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What do we know, what we don't and what we cannot know so far about COVID-19: The case of Russia

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Abstract
The paper surveys the Russian experience of COVID-19 pandemia over the two waves: April-May and October-December 2020. We discuss the implementation of the various policy measures, including hospital capacity buidling, quarantine restrictions and behavioral nudging, and compare their efficiency against social costs. The analysis of COVID-19 dynamics is much restricted by the quality of the available data, which remains poor for a number of medical, statistical and political reasons. We argue that exogenous sources, such as the number of internet search queries related to COVID and excess mortality over the previous year, provide a more impartial picture of the pandemia. Using panel data regression analysis, we find that both official COVID-19 casualties and excess mortality are correlated with internet queries and population density, but lower excess mortality only is also explained by the exogenous characteristics of healthcare system, such as the number of ambulance staff and mean duration of hospital treatment. We conclude that better information and more diversified health policies are needed to fight the pandemia and its consequences.

JEL Classification: I18; I12; J11

Keywords
COVID-19 — excess mortality — medical statistics — internet queries — panel data

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Introduction

Global pandemia of COVID-19 is unprecedented for the humankind in many respects, ranging from biomedical and epidemic issues and challenges to economic crisis and policy responses. No single country or international organization has had the experience needed to deal with challenges of that scale. The previous global pandemia, the Spanish flu of 1918-1920, took place almost exactly a century ago. Hence at least three generations in developed countries have been living under the impression that modern societies at large are epidemic-proof. All of a sudden, this has become untrue for millions: According to the Coronavirus Resource Center of Johns Hopkins University coronavirus.jhu.edu/map.html, over 65 million people were caught by the SARS-CoV-2 by early December 2020; and over 1.5 million registered deaths of COVID-19 amount to 2.5% of the average global annual figure.

Since the Spring 2020, Russia has been one of the leading nations affected by the global pandemia. According to official records, by the mid-May 2020 Russia was the runner-up in the world list of contagions, with over 300,000 confirmed cases of coronavirus. By the end of 2020, it remains in the top of the list, next to the US, India and Brazil, and competing for the 4th place with France, with over 2.4 million infected. The spread of COVID in Russia began from its capital city of Moscow, where it apparently penetrated from Europe, primarily Italy and Spain around mid-March of 2020. At the peak of the first wave, Moscow city accounted for over a half of newly infected people.

Following the set of anti-epidemic measures, which included a ban on all international contacts and nationwide business lockdown from 30 March till 11 May, the number of countywide daily cases went down to under 5,000 per country by August 2020 (see Figure 1). Yet in September, the second wave has arrived, and its consequences were ways more severe: the maximum number of new cases per day amounted to nearly 30,000 in the late November[1]. Over that second wave, the main sources of contagion have been domestic and dispersed over the whole country. Figure 2 shows the total number of cases confirmed in the 83 regions of the mainland Russia as of November 25, 2020. The leading spots on that map are Moscow (over 570,000 registered cases) followed by Moscow region and the city of St. Petersburg (both just over 100,000 cases); 15 more regions from all over the country have over 25,000 registered cases.

The above map is not the most informative, because the distribution of population and economic activity in the country is quite uneven: about 3/4 of population and over 2/3 of

[1] All data on Russian COVID spread are taken from Yandex datalens available here yandex.ru/covid19/stat (Russian). All links last accessed January 19, 2021

economic activity is concentrated in the European part, to the West of the Urals mountains. More telling is Figure 3 which displays the number of cases per 1,000 inhabitants of each region. In these terms, Moscow city is still one of the leaders (46 persons per 1,000 inhabitants), but other largely affected regions are spread all over the country: Republics of Altay (49 persons) and Tyva (37 persons) and Yamalo-Nenets Autonomous District (47 persons) are in Siberia, Magadan region (38 persons) in the Far East, Murmansk (34 persons) in European North, and Republic of Kalmykia (41 person) – in European South parts of the country. These relative figures imply uneven patterns of pandemics propagation, and raise questions about what factors may be responsible for the SARS-CoV-2 spread in the country.

Determinants of these trends are explored in the remaining sections of the paper. Section 2 describes policy responses of Russia on the pandemic threat, and compares them across waves and regions. Section 3 discusses data quality, including possible sources of discrepancies and misinterpretations. Section 4 presents an empirical analysis searching for possible explanation of the causes and factors of the epidemic spread in Russia. Section 5 concludes.

