that from April 2020 to May 2021 there was only one wave of additional deaths in Russia, with a peak in December 2020, and at the end of summer 2020 there was only a temporary lull.

Possibly some of the deaths that occurred in April-June 2020 could appear in the statistics of Rosstat only in later months. The author suggests that all the deaths occurred in 2020 were counted in the statistics by the end of 2020, but the distribution of these deaths by months was different, at least in some regions.

Figure 2. Additional mortality in Russia per month



Sources: EMISS 2021b; the author's estimates.

To test this version, let us compare the most affected regions, according to the Memory List and Rosstat data, in April-August 2020 (period 1), September-December 2020 (period 2) and in January-June 2021

(period 3). In each of these three time periods, the ten regions with the highest number of health worker deaths or additional deaths of the total population are highlighted in red in Table 1. The numbers of deaths in 2019 were used as the basis for calculating additional deaths in Russian regions. The Russian regions are arranged in descending order of the number of additional deaths during these periods. The first column shows the region's rank by the number of additional deaths over the three periods (Crimea has not been taken into account).

The names of the regions are highlighted in red in Table 1, if there is a high probability that in reality the number of deaths in the first period was higher than the Rosstat data showed, and some of these deaths appeared only in the statistics of the second period. This can be stated with the high certainty about the following regions: Krasnodar, Altai krai and Krasnoyarsk krai, St. Petersburg, Dagestan and North Ossetia. This conclusion was made on the basis of the ratio of the number of medical deaths and additional deaths in the total population.

For example, in St. Petersburg in the first period there were 87 additional deaths per one deceased medic, in the second 898, and in the third 545. This seems implausible, because in the country as a whole, the number of additional deaths per one deceased medic increased over time (123, 551, and 717 for first, second and third periods respectively), because in the first period there was a lack of personal protective equipment for medical workers, and in the third period there was an active vaccination of the personnel of medical institutions. Thus, the figures in Table 1 do not contradict the author's hypothesis.

Table 1. The Russian regions with the highest number of deaths of health workers and additional deaths

Rank	Region	Deaths of health workers by periods				Additional deaths by periods			
		1	2	3	Total	1	2	3	Total
1	Moscow	125	13	13	151	13,591	15,407	24,201	53,199
2	Moscow region	80	18	10	108	8,228	11,829	13,372	33,429
3	St. Petersburg	66	9	19	94	5,711	8,080	10,346	24,137
4	Krasnodar krai	14	17	11	42	1,230	9,540	8,141	18,911
5	Samara region	8	13	4	25	2,619	8,114	4,593	15,326
6	Tatarstan, Rep.	7	4	2	13	4,043	7,163	3,952	15,158
7	Rostov region	10	23	9	42	1,308	8,027	5,413	14,748
8	Bashkortostan, Rep.	9	14	7	30	3,493	7,615	3,373	14,481
9	Nizhny Novgorod reg.	9	14	10	33	2,095	6,020	5,959	14,074
10	Sverdlovsk region	9	13	6	28	2,812	7,604	3,257	13,673
11	Chelabinsk region	11	14	4	29	1,911	8,118	1,752	11,781
12	Novosibirsk region	14	8	1	23	1,930	5,549	2,959	10,438
13	Saratov region	5	8	3	16	1,235	4,958	3,742	9,935
14	Volgograd region	11	11	1	23	1,348	5,250	3,037	9,635
15	Voronezh region	2	14	7	23	837	4,775	3,090	8,702
16	Leningrad region	14	4	5	23	1,949	2,452	4,037	8,438
17	Krasnoyarsk krai	10	4	4	18	1,049	4,647	2,448	8,144
18	Orenburg region	2	28	11	41	1,141	5,139	1,743	8,023
19	Stavropol krai	5	10	3	18	752	4,556	2,536	7,844
20	Altai krai	4	8	6	18	-283	6,059	2,037	7,813
23	Dagestan, Rep.	59	5	2	66	2,597	2,337	1,494	6,428
24	Tula region	13	8	8	29	1,121	2,662	2,583	6,366
29	Vladimir region	13	5	5	23	1,066	2,330	2,188	5,584
37	Kursk region	21	10	10	41	713	1,901	2,478	5,092
66	North Ossetia, Rep.	20	3	8	31	512	752	481	1,745
	Other regions	149	168	76	393	21,911	96,583	59,363	177,857
	Total	690	446	245	1381	84,919	247,467	178,575	510,961

Note: A negative figure for Altai krai in the first period means that the number of deaths in 2020 was less than in 2019. 10 biggest numbers in each column are highlighted in red. The region name is red if the number of deaths in the first period is underestimated of Rosstat (by the author's opinion).

Sources: EMISS 2021b; Memory List; the author's estimates.

The earlier study also showed that data on the number of deaths in some regions in April and May in 2020 were underestimated (Lifshits and Neklyudova, 2020).

Two explanations for this phenomenon can be offered. Firstly, in a number of regions with a high spread of the new virus, restrictions were introduced, so people there simply had no opportunity to obtain death certificates for their relatives. Secondly, it cannot be ruled out that this was purposeful disinformation, so that people did not know the truth before the vote on the constitutional amendments, which took place from June 25 to July 1, 2020.

3. Additional mortality in the Russian regions and falsehood of official data on the number of people infected and died from COVID-19

Let us now compare the numbers of additional deaths in the regions, calculated according to Rosstat data, with official data on the number of people infected and died from COVID-19. To do this, we built three tables of the same type for each of the three periods selected earlier.

In Appendices 1-3, regions are shown in descending order of the mortality growth rate in percentage (column 5) and are selected to show the 18-20 worst of these values. The rank of the region by this indicator from lower to higher values is shown in brackets. The ten worst values of indicators in columns 2-4 are also shown, they are highlighted in red. Several of the highest and lowest values in columns 6-8 are also shown in red. As a rule, the 12 subjects of the Russian Federation with a population of less than 500,000 are not shown in the tables, since statistical anomalies there may be accidental, but they are taken into account in the ranks of regions (in contrast to Crimea).

Appendices 1-3 give a representation of how the epidemic developed on the territory of the Russian Federation. In the first period (Appendix 1), there were all of six republics of the North Caucasus (Ingushetia, Chechnya, Dagestan, Karachay-Cherkessia, Kabardino-Balkaria and North Ossetia) among the most affected regions, as well as the largest cities with adjacent regions (Moscow with the Moscow region and St. Petersburg with the Leningrad region). On the third place in terms of damage was the Volga Federal District (FD) – especially the republics of Tatarstan, Chuvashia, Bashkortostan and Mordovia, as well as the Penza region and the Samara region. There are also three Siberian regions in the top twenty, namely the Yamalo-Nenets Autonomous District (AD) and the Khanty-Mansi AD and the Novosibirsk region.

In the second period (Appendix 2), according to Rosstat, the increase in deaths in the North Caucasian FD was even greater than in the first period (45.5% and 22.0% respectively), especially in the Chechen Republic, but the Volga FD (48.0%), the Urals FD (46.7%) and the Siberian FD (46.1%) suffered even more than the North Caucasus in total. In the Volga FD, mortality increased most in the Orenburg region, the Samara region and the Ulyanovsk region, the republics of Tatarstan, Udmurtia and Mordovia; in the Ural FD this occurred in the Chelyabinsk region, the Khanty-Mansi AD and the Yamalo-Nenets AD; in the Siberian FD in the Altai krai, the Omsk region and the Tomsk region.

In the third period (Appendix 3), the mortality rate increased mostly in the Central FD (26.8%), and there are half of all regions of the Central FD in the worth twenty, not only the Moscow city and the Moscow region, but also the following regions: Kursk, Lipetsk, Oryol, Yaroslavl, Tver, Bryansk and Ryazan. The second place is occupied by the North-Western FD (26.4%), it is also represented in the top twenty by several regions: the Leningrad region, Saint-Petersburg, the Republic of Karelia and the Novgorod region.

In the first period, the epidemic broke out primarily in the two largest cities, as well as in the places of origin (North Caucasus) and work (autonomous districts of the Siberian FD) of internal labor migrants. In the second period, the epidemic blazed all over the country. In the third period, Moscow and St. Petersburg were again at the top of the table. This indicates the beginning of the third wave caused by the arrival of a new strain of coronavirus in Russia.

We will deal with the third wave later, but for now let us look at the values in columns 6-8 of Appendices 1-3.

Column 6 show the ratio of the number of infections to the number of deaths from COVID-19. If this value is very high, it can be assumed that the number of deaths is underestimated, and if it is very low, the number of infections may be underestimated. If the value in column 6 is in the middle range, then either the data on infections and deaths are relatively adequate, or both the number of infections and the number of deaths are underestimated.

Column 7 represent the ratio of the number of infections to the number of additional deaths according to the Rosstat data. If this value is too low, then the number of infections is underestimated.

Finally, column 8 show the ratio of the number of additional deaths according to Rosstat to the number of deaths from COVID-19 according to official data. If the value is too high, this indicates either a clear underestimation of official data, or a complete collapse of the health care system due to the epidemic.

Undoubtedly, it is necessary to understand which values can be considered as “normal”. So let us look at the data for different countries and for the world as a whole (Worldometers, 2021). Table 2 compares the ratio of infections

and deaths in Russia and other countries in the three periods highlighted earlier.

Table 2. COVID-19 in the world until mid-2021 (cases and deaths in thousands)

(1)	31 August 2020			September-December 2020			January-June 2021		
	Cases (2)	Deaths (3)	(3)/(2) (4)	Cases (5)	Deaths (6)	(6)/(5) (7)	Cases (8)	Deaths (9)	(9)/(8) (10)
World	26,296	946	3.60%	57,602	989	1.72%	99,051	2,043	2.06%
USA	6,362	192	3.02%	14,272	173	1.22%	13,815	255	1.85%
India	3,688	66	1.79%	6,598	84	1.27%	20,124	254	1.26%
Brazil	3,916	122	3.10%	3,770	73	1.95%	10,929	323	2.96%
Russia	995	17	1.73%	2,164	40	1.84%	2,355	78	3.32%
France	264	31	11.62%	2,195	34	1.56%	3,316	46	1.40%
UK	335	42	12.40%	2,147	32	1.49%	2,316	55	2.36%
Turkey	735	6	0.87%	1,474	15	0.98%	3,217	29	0.90%
Argentina	418	16	3.80%	1,208	27	2.27%	2,845	51	1.79%
Ukraine	121	3	2.11%	934	16	1.71%	1,181	34	2.86%
Israel	117	1	0.81%	307	2	0.78%	419	3	0.74%
Others	9,346	452	4.83%	22,534	492	2.18%	38,533	915	2.37%

Sources: Worldometers 2021; the author's calculations.

Russia was the only country out of all presented in Table 2 where COVID-19 mortality consistently increased and where mortality in the third period was much higher than in the first one. In almost all countries, the mortality in the second period was less than in the first one. This can be easily explained. In the second period, testing was more extensive and of higher quality, and milder cases began to appear in the statistics. In addition, the effectiveness of treatment of severe cases has increased. However, Russian official statistics contradict this. Consequently, either the Russian official data on the number of infections were even less true in the second period than in the first one, or the data on the number of deaths became less false.

In the third period, many countries had a higher mortality rate than in the second one, but only in Russia it jumped by a record 80%. According to Russia's official data, in the third period, the monthly number of deaths from COVID-19 was slightly higher than in the second one. However, according to the Rosstat data, the rate of additional deaths in the third period was lower than in the second one. This means that the official data on the number of deaths were more consistent with reality in the third period than in the second one.

Table 2 helps to understand which values in columns 6-7 of Appendices 1-3 should be considered too high and too low. Apparently, values 0.74-12.40% should be considered 'normal'.

In the first period, there were 19 regions (out of 83) with a value in column 6 of Appendices 1-3 less than 0.74%, in the second period 14, and in the third one only 2. Thus, over time, the ratio of deaths to infections became more adequate.

There were no values more than 12.40% in columns 6, and there are a lot of them in columns 7: 18 in the first period, 47 in the second and 14 in the third. In Russia as a whole, the number of additional deaths in the first period was 11.8 times less than the number of infections, and 4.9 times more than deaths according to official data, in the second period 8.6 and 6.3, and in the third one 13.0 and 2.3, respectively. From these facts, we can conclude that either the number of infections in the second period has become more underestimated in comparison with the first period, or some of the deaths that occurred in the first period appeared in the Rosstat statistics only in the second period. It is possible that both assumptions are true.

The author considers that the first period's strong underreporting of COVID-19 deaths was a deliberate lie by the authorities, because their main task in 2020 was not to fight the epidemic, but to vote on amendments to the Constitution of the Russian Federation so that the current president could hold his position until 2036. The pandemic was not to be allowed to interfere with that.

Perhaps that is the reason why, as early as 11 days after the appearance of the WHO Guidelines for certification of COVID-19 as a cause of death (WHO, 16 April 2020), the Moscow government issued its own manual for pathologists

(Government of Moscow, 27 April 2020), which made it possible to significantly underestimate COVID-19 mortality compared to the WHO recommendations (Lifshits, 2020).

At the same time, as Appendices 1-3 show (columns 8), COVID-19 mortality in Moscow was underestimated several times less than in most other regions of the Russian Federation. In Moscow, the ratio of additional deaths to COVID-19 deaths according to official data was 2.8 in the first period, 2.4 in the second period and 2.2 in the third one. In the first period, there were 24 regions where this ratio was more than 10, in the second period 36 regions, and in the third period only 3 regions. Values greater than 20 occurred 12 times in the first period and 15 times in the second, and there were no such values in the third one. Again, we see the evidence that some of the additional deaths were carried over from the first period to the second one, and in the third period, the data are most adequate.

4. Vaccination and the third wave in Russia

We saw in Table 2 that COVID-19 mortality increased in the third period in almost all countries compared to the second period. To figure out whether vaccination has an impact, let us build a table similar to Table 2, but choose 3 other periods, 4 months each, until the end of August 2021 (Table 3).

Indeed, in almost all countries of the world, COVID-19 lethality was higher in January-April 2021 than in September-December 2020. Perhaps this was a consequence of the spread of more dangerous strains of the coronavirus. However, the situation has changed dramatically in the past four months, with large differences between countries. COVID-19 lethality has remained high in Russia, Ukraine, Brazil, Argentina, India and many other countries, but in the United Kingdom, Israel, France and the United States it has decreased very much. Undoubtedly, this can only be explained by vaccination. Table 4 illustrates that, as a rule, it can be achieved low COVID-19 mortality only after fully vaccinating at least 40% of the total population.

Table 3. COVID-19 in the world September 2020-August 2021 (cases and deaths in thousand)

1	September-December 2020			January-April 2021			May-August 2021		
	2 Cases	3 Deaths	4 (3)/(2)	5 Cases	6 Deaths	7 (6)/(5)	8 Cases	9 Deaths	10 (9)/(8)
World	57,602	989	1.72%	67,798	1,386	2.04%	66,854	1,211	1.81%
USA	14,272	173	1.22%	12,468	227	1.82%	6,852	64	0.93%
India	6,598	84	1.27%	8,871	64	0.72%	13,651	225	1.65%
Brazil	3,770	73	1.95%	7,015	209	2.98%	6,078	176	2.90%
Russia	2,164	40	1.84%	1,646	53	3.23%	2,114	73	3.46%
France	2,195	34	1.56%	2,812	40	1.41%	1,495	10	0.66%
UK	2,147	32	1.49%	1,923	54	2.80%	2,384	5	0.21%
Turkey	1,474	15	0.98%	2,612	19	0.74%	1,568	17	1.06%
Argentina	1,208	27	2.27%	1,352	21	1.53%	2,208	48	2.17%
Ukraine	934	16	1.71%	1,014	26	2.52%	217	10	4.48%
Israel	307	2	0.78%	415	3	0.73%	228	1	0.30%
Others	22,534	492	2.18%	27,670	671	2.42%	30,060	584	1.94%

Source: Worldometers (2021).