Policy response

Russian authorities took seriously the threat of COVID-19. At the beginning of the first wave in March 2020, policy decisions take have been pre-emptive and multi-directional. Centralized medical response followed nationwide standards[2], and included mobilization of existing resources, including medical students and the military, allocation of specific hospitals to treat COVID patients, and deployment of over 165,000 thousand hospital beds for patients in need of intensive therapy. In Russia, like everywhere, the capacity to provide hospital treatment to all patients in need has been viewed as one of the major indicators of governance efficiency. This target has largely been met over the first wave, with at most 110 thousand hospital beds occupied at its peak[3]. The city of Moscow which had to meet the first wave, took the lead in setting up the standards of regional responses, opening a brand new specialized hospital in less than a month, and assigned over 24,000 ad hoc hospital beds equipped to treat COVID patients.

Quarantine restrictions and behavioral response

From the very beginning the authorities have relied on quarantine restrictions, aimed at mitigation of social contacts and smoothening out the peak of contagions (Wilder-Smith & Feedman, 2020). In Russia, it took a form of the regime of "public holidays" announced by the President Putin from March 30, 2020[4] and prolonged nationwide several times till May 11, 2020. All business activities of public and private enterprises except for those serving the vital necessities of the citizens have been suspended or transferred online. Education of all levels went online, intermitted with several extended vacations. People of all ages were urged to maintain the regime of 'self-isolation' in their homes, except for the vital visits to the nearest shop or pharmacy, and elderly citizens over 65 were required to stay home. In Moscow and some other big cities, this regime has been enforced by the system of obligatory electronic passes to get out of homes, and a system of electronic monitoring of people diagnozed with COVID or contacting infected persons. In the city of Moscow, a fine of 4,000 Rub. (about US$60) has been imposed on every infected person one whose personal mobile device was registered in more than 50 meters away from home, or who failed to produce an immediate home selfie upon a push-up request[5]. Fines were also announced, but enforced to a much lower extent, for not wearing masks and gloves in public transport. These measures of administrative regulation have been backed up by a rather massive 'nudging' campaign, including social advertisements, call for volunteers to help the elderly, and massive promotion of online deliveries and other services.

Most people seem to have complied with these regulatory restrictions. Yandex, the largest Russian internet-aggregator, has introduced a special Isolation index[6], which varies from 0 (usual number of people outdoors in peak hours in big cities in February-March 2020) to 5 (number of people outdoors in the midst of the night). Immediately after the announcements of the restrictions in the late March, this index went up from 1.2 to about 3.5. Figure 4 features the dynamics of this index for the city of Moscow (blue line; Peaks in the index correspond to weekends), along with the number of new cases (bars). A sharp increase in its value in the end of March depicts a very prompt reaction of the city residents to the announcement of the holiday regime, going much beyond what might have been warranted by effective fines for violations of the quarantine regime. It seems plausible that the decrease in an erupting part of the first wave that occurred around mid-April is largely due to this fact, allowing for an up-to fifteen-day incubation period of the virus. This indirect evidence seems to support the findings that social isolation is instrumental in restricting pandemic spreads in other countries (Jeffrey e.a., 2020; Flaxman e.a., 2020), and is further backed up by the data.

The social cost of quarantine

The quarantine regime inevitably imposes some social costs. Forced shutdown has been detrimental to many businesses, especially small ones, whose existence has been dependent on

[2] static-0.minzdrav.gov.ru/system/attachments/attaches/000/052/550/original/%D0%9C%D0%A0_COVID-19_%28v9%29.pdf?1603788097 (Russian).

[3] rbc.ru/politics/22/05/2020/5ec7be1a9a794743a79f2436?from=newsfeed (Russian).

[4] At the time of announcement on March 25, the total number of confirmed cases in the country has been under 200, of whom 75% were registered in the city of Moscow.

[5] According to the records of the Moscow city government, in April-November 2020, there were over 100,000 cases of violations of the regime of 'compulsory self-isolation' in the city.