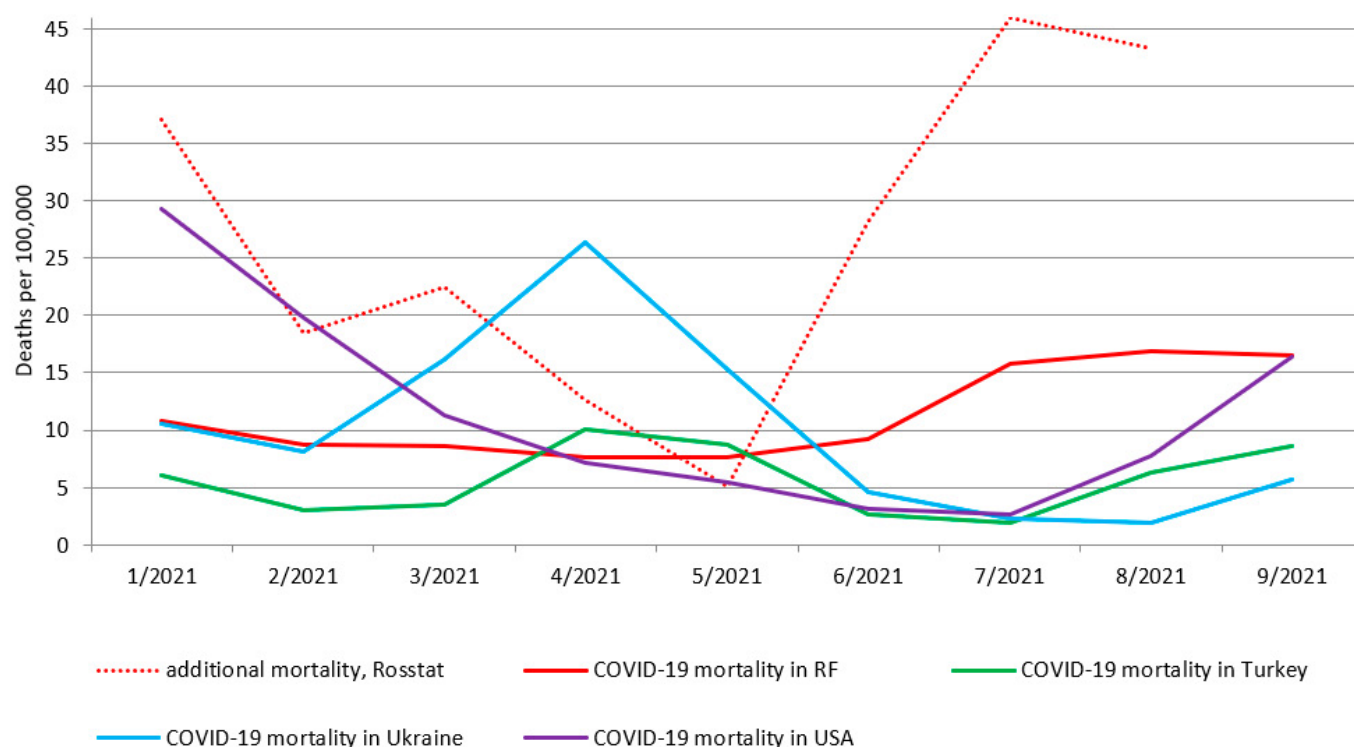
Table 4. People fully vaccinated per hundred in 2021 (dates of months are in brackets)

	February	March	April	May	June	July	August
USA	7.37 (28)	16.2 (31)	30.2 (30)	40.2 (30)	46.1 (30)	48.9 (31)	51.3 (27)
India	0.18 (28)	0.67 (31)	1.91 (30)	3.10 (31)	4.14 (30)	7.30 (30)	10.0 (27)
Brazil	0.89 (28)	1.98 (31)	6.33 (30)	10.3 (31)	12.2 (29)	19.4 (31)	27.7 (27)
Russia	–	2.99 (31)	5.16 (30)	8.17 (31)	11.9 (30)	17.3 (31)	24.6 (27)
France	2.37 (28)	4.25 (31)	14.3 (30)	32.5 (31)	31.2 (30)	47.9 (31)	57.7 (26)
UK	1.20 (28)	6.62 (31)	21.9 (30)	37.7 (31)	48.5 (30)	56.2 (31)	62.1 (27)
Turkey	1.97 (28)	8.04 (31)	10.7 (30)	14.8 (31)	17.9 (30)	32.2 (31)	42.8 (27)
Ukraine	0	0	0	0.30 (31)	1.49 (29)	4.65 (31)	8.14 (27)
Israel	38.7 (28)	54.6 (31)	57.5 (30)	58.4 (31)	58.9 (30)	61.2 (31)	62.2 (27)
Argentina	0.64 (28)	1.49 (31)	2.06 (30)	6.10 (31)	8.86 (30)	15.2 (31)	29.1 (27)
Africa	0.02 (28)	0.29 (31)	0.36 (30)	0.61 (31)	1.14 (30)	1.65 (31)	2.63 (27)
Asia	0.23 (28)	0.61 (31)	1.36 (30)	2.26 (31)	8.18 (30)	10.8 (31)	28.2 (27)
Europe	1.77 (28)	4.46 (31)	8.79 (30)	16.9 (31)	28.1 (30)	39.7 (31)	47.0 (27)
EU	2.55 (28)	5.03 (31)	8.97 (30)	18.5 (31)	33.5 (30)	48.9 (31)	57.1 (27)
North America	4.35 (28)	9.49 (31)	18.7 (30)	25.7 (31)	32.5 (30)	37.6 (31)	41.4 (27)
South America	0.52 (28)	2.18 (31)	5.69 (30)	9.16 (31)	12.7 (30)	19.9 (31)	29.0 (27)

Source: Our world in data (2021).

Now let us see how the third wave of the epidemic is developing in Russia. To do this, we compare the official data on the number of deaths in Russia from COVID-19 per 100,000 of population in 2021 with similar data for Ukraine, the USA, and Turkey. For comparison, Figure 3 also shows additional mortality by months of 2021 per 100,000.

Figure 3. COVID-19 mortality per 100,000 persons in Russia, Turkey, Ukraine, and the USA in 2021



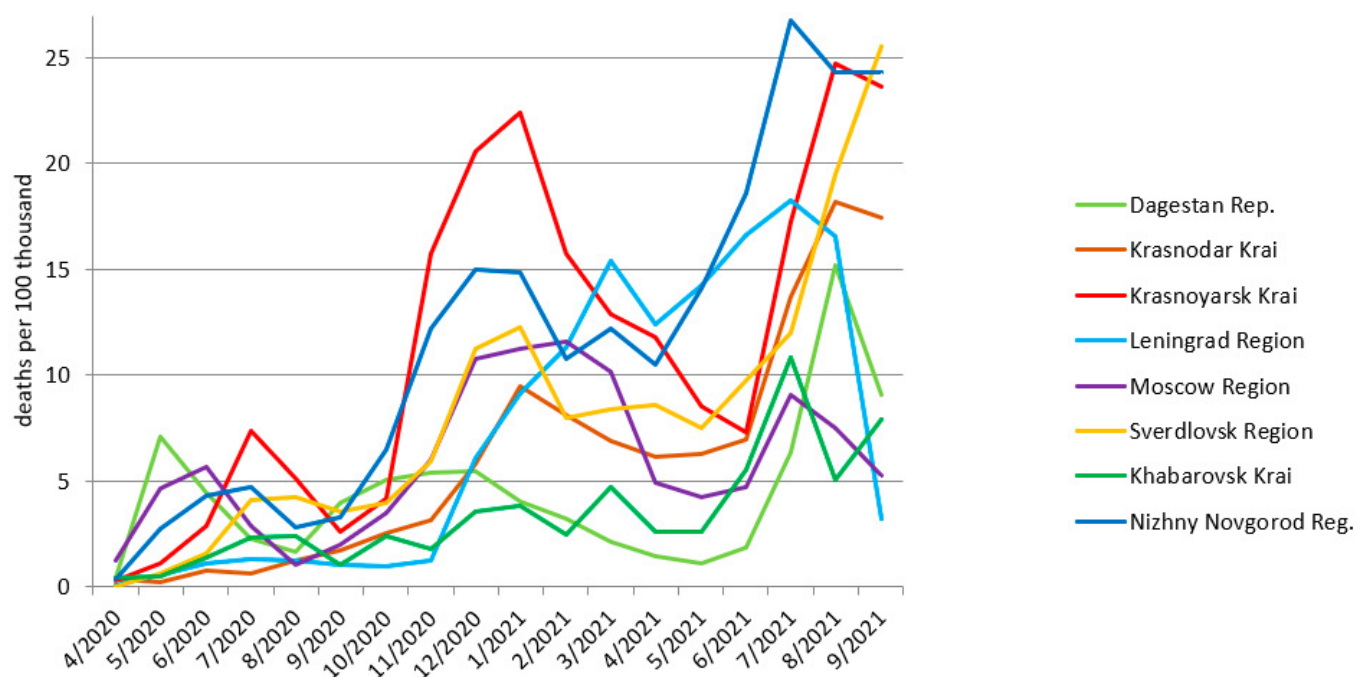
Note: RF = the Russian Federation.

Sources: Worldometers (2021), Our world in data (2021), the author's estimates.

The disease waves do not coincide in different countries; this is quite understandable. But it is completely unclear why the mortality lines from COVID-19 according to official data and additional mortality according to Rosstat are so different in Russia. The author has only one explanation for this. Elections to the State Duma took place in September, so it was important for the authorities to create the impression that the situation in Russia is not too bad in comparison with other countries. We note that the most important “other countries” for Russians are the United States and Ukraine, judging by the Russian media, and Turkey is important as a top holiday destination.

Figure 4 shows the dynamics of COVID-19 mortality, according to official data, in seven regions from seven federal districts. The Republic of Dagestan in the North Caucasus FD, the Krasnodar krai in the Southern FD and the Krasnoyarsk krai in the Siberian FD, and the Sverdlovsk region in the Ural FD are the largest regions in terms of population. The Moscow region in the Central FD, the Leningrad region in the Northwestern FD and the Khabarovsk krai in Far Eastern FD are the second most populous regions. The Republics of Bashkortostan and Tatarstan are the largest regions of the Volga FD in terms of population, but we saw in Appendices 1-3, that they were among the Russian leaders of lying official data. Therefore, in Figure 4 there is the third most populous region of the Volga FD, the Nizhny Novgorod region.

Figure 4. COVID-19 mortality per 100,000 of population in eight subjects of the Russian Federation



Sources: Shpilkin 2021; Rosstat.

Estimating the latest official data, the third wave of deaths by the epidemic in Russia may be even greater than the second one. Obviously, this is a consequence of the fact that vaccination in Russia has not been very successful.

Unfortunately, there is no official resource that collects information on vaccination in every region of the Russian Federation in dynamics. The daily reports of the Russian Government Communication Center on the situation with coronavirus usually contain information about vaccination in only 2-3 regions. However, enthusiasts have created a website GOGOV where all official information published by both the Russian Government and regional authorities is collected. The data of GOGOV is shown in Table 5.

Table 5. Vaccination in the Russian regions

Rank	Region	Vaccinated		Fully vaccinated		Date	Population
		people	% of adults	people	% of popul.		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1	Chechen Rep.	626,000	65.9%	442,000	29.5%	31 Aug.	1.497,992
2	Chukotka AD	21,300	57.7%	19,400	39.2%	27 Aug.	49,527
3	Belgorod region	713,468	57.1%	646,136	41.9%	01 Sep.	1.541,259
4	Moscow region	3.200,000	51.7%	3.000,000	38.9%	01 Sep.	7.708,499
5	Tyva Republic	101,848	48.9%	79,687	24.1%	02 Sep.	330,368
6	Tyumen region	566,635	48.2%	510,251	33.1%	01 Sep.	1.543,389
7	Mordovia Rep.	298,509	46.2%	266,482	34.2%	01 Sep.	778,965
8	Tula region	551,000	45.8%	485,419	33.5%	28 Aug.	1.449,115
9	Yakut Republic	320,000	44.6%	290,000	29.5%	01 Sep.	981,971
10	Buryatia Rep.	320,361	44.5%	265,284	26.9%	02 Sep.	985,431
13	Moscow	4.539,902	43.3%	3.611,289	28.5%	11 Aug.	12.655,050
14	Rostov region	1.452,440	42.9%	1.264,890	30.2%	02 Sep.	4.181,486
23	Samara region	1.031,104	40.6%	864,000	27.4%	01 Sep.	3.154,164
26	Krasnodar krai	1.820,000	40.5%	1.316,939	23.2%	27 Aug.	5.683,947
31	Kemerovo region	791,473	38.5%	630,775	24.0%	30 Aug.	2.633,446
33	Volgograd reg.	767,000	38.4%	656,000	26.5%	26 Aug.	2.474,556
36	Bashkortostan R.	1.166,855	37.6%	1.015,426	25.3%	02 Sep.	4.013,786
37	Nizh. Novgorod reg.	944,405	36.8%	854,211	26.9%	02 Sep.	3.176,552
41	Krasnoyarsk krai	799,394	36.0%	692,539	24.2%	01 Sep.	2.855,899
50	Perm krai	679,890	34.1%	535,422	20.8%	01 Sep.	2.579,261
53	St. Petersburg	1.481,860	33.4%	1.439,618	26.7%	01 Sep.	5.384,342
54	Leningrad region	523,974	33.4%	363,225	19.2%	01 Sep.	1.892,711
58	Irkutsk region	592,425	33.0%	508,825	21.4%	02 Sep.	2.375,021
61	Saratov region	638,489	32.8%	573,750	24.0%	02 Sep.	2.395,111
62	Tatarstan Rep.	997,855	32.7%	843,568	21.7%	01 Sep.	3.894,120
64	Sverdlovsk region	1.087,000	32.4%	985,000	23.0%	31 Aug.	4.290,067
68	Novosibirsk region	683,033	31.1%	615,009	22.1%	31 Aug.	2.785,836
69	Khabarovsk krai	318,510	31.1%	278,424	21.4%	02 Sep.	1.301,127
72	Chelyabinsk region	815,348	30.2%	674,769	19.6%	01 Sep.	3.442,810
74	Stavropol krai	658,500	29.9%	598,500	21.4%	02 Sep.	2.792,796
75	Udmurtia Republic	333,973	29.0%	296,186	19.8%	02 Sep.	1.493,356
76	Jewish AR	34,606	28.9%	29,569	18.9%	16 Aug.	156,500
77	Ryazan region	259,000	28.7%	220,000	20.0%	31 Aug.	1.098,257
78	Adygea Republic	102,000	28.2%	83,000	17.9%	25 Aug.	463,167
79	Primorsky krai	386,798	25.8%	335,567	17.9%	02 Sep.	1.877,844
80	Vladimir region	278,000	25.5%	239,000	17.8%	26 Aug.	1.342,099
81	Kabard.-Balkaria R.	159,227	24.0%	122,890	14.1%	31 Aug.	869,191
82	North Ossetia Rep.	125,476	23.7%	88,468	12.8%	24 Aug.	693,098
83	Dagestan Republic	384,379	17.1%	260,826	8.3%	02 Sep.	3.133,303

Note: an adult is here a person 18+ years old.

Sources: GOGOV; Rosstat.

Table 5 shows the results of vaccination in several regions of the Russian Federation by the beginning of autumn. The first column is the rank according to the proportion of adults who received at least one vaccine component (column 4). The table includes ten best and ten worst regions for this indicator, as well as 20 largest in terms of population. All regions from Figure 4 are also in Table 5, they are highlighted in bold.

Comparing Table 5 and Figure 4, it is impossible to say that the proportion of the vaccinated population is the main reason for regional differences in mortality rates in August. Perhaps this connection will manifest itself later. However, it is possible that vaccination has determined such a large difference between the neighboring Moscow and Nizhny Novgorod regions.

During July, the number of people vaccinated with at least one component of the vaccine increased by 14 million people (from 23 million to 37 million), and during August only by seven million people (to 44 million). Thus, the vaccination speed in Russia is declining. We will discuss the reasons of this below.

5. Actions of the authorities and public opinions

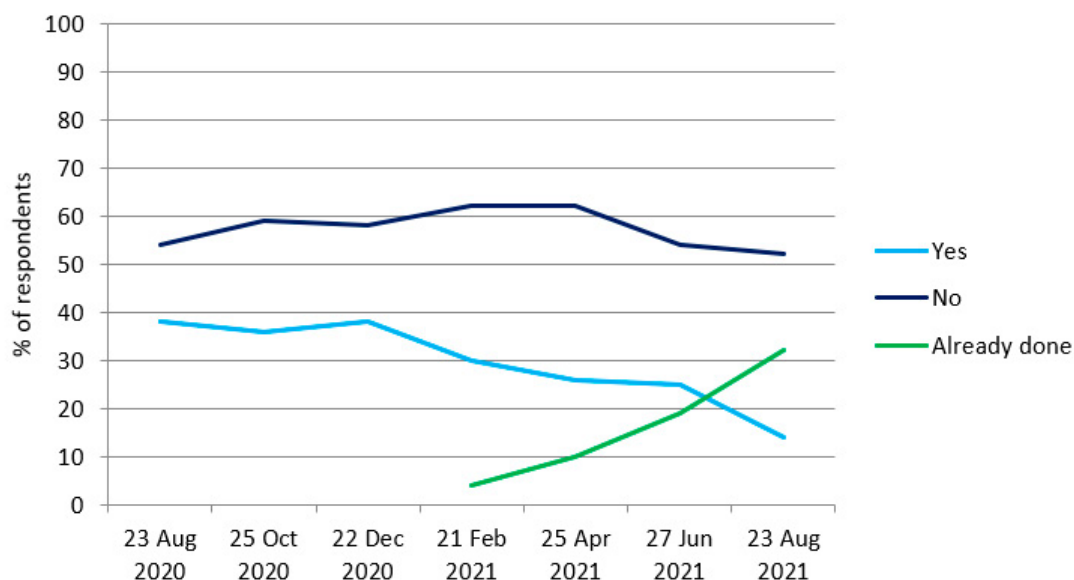
The actions of the authorities during the pandemic have consisted of five components: (1) propaganda and information, (2) medical system management, (3) restrictions, (4) assistance to people and business, (5) vaccination (including vaccination of the Russian population and export supplies of vaccine).