[6] yandex.ru/covid19/stat#activity (Russian). This index, based on data collected by Yandex, Apple and Otonomo services, measures the number of users outside of their places of residence according to the signals coming from their mobile devices. It is also sometimes represented as inverted-scale, 'activity index'.

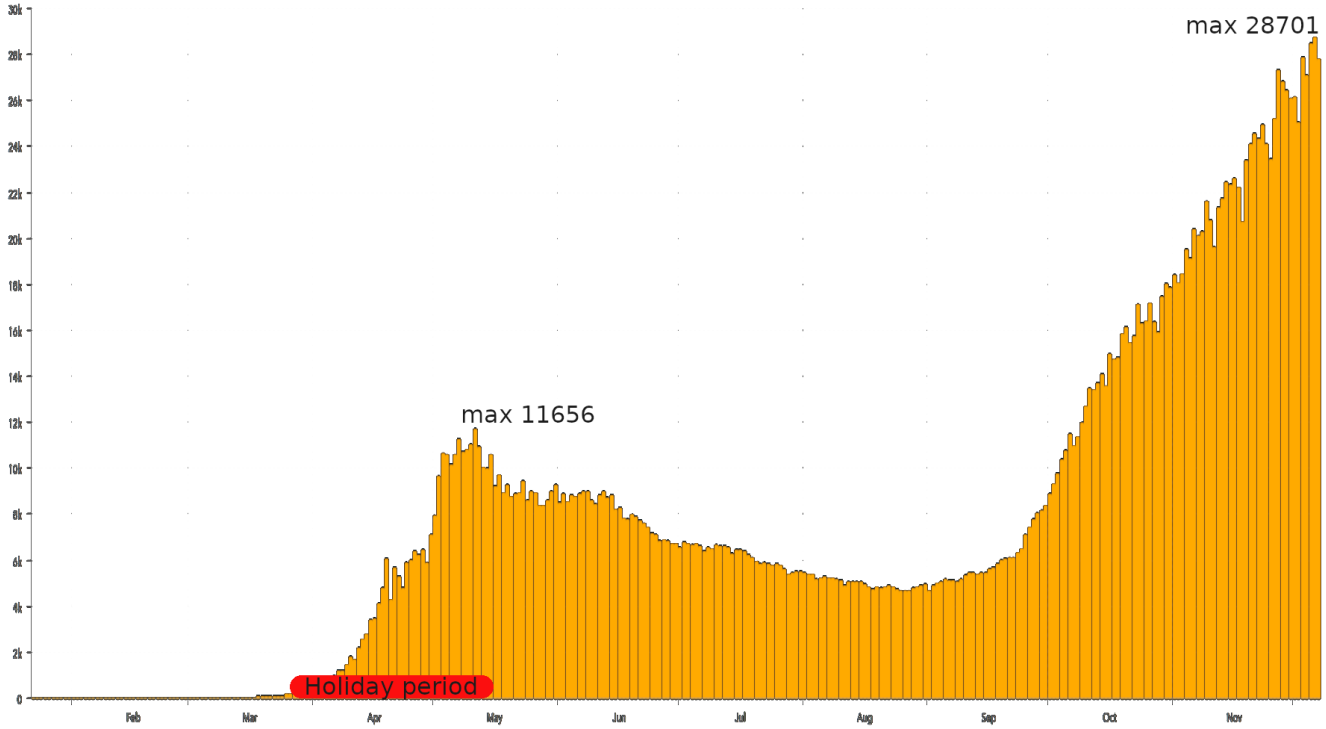

Figure 1. Waves of COVID pandemia in Russia.
Source:coronavirus.jhu.edu/map.html

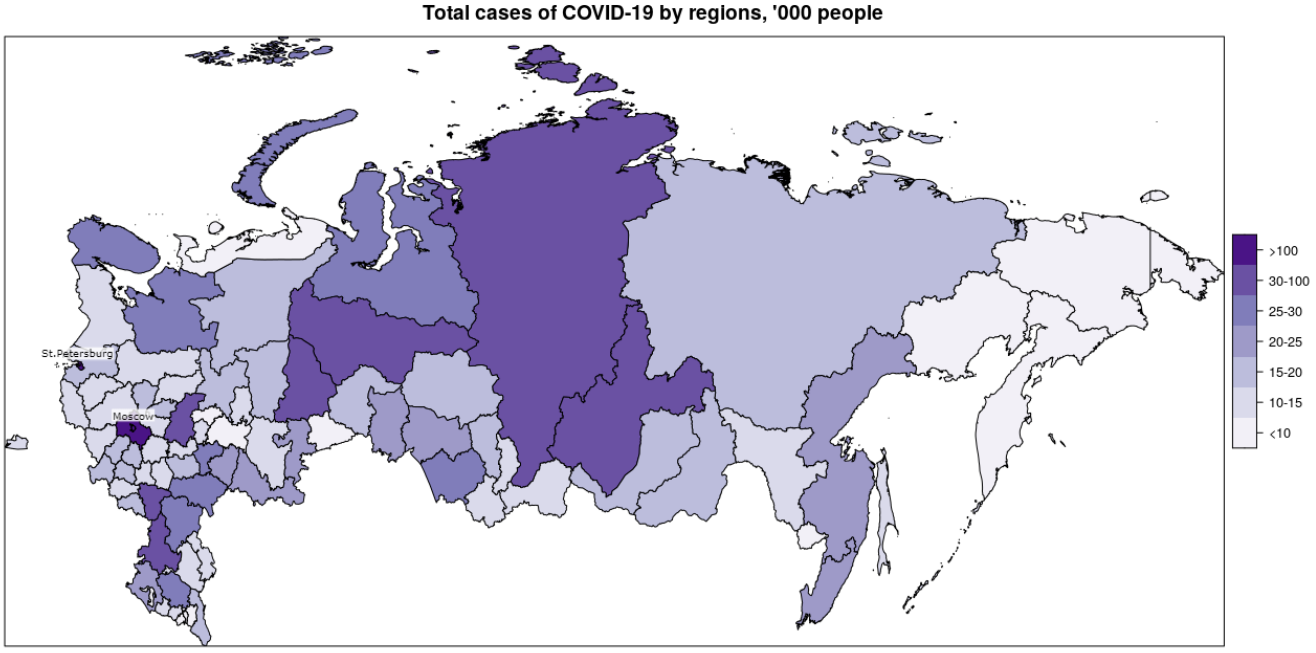

Figure 2. Total number of COVID cases by regions by 25 November 2020 (excluding Crimea).