Describing public opinions and attitudes, the author will rely on research from the Levada Center and her own observations on social networks.

In Russia, television is completely controlled by the state. Therefore, there is no doubt that everything that you can see and hear on television in Russia is approved by the state. According to the Levada Center, television is the main source of information for the majority of the population, although this share is gradually decreasing: 90% in March 2014, 74% in March 2020, and 62% in July 2021. The level of public trust in television is almost unchanged: 50% of the population in March 2014 and March 2020, 46% in July 2021. The most active TV viewers are people over 55 years old (Levada, 05.08.2021).

The coronavirus came to Russia first on television. At about the end of February 2020, television for the first time told to the Russians that Bill Gates was to blame for the coronavirus epidemic, Dozhd reports (2020). The fake about Bill Gates and chipping by vaccination was actively spreading on social networks in March and April 2020. Then various conspiracy theories related to Bill Gates and vaccinations were popularized by high-rating TV shows on the main federal TV channels: Alexei Pimanov's "Person and Law" on the First Channel on 24 April 2020 (First Channel, 2020) and Nikita Mikhalkov's "BesogonTV" on Russia 24 (Mikhalkov, 2020) on 1 May 2020. Therefore, it is not surprising that many Russians have a negative attitude toward vaccination (Figure 5).

Figure 5. Are you personally going to be vaccinated with a domestic vaccine, voluntarily and free of charge?



Source: Levada Center.

Although the epidemic came in real life of the Russians a month later than in Spain and Italy, it happened unexpectedly for the Russian authorities. On 26 February 2020, when there were already more than a thousand COVID-19 cases in Spain, Putin set a voting date on amendments to the Russian Constitution for 22 April. On 11 March the WHO declared a pandemic, but only on March 25, Putin announced the postponement of the voting date. At the end of March 2020, as we know from the Memory List, a hospital employee died of COVID-19 in the Komi Republic in Russia (Yarovaya, 2020). According to official data, there were only 17 coronavirus deaths by that time in the Russian Federation.

Russia's medical system was completely unprepared for the epidemic. On the one hand, there is a completely new, modern, exemplary hospital in the Moscow district of Kommunarka, it was redesigned into a COVID-19 hospital and TV showed Putin's visit there on 24 March 2020. And on the other hand there are other hospitals that became the main source of the infection spread in the first months of the epidemic.

Usually there are about ten patients in one room in Russian hospitals. Only in some hospitals you can get a single or double room for money. When new patients with suspected COVID-19 arrived at the hospital, they were placed in common rooms. Then the tests were done. There were not enough tests and laboratories, so you had to wait 2-3 weeks for the results. The results were often false negative because of the poor quality of the tests. If the test result was positive, the patient was transferred to the COVID-19 ward. By that time he had managed to infect many other patients and medical staff (Bazekina, 2020; Takie dela, 2020). Personal protective equipment was given to medical workers only in the COVID-19 wards, but even there it was a shortage of them. So medics usually worked for 12 hours in the same protective suit without a break, they could neither eat nor go to the toilet. When Putin visited the hospital in Kommunarka, he was wearing a super expensive mask and an American protective suit. None of the Russian doctors had that (Sokolov, 2020). In many regions, medics washed their protective suits and masks after work to wear them the next day (Penzalinform, 2020).

One of the main problems was the lack of hospital beds. To a large extent, it was a consequence of the healthcare system "optimization" (Klenko and Rudnev, 2019; Sokolov, 2020). During the period 2000-2018, the total number of hospitals in the Russian Federation decreased by 2.1 times, the number of hospital beds decreased by 30%, including cots in the infectious wards by 44% (Table 6). We see that in just one year, in 2006, in rural areas the number of hospitals decreased by 46%, and the number of outpatient facilities by 44%. Obviously, this could only be a consequence of the central government's decision. Subsequently, the number of hospitals continued to decline, but some outpatient facilities and nurses returned to the villages.

Here it is necessary to make a small digression from the topic of the report and explain how state power is arranged in Russia.

Table 6. Number of hospitals, outpatient facilities and hospital beds in Russia

End of year	Hospitals		Outpatient facilities		Hospital beds, thousand			Hospital beds per 10,000	
	Urban	Rural	Urban	Rural	Urban	Rural	Infectious	Urban	Rural
1995	6,627	5,437	11,854	9,217	1569.2	281.3	124.3	145.5	71.7
1996	6,540	5,295	13,096	9,006	1543.1	269.5	119.7	143.2	68.9
1997	6,460	5,011	12,748	8,984	1506.2	254.5	114.3	139.9	65.3
1998	6,341	4,776	12,432	8,677	1471.4	245.1	109.3	136.8	63.2
1999	6,389	4,521	12,591	8,513	1438.1	234.2	105.7	134.4	60.5
2000	6,326	4,378	12,865	8,389	1438.7	232.9	103.4	134.8	60.4
2001	6,227	4,334	12,981	8,367	1423.9	229.6	99.1	133.9	60.1
2002	6,139	4,181	13,120	8,283	1399.3	220.4	94.5	132.1	58.1
2003	6,047	4,054	13,316	8,151	1388.4	208.2	91.3	131.7	55.4
2004	6,022	3,829	14,268	7,816	1391.4	209.4	88.0	133.4	55.1
2005	5,820	3,659	14,288	7,495	1365.9	209.5	84.6	131.7	55.3
2006	5,512	1,966	14,611	4,181	1349.5	204.1	81.6	130.0	53.1
2007	5,315	1,462	15,554	2,747	1331.6	190.4	79.1	128.3	49.8
2008	5,131	1,414	12,754	2,871	1226.2	172.3	73.8	118.3	45.1
2009	5,079	1,375	12,398	2,924	1210.0	163.4	74.0	116.8	42.3
2010	4,959	1,349	12,753	2,979	1186.1	153.4	70.5	112.5	40.9
2011	5,048	1,295	13,273	2,989	1198.3	148.8	71.1	113.3	39.9
2012	4,956	1,216	13,584	2,853	1188.9	143.4	70.2	112.0	38.5
2013	4,775	1,095	13,730	2,731	1164.7	137.2	68.2	109.3	37.0
2014	4,574	1,064	14,042	3,064	1123.5	143.3	65.3	103.8	37.7
2015	4,397	1,036	13,815	4,749	1060.1	161.9	62.7	97.6	42.7
2016	4,351	1,006	14,236	4,890	1041.0	156.2	61.0	95.5	41.4
2017	4,297	996	15,254	4,963	1026.9	155.8	59.9	93.9	41.5
2018	4,275	982	15,337	4,891	1018.7	154.1	59.3	93.1	41.3

Source: Zdravookhranenie v Rossii.

When Boris Yeltsin was President of the Russian Federation, there was independent television, and all branches of government were also independent. During Yeltsin's time, there were fair and free elections at all levels. Under Yeltsin, there were real local self-government and real federalism in the country, because a significant portion of the collected taxes remained in the regions and municipalities. Under Yeltsin, through the efforts of Yegor Gaidar and his associates, a market economy was created. Nevertheless, over the period 1992-1998, Russia's GDP fell by almost 40%. It was mainly due to two reasons. First, former KGB officers organized and led massive banditry to terrorize, rob and kill entrepreneurs across the country. Second, the State Duma voted for huge budget deficits, contrary to the government's requests, and most of the budget money went to support loss-making state enterprises. This hindered the emergence of free competition.

After the default of 1998, the State Duma adopted a deficit-free budget for the first time, unprofitable state enterprises were sold or closed, and then the economy began to grow very rapidly. Subsequently, all state budgets were, as a rule, in surplus. In 2000, KGB Lieutenant Colonel Putin became president; he put an end to mass banditry. 1999-2003 were the most favorable years for the growth and development of a market economy in Russia. Prime Minister Mikhail Kasyanov pursued a competent economic policy. The State Duma accepted adequate laws, thanks to the parliamentary groups of SPS and Yabloko parties. But at the same time, Putin began to destroy independent television. In spring and summer of 2003, Sergei Yushenkov (SPS) and Yuri Shchekochikhin (Yabloko), members of the parliamentary group that tried to investigate the explosions of apartment buildings in Moscow and Volgograd in September 1999, were killed. In October 2003, Mikhail Khodorkovsky was arrested. In December 2003, the SPS and Yabloko parties were defeated in the elections to the State Duma. In February 2004, Mikhail Kasyanov was fired. In September 2004, Putin canceled the election of regional heads. State corporations have been organized that undermine free competition. The electoral and fiscal laws have been changed. So democracy and federalism in Russia were destroyed until 2006.

Now Russia is a unitary state with a rigid vertical of power. This complicates the economic development of the country. During the period 2009-2019, GDP grew by 11%, less than 1% per year. Most of the collected taxes go to the federal center, and from there the money is redistributed among the regions. Most regions do not have the funds to build hospitals and buy modern equipment for them. A relative of one of the deceased doctors writes on Instagram: "The poverty of hospitals all over the country has killed many people" (Gradskaya, 2020). Marina Gradskaya described the complete collapse of the medical system in Tomsk (Siberian FD) in November 2020. Ambulances did not arrive on the emergency calls, there was no possibility to make a computed tomography (CT) scan even for a fee, there was no oxygen, patients lay on chairs in the corridor, and there were not even enough blankets and antiseptics. And this happens eight months after the start of the epidemic in the country, when it would have been possible to purchase everything necessary for the hospitals.

In recent months, when all health care workers are already vaccinated, their deaths are very rare. For example, in July 2021 in Nizhny Novgorod, a doctor died of COVID-19 despite two vaccinations with the CoviVac vaccine, he was 72 (nn.ru, 2021). Valery Elizarov, head of the Center for the Study of Population Problems at the Moscow State University, died of COVID-19 in July 2021, two months after being vaccinated with the CoviVac (according to his colleagues). Currently, the CoviVac is only prohibited for people over the age of 60. The EpiVacCorona vaccine, which efficacy also has not been confirmed, is still used without restriction. In small localities, people do not have the opportunity to choose a vaccine. Sometimes people are deceived and injected with EpiVacCorona instead of Sputnik V (Volcheck, 2021). Perhaps it may be because the Sputnik V is in short supply due to export contracts. Foreign vaccines are forbidden in Russia.

Vaccination for some professions is compulsory if it is announced by the region's chief sanitary doctor. In Moscow and the Moscow region, in addition to medical workers, vaccination is mandatory for teachers and officials working with the public, and at least 60% of employees should be vaccinated in the service sector. Similar decisions have been taken in Yakutia and the Kemerovo region (Filippenok et al., 2021).

6. Demographic projections for men and women

To estimate the potential demographic consequences of the pandemic, we construct two demographic projections using the age shifting method based on the demographic outcomes of 2018 and 2020. The essence of the method is that we assume that the coefficients of the age shifting remain unchanged, i.e. for each age x and each year t equality (1) is true.

$$\frac{l(x+1)_{(t+1)}}{lx_t} = \frac{l(x+1)_{(t+2)}}{lx_{(t+1)}}, \quad (1)$$

where lx_t is number of people in age x at the beginning of the year t .

For comparison with 2020, it is best to choose 2018 because then, according to Rosstat, the migration balance in Russia was almost as low as in 2020 (124,884 and 106,496, respectively), a difference is only 18,400. But it is important to understand that these 18,400 are mostly men aged 18-64. Data on the sex and age structure of the population are taken from EMISS (2021a; 2021c).

If the coronavirus is not defeated and the age shifting rates remain the same as in 2020, then by the end of 2045 in Russia without Crimea, the total losses by the epidemic will exceed four million people (Table 7).

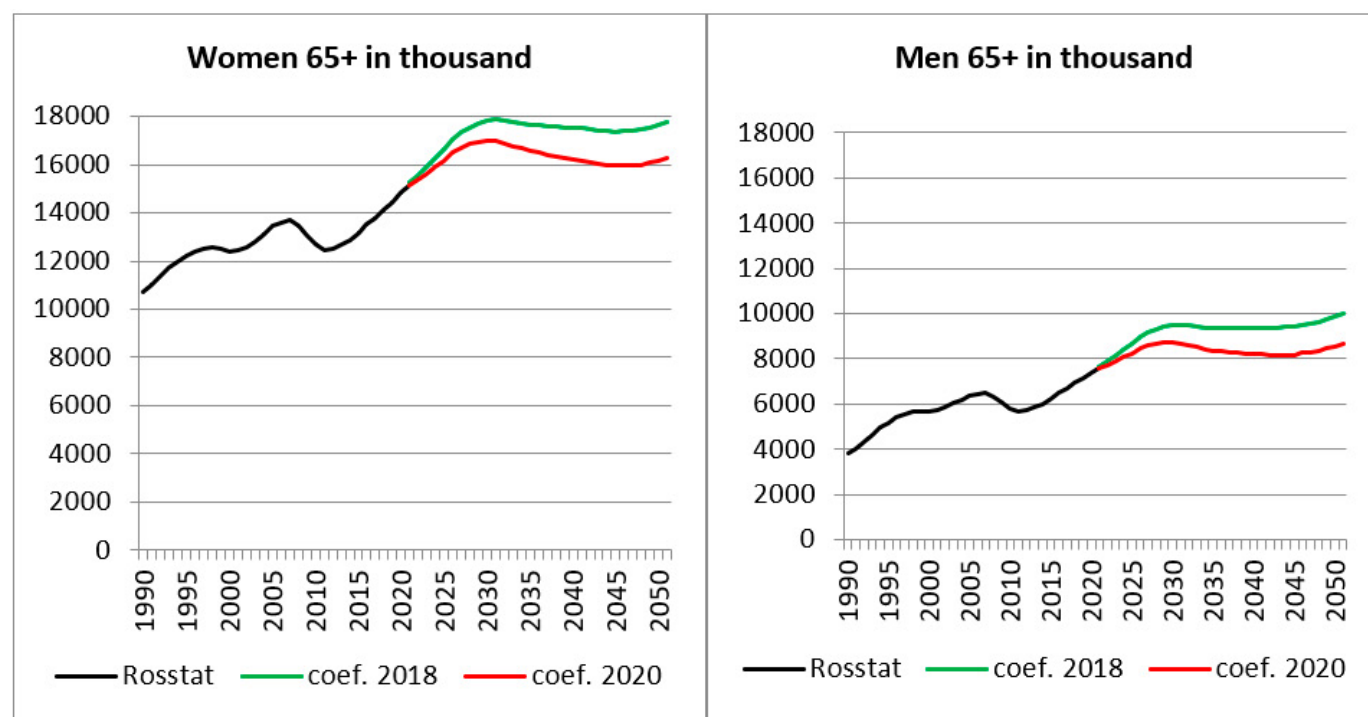
Table 7. Difference in numbers of 20-34, 35-64, and 65+ age and gender groups between projections with the age shifting coefficients for 2018 and 2020, in the beginning of the given year

	2021	2026	2031	2036	2041	2046	2051
Women 20-34	4,301	36,505	78,998	119,306	134,894	132,745	117,352
Men 20-34	13,807	84,698	155,733	217,172	248,639	247,902	216,505
Women 35-64	29,699	139,013	204,979	266,004	322,967	364,999	388,194
Men 35-64	41,391	209,410	331,408	452,417	564,123	653,735	719,832
Women 65+	96,391	543,431	892,405	1,158,906	1,331,768	1,426,764	1,467,831
Men 65+	90,167	497,772	814,845	1,040,221	1,177,036	1,264,943	1,341,670
Total 20+	275,756	1,510,829	2,478,368	3,254,026	3,779,427	4,091,088	4,251,384

Sources: EMISS (2021a, 2021b); the author's estimates.

Considering the age structure of migrants, we cannot say unequivocally that men will suffer more than women. However, it is obvious that the greatest losses will be among seniors. These hypothetical losses are shown in Figure 6.