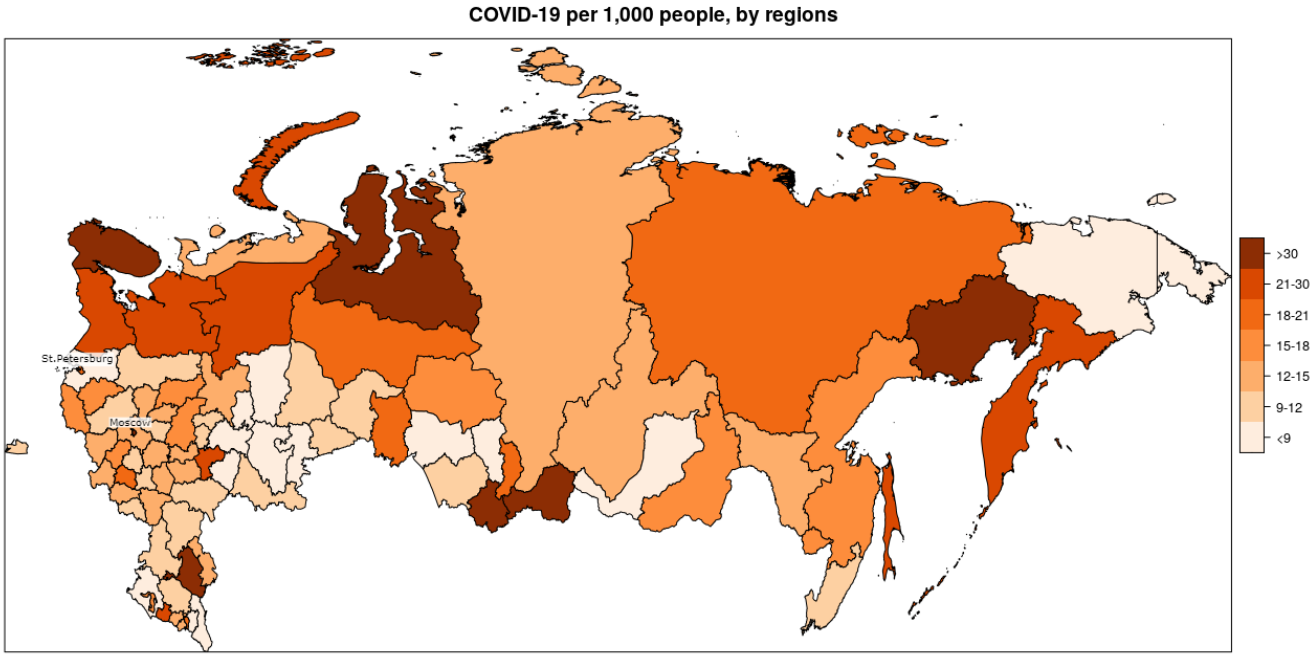

Figure 3. Number of per capita COVID cases by regions by 25 November 2020 (excluding Crimea).

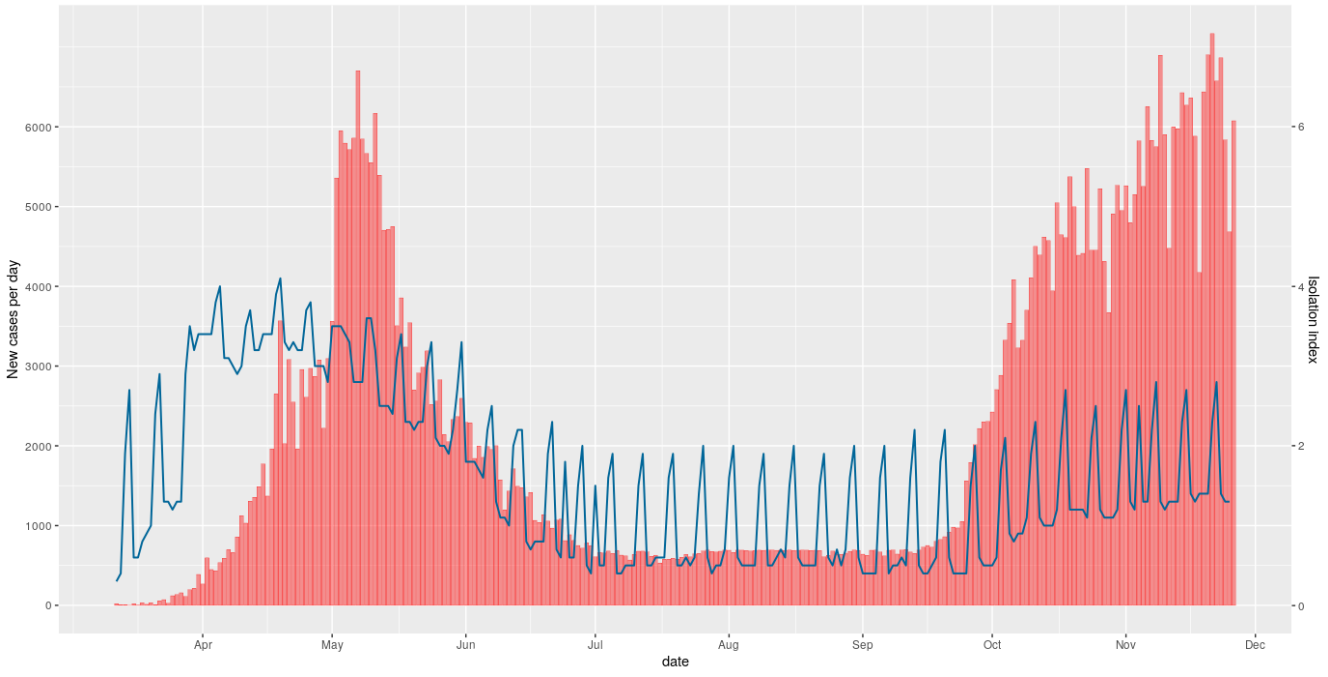

Figure 4. Newly registered cases of COVID-19 and isolation index by Yandex in Moscow city.

continuous cash flow. According to some estimates, at least 10% of existing firms have been forced to shut down over 2020, and about one third of them were reportedly struggling to survive[7]. Such adverse consequences of the quarantine restrictions were not hard to foresee – but the response of the