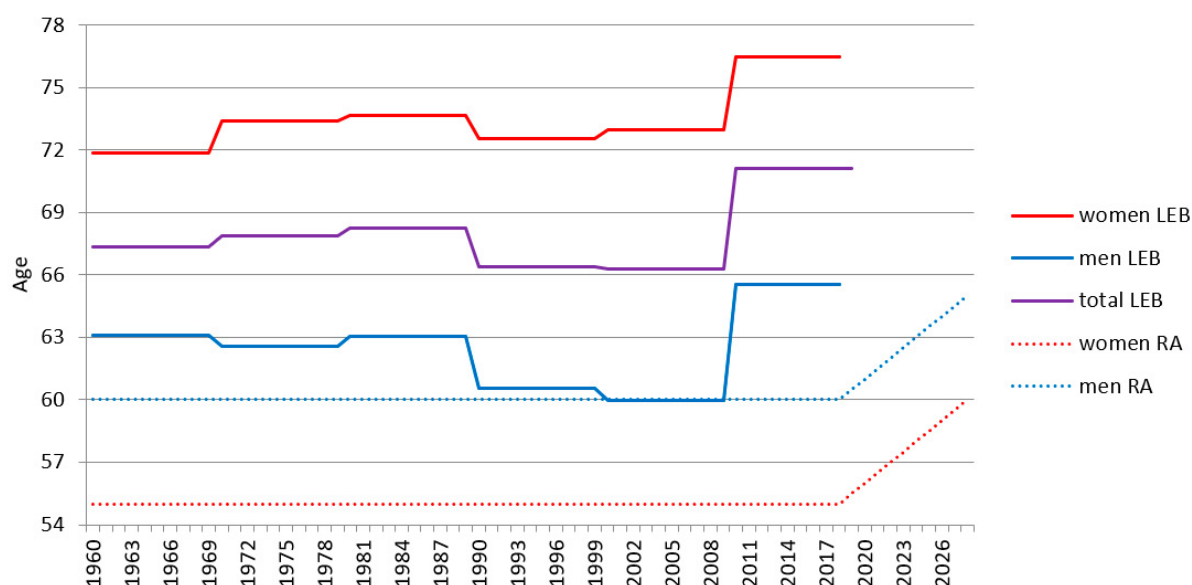
Figure 6. Age groups 65+ according to Rosstat and 2 versions of the author's forecast with the age shifting coefficients for 2018 and 2020



Sources: EMISS (2021a, 2021b); the author's estimates.

But do the Russian authorities need older people? Life expectancy in Russia in 1960-2020 did not change linearly. In 2018, Putin announced an increase of the retirement age by five years during 2019-2028, although the values in Figure 7 do not provide reasons for this (especially for men), and the economic activity of seniors in Russia does not depend on the retirement age. In 2020, life expectancy has dropped by two years, but the “pension reform” has not been suspended. Perhaps the authorities consider older people a burden on the budget.

Figure 7. Life expectancy at birth (LEB), 10-year averages, and the retirement ages (RA)



Sources: Rosstat; the World Bank.

7. Conclusions

The tragedy in Russia continues. Obviously, there will be even more victims of the epidemic in 2021 than in 2020. Our study showed that the main element of the authorities’ policy during the pandemic was and still remains a lie. The numbers of infected and dead people are underestimated to make Russia look “decent” in comparison to other countries. False information about the ineffectiveness and harm of foreign vaccines is disseminated regularly. As a result, the Russian population does not trust vaccination in principle. There are not enough hospital beds and hospitals do not have enough equipment. The tests are still of poor quality, in half of the cases they give a false negative result.

To change the situation, it is necessary, first of all, to stop lying. It is necessary to allow the use of foreign tests and foreign vaccines. It is necessary to increase funding for health care. It is necessary to build new hospitals and to buy modern equipment for them.

Unfortunately, it is hard to hope for this, because the authorities are not accountable to the population. Moreover, in Russia there is not even an active demand from the population for democratization. Public opinion polls and the results of recent elections confirm this. Therefore, tragedies will continue.

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Appendices

Appendix 1. Official infections and deaths from COVID-19 (31 August 2020) and additional deaths for the period from April to August 2020 (period 1)

Region	Official data		Additional mortality		Ratios		
	Infections	Deaths	Deaths	Increase, %	(3)/(2)	(4)/(2)	(4)/(3)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Ingushetia, Rep.	4,397	76	309	54.4 (83)	1.7%	7.0%	4.1
Chechen Rep.	2,270	38	1,377	51.5 (82)	1.7%	60.7%	36.2
Dagestan, Rep.	10,999	497	2,597	44.4 (81)	4.5%	23.6%	5.2
Yamalo-Nenets AD	13,411	90	292	28.9 (80)	0.7%	2.2%	3.2
Moscow	262,418	4,821	13,591	27.8 (79)	1.8%	5.2%	2.8
St. Petersburg	36,667	2,421	5,711	23.6 (78)	6.6%	15.6%	2.4
Tatarstan, Rep.	6,509	34	4,043	22.7 (77)	0.5%	62.1%	118.9
Chuvash Rep.	7,774	70	1,438	22.7 (76)	0.9%	18.5%	20.5
Moscow region	68,223	1,187	8,228	22.1 (75)	1.7%	12.1%	6.9
Karachay-Cherkesia, R.	5,115	26	357	21.3 (74)	0.5%	7.0%	13.7
Leningrad region	6,811	79	1,949	20.2 (73)	1.2%	28.6%	24.7
Penza region	8,125	107	1,512	19.9 (72)	1.3%	18.6%	14.1
Kabard.-Balkaria, Rep.	6,514	78	560	19.8 (71)	1.2%	8.6%	7.2
Khanty-Mansi AD	19,609	166	769	18.6 (70)	0.8%	3.9%	4.6
Bashkortostan, Rep.	7,795	29	3,493	17.3 (69)	0.4%	44.8%	120.4
Mordovia, Rep.	5,462	38	760	17.2 (68)	0.7%	13.9%	20.0
North Ossetia, Rep.	4,922	67	512	17.1 (67)	1.4%	10.4%	7.6
Samara region	8,505	125	2,619	15.1 (65)	1.5%	30.8%	21.0
Novosibirsk region	11,404	358	1,930	13.1 (64)	3.1%	16.9%	5.4
Tver region	5,407	193	1,054	12.6 (63)	3.6%	19.5%	5.5
Sverdlovsk region	25,315	450	2,812	12.0 (59)	1.8%	11.1%	6.2
Tula region	9,254	322	1,121	11.6 (57)	3.5%	12.1%	3.5
Tumen region exc. ADs	7,771	30	726	11.0 (56)	0.4%	9.3%	24.2
Nizhny Novgorod reg.	27,688	473	2,095	10.9 (55)	1.7%	7.6%	4.4
Bryansk region	8,227	35	771	10.7 (53)	0.4%	9.4%	22.0
Lipetsk region	5,094	26	678	9.9 (48)	0.5%	13.3%	26.1
Yaroslavl region	7,228	36	689	9.0 (45)	0.5%	9.5%	19.1
Krasnoyarsk krai	16,870	477	1,049	7.3 (35)	2.8%	6.2%	2.2
Voronezh region	14,144	109	837	6.2 (31)	0.8%	5.9%	7.7
Rostov region	16,927	351	1,308	5.8 (28)	2.1%	7.7%	3.7
Arkhangelsk reg. exc.AD	10,825	251	176	2.9 (16)	2.3%	1.6%	0.7
Pskov region	4,635	65	75	1.7 (12)	1.4%	1.6%	1.2
Irkutsk region	16,810	248	185	1.4 (11)	1.5%	1.1%	0.7
Primorsky krai	9,603	103	78	0.7 (10)	1.1%	0.8%	0.8
Karelia, Rep.	3,130	16	19	0.5 (9)	0.5%	0.6%	1.2
Komi, Rep.	6,563	85	2	0.0 (8)	1.3%	0.0%	0.0
Zabaykalsky krai	4,600	57	-43	-0.8 (6)	1.2%	-0.9%	-0.8
Kemerovo region	6,437	44	-149	-0.9 (5)	0.7%	-2.3%	-3.4
Buryatia, Rep.	5,243	47	-69	-1.6 (3)	0.9%	-1.3%	-1.5
Altai krai	11,720	119	-283	-2.1 (2)	1.0%	-2.4%	-2.4

Sources: EMISS 2021b; Shpilkin 2021; the author's calculations.