[7] openmedia.io/news/n2/za-vremya-pandemii-v-rossii-obankrotilis-45-mln-malyx-biznesov-i-ip/

Russian government was peculiar. While support packages of most OECD countries to local consumers and enterpreneurs amounted to about 10% of GDP[8], in Russia it was only about 1.2% of GDP[9]. A substantial part of that money went to the largest companies; medium and small-sized enterprises have ultimately received tax holidays (not credits or waivers), and direct subsidies of 12,400 RuR (about 160 US$) per employee provided the firm did maintain at least 90% of its pre-crisis workforce. Moreover, the Russian government has been apparently the only one in the world who announced a tax increase as one of the first measures facing the threat of the COVID recession. One is the reasons for that may be concerns about tax revenues in decline. According to some reports, the city of Moscow has lost about 20% of its tax revenues in the first four months of the current fiscal year; in the whole country, over the summer 2020 the year-to-year loss of tax revenues amounted to 13%[10]. The imposition of fines for violation of the self-isolation regime and penalties for not wearing masks and gloves in public transport were also largely perceived as fiscal rather than regulatory measures.

Not surprisingly, public attitude to the quarantine regime has been uneven. Many people have viewed restrictions as unduly and unneeded, especially at first, when the absolute numbers of those affected have been relatively low. Others, especially families with children, have risen up against distance learning at schools. Further, some people have criticized the programme of 'electronic collars' on the ground of mistaken fines, or as an implicit attempt to foster total control over the citizens.

All in all, policy measures announced and implemented by the Russian federal authorities seem to put much of economic burden of the COVID crisis on the shoulders of private businesses and the citizens. The authorities themselves have focused on medical assistance to the infected, securing excess capacity of the clinical facilities in case of further uprising of the epidemia, and measures in support of the medical personnel dealing with COVID. Over the Summer 2020, the federal authorities have gradually delegated the epidemological, fiscal and economic decisions on gradual relief of the restrictions to the local governors[11]. Largely because of this public disconsent, the government has decided not to re-introduce the quarantine regime during the second wave, which has begun since September. During that wave, restrictions have been limited mostly to school and university teaching which was transferred to online regime in the large cities, and the number of people allowed on public gatherings, such as concerts or clubs. Accordingly the Isolation Index was almost constant during the second wave, even though it has been much more overwhelming and severe. In some places, such as the city of St. Petersburg over 95% of the 10,000 hospital bed capacity has been exhausted by December 2020[12]. At the same time, the government apparently relies on intensive testing (over 85 mln.tests completed in the country overall) and vaccination of the Russian-made Sputnik V vaccine, which has started in November 2020.

Data challenge of COVID-19

The above evidence raises question about which factors have been determining the trajectories of COVID-19 in Russia, and the relative success and failure of anti-pandemic measures. However, a qualified look at these issues crucially depends on the quality of data – yet its analysis is complicated both in global and in local perspective.

Conventional public figures featuring confirmed new cases, recovery, mortality and related indicators are available at the Johns Hopkins University Coronavirus Resource Center. According to these figures, Russia is among the global leaders in terms of contagion, but only 15th in case-fatality ratio (1.8%), well behind such countries as the UK, Italy, Spain or France, and in line with the US, Germany and Ukraine[13]. In terms of incidence ratio (number of registered cases per 100,000 inhabitants) Russia is in the lower tier of Europe (1,819 persons), much less than the leading Luxemburg (6,722) and Montenegro (6,658)[14]. These rankings may appear erratic, for several interrelated reasons.

First, medical policies are established at the national level. Hence the decision to classify a particular case or death as COVID-related is ultimately left upon their discretion, despite some attempts of the WHO to coordinate them[15]. In accordance with the recommendations of the Russian Ministry of public health, Russian medical doctors are requested to report COVID as the principal cause of death only following confirmation from autopsy and biochemical analysis of the patient's specimen based on Polymerase chain reaction (PCR)[16]. Along with that, medical doctors were advised to state any accompanying disease as the primary cause of death, has the COVID-diagnosed patient had any. Since Summer 2020, the Russian statistical agency started reporting death from COVID-19 as primary and auxiliary cause. This statistics is collected separately from medical reports, and is believed by many to be more accurate. Amid the absence of any other sensible causes, excess mortality of 2020 relatively to 2019 is attributable to COVID-19. For March-November 2020, this excess mortality amounts to over 243,000 deaths, or about

[8] tmf-group.com/en/news-insights/coronavirus/government-support-schemes/#U

[9] worldbank.org/en/country/russia/brief/covid-19-response-jobs-sme-russia

[10] nifi.ru/images/FILES/COVID-19/taxview.pdf (Russian).