Appendix 2. Official COVID-19 infections and deaths and additional deaths for the period from September to the end of 2020 (period 2)

Region	Official data		Additional mortality		Ratios		
	Infections	Deaths	Deaths	Increase, %	(3)/(2)	(4)/(2)	(4)/(3)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Chechen Rep.	6,398	54	1,458	69.9 (83)	0.8%	22.8%	27.0
Orenburg region	18,798	267	5,139	62.3 (82)	1.4%	27.3%	19.2
Lipetsk region	10,935	232	3,114	60.0 (81)	2.1%	28.5%	13.4
Samara region	22,896	481	8,114	58.8 (80)	2.1%	35.4%	16.9
Altai krai	21,192	758	6,059	57.6 (79)	3.6%	28.6%	8.0
Omsk region	20,829	684	4,335	55.5 (78)	3.3%	20.8%	6.3
Chelyabinsk region	21,023	434	8,118	55.2 (77)	2.1%	38.6%	18.7
Khanty-Mansi AD	21,685	375	1,825	54.3 (76)	1.7%	8.4%	4.9
Tatarstan, Rep.	6,775	148	7,163	51.1 (74)	2.2%	105.7%	48.4
Yakutia, Rep.	18,990	309	1,241	50.0 (72)	1.6%	6.5%	4.0
Udmurtia, Rep.	16,455	340	2,918	49.9 (71)	2.1%	17.7%	8.6
Mordovia, Rep.	8,027	57	1,696	49.9 (70)	0.7%	21.1%	29.8
Volgograd region	23,298	357	5,250	49.6 (69)	1.5%	22.5%	14.7
Yamalo-Nenets AD	18,695	244	424	49.4 (68)	1.3%	2.3%	1.7
Ulyanovsk region	24,241	373	2,748	49.2 (67)	1.5%	11.3%	7.4
Belgorod region	14,452	205	3,230	49.1 (66)	1.4%	22.3%	15.8
Tomsk region	18,712	149	1,924	48.8 (65)	0.8%	10.3%	12.9
Astrakhan region	13,317	312	1,708	48.0 (64)	2.3%	12.8%	5.5
Dagestan, Rep.	12,462	622	2,337	47.9 (63)	5.0%	18.8%	3.8
Novosibirsk region	16,481	609	5,549	47.8 (62)	3.7%	33.7%	9.1
Bashkortostan, Rep.	11,269	113	7,615	47.1 (60)	1.0%	67.6%	67.4
Amur region	12,480	58	1,655	45.6 (55)	0.5%	13.3%	28.5
Khabarovsk krai	24,980	113	2,614	45.2 (53)	0.5%	10.5%	23.1
Voronezh region	32,061	1,036	4,775	44.8 (52)	3.2%	14.9%	4.6
Rostov region	34,724	1,710	8,027	44.6 (51)	4.9%	23.1%	4.7
Krasnodar krai	16,521	748	9,540	42.1 (46)	4.5%	57.7%	12.8
Perm krai	22,763	918	4,772	41.8 (44)	4.0%	21.0%	5.2
St. Petersburg	205,457	5,273	8,080	41.8 (43)	2.6%	3.9%	1.5
Karelia, Rep.	24,415	144	1,178	41.5 (42)	0.6%	4.8%	8.2
Sverdlovsk region	33,267	1,059	7,604	40.6 (40)	3.2%	22.9%	7.2
Krasnoyarsk region	29,643	1,228	4,647	40.5 (39)	4.1%	15.7%	3.8
Chuvash Rep.	8,607	458	2,051	40.5 (38)	5.3%	23.8%	4.5
Nizhny Novgorod reg.	42,127	1,173	6,020	38.7 (34)	2.8%	14.3%	5.1
Moscow region	87,107	1,712	11,829	38.5 (33)	2.0%	13.6%	6.9
Moscow	547,351	6,388	15,407	38.1 (32)	1.2%	2.8%	2.4
Arkhangelsk region	32,502	188	1,719	37.4 (30)	0.6%	5.3%	9.1
Komi, Rep.	23,790	490	1,189	36.5 (28)	2.1%	5.0%	2.4
Irkutsk region	23,709	972	3,737	35.9 (26)	4.1%	15.8%	3.8
Buryatia, Rep.	20,481	544	1,201	34.6 (22)	2.7%	5.9%	2.2
North Ossetia, Rep.	7,088	34	752	32.9 (17)	0.5%	10.6%	22.1
Pskov region	18,660	35	1,013	29.5 (7)	0.2%	5.4%	28.9
Novgorod region	13,969	23	774	23.6 (1)	0.2%	5.5%	33.7

Sources: EMISS 2021b; Shpilkin 2021; the author's calculations.

Appendix 3. Official COVID-19 infections and deaths and additional deaths for the first half of 2021 (period 3)

Region	Official data		Additional mortality		Ratios		
	Infections	Deaths	Deaths	Increase, %	(3)/(2)	(4)/(2)	(4)/(3)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Moscow	548,446	11,239	24,201	39.7 (82)	2.0%	4.4%	2.2
Leningrad region	24,939	1,496	4,037	34.9 (81)	6.0%	16.2%	2.7
St. Petersburg	227,528	8,652	10,346	34.2 (80)	3.8%	4.5%	1.2
Karelia, Rep.	22,435	469	1,400	31.5 (79)	2.1%	6.2%	3.0
Moscow region	158,831	3,612	13,372	29.1 (78)	2.3%	8.4%	3.7
Kursk region	19,928	627	2,478	29.1 (77)	3.1%	12.4%	4.0
Novgorod region	13,896	84	1,269	26.0 (76)	0.6%	9.1%	15.1
Kirov region	21,144	162	2,386	25.8 (75)	0.8%	11.3%	14.7
Lipetsk region	17,481	639	2,169	25.6 (74)	3.7%	12.4%	3.4
Nizhny Novgorod reg.	55,028	2,571	5,959	25.1 (73)	4.7%	10.8%	2.3
Khanty-Mansi AD	18,594	268	1,218	24.0 (72)	1.4%	6.6%	4.5
Oryol region	16,026	477	1,399	23.9 (71)	3.0%	8.7%	2.9
Yaroslavl region	21,545	516	2,164	23.4 (70)	2.4%	10.0%	4.2
Tver region	23,591	730	2,421	23.1 (69)	3.1%	10.3%	3.3
Bryansk region	21,349	291	2,080	22.7 (68)	1.4%	9.7%	7.1
Krasnodar krai	24,144	2,490	8,141	22.7 (67)	10.3%	33.7%	3.3
Chuvash Rep.	10,916	1,019	1,721	22.5 (66)	9.3%	15.8%	1.7
Mordovia, Rep.	8,501	235	1,208	22.5 (65)	2.8%	14.2%	5.1
Ryazan region	12,894	449	1,952	22.4 (64)	3.5%	15.1%	4.3
Saratov region	30,929	913	3,742	21.9 (62)	3.0%	12.1%	4.1
Tula region	19,925	1,463	2,583	21.8 (61)	7.3%	13.0%	1.8
Samara region	36,194	1,673	4,593	21.4 (59)	4.6%	12.7%	2.7
Kaluga region	16,341	202	1,535	20.6 (58)	1.2%	9.4%	7.6
Mari El Republic	5,125	171	796	19.0 (49)	3.3%	15.5%	4.7
Rostov region	47,657	2,612	5,413	18.7 (47)	5.5%	11.4%	2.1
Tatarstan, Rep.	9,152	358	3,952	18.3 (45)	3.9%	43.2%	11.0
Voronezh region	44,322	2,059	3,090	18.2 (44)	4.6%	7.0%	1.5
Yamalo-Nenets AD	7,993	97	225	18.0 (43)	1.2%	2.8%	2.3
Novosibirsk region	18,935	1,096	2,959	16.3 (37)	5.8%	15.6%	2.7
Krasnoyarsk krai	31,119	2,246	2,448	13.6 (28)	7.2%	7.9%	1.1
Chechen Rep.	4,137	65	441	13.6 (27)	1.6%	10.7%	6.8
Bashkortostan Rep.	22,288	453	3,373	13.5 (25)	2.0%	15.1%	7.4
Irkutsk region	33,546	1,523	1,989	12.5 (19)	4.5%	5.9%	1.3
Altai krai	21,497	1,574	2,037	12.1 (18)	7.3%	9.5%	1.3
Astrakhan region	17,135	476	679	11.4 (17)	2.8%	4.0%	1.4
Zabaykalsky krai	19,474	348	762	11.2 (16)	1.8%	3.9%	2.2
Sverdlovsk region	35,402	2,334	3,257	11.1 (15)	6.6%	9.2%	1.4
Komi Republic	16,303	437	548	11.0 (13)	2.7%	3.4%	1.3
Khabarovsk krai	20,497	283	941	10.5 (12)	1.4%	4.6%	3.3
Buryatia, Rep.	18,535	641	578	10.2 (10)	3.5%	3.1%	0.9
Perm krai	30,672	1,569	1,454	8.4 (7)	5.1%	4.7%	0.9
Khakasia Rep.	7,471	330	205	6.0 (5)	4.4%	2.7%	0.6

Sources: EMISS 2021b; Shpilkin 2021; the author's calculations.

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