[11] Another, political reason of revocation of the quarantine regime was a nationwide referendum for the changes in constitution planned originally for the late April, but eventually conducted in early July, when the first wave seems to have gone.

[12] gov.spb.ru/press/government/203742/ (Russian).

[13] coronavirus.jhu.edu/data/mortality

[14] statista.com/statistics/1110187/coronavirus-incidence-europe-by-country/

[15] who.int/classifications/icd/Guidelines_Cause_of_Death_COVID-19-20200420-EN.pdf?ua=1

[16] static-0.minzdrav.gov.ru/system/attachments/attaches/000/052/550/original/%D0%9C%D0%A0_COVID-19_%28v9%29.pdf?1603788097, version 9 of 26/10/2020.

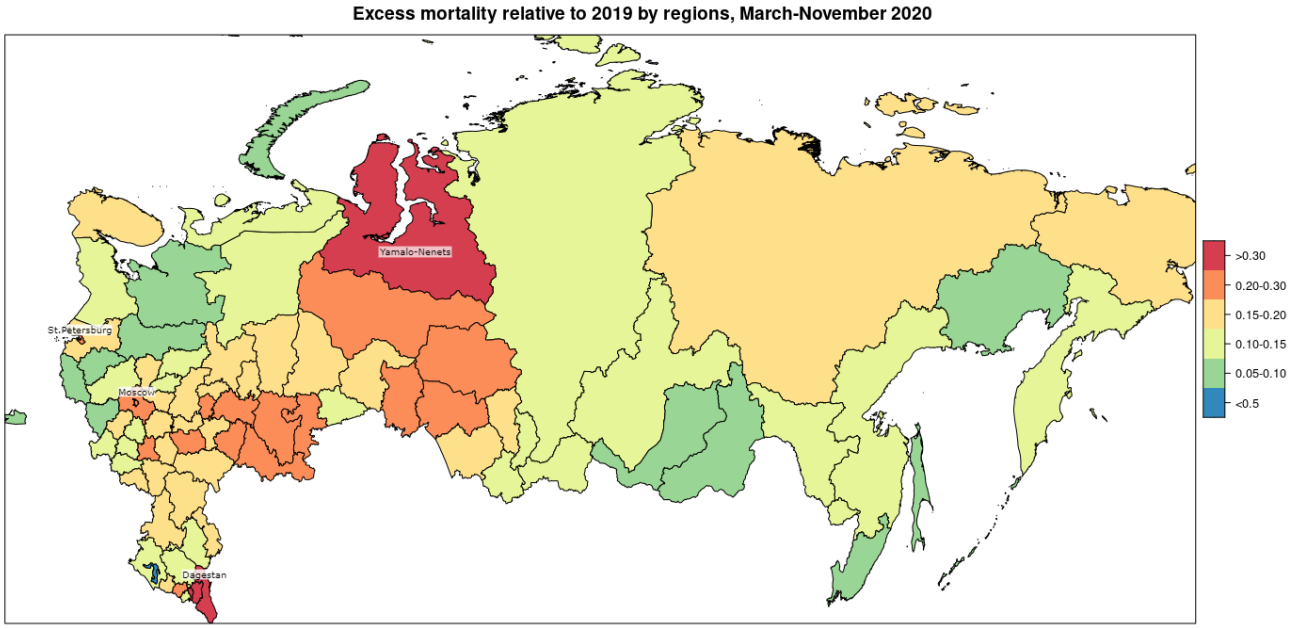

Figure 5. Excess mortality in March-November 2020 relative to 2019.
Source: Own calculations based on Rosstat data.

18%. Figure 5 shows excess mortality by Russian regions: as can be seen, this indicator went up the most in the North Caucasus: e.g. in the republic of Checnya it amounts to 43%. In many other regions of Central Russia and Western Siberia, this indicator exceeds 20%, and continues growing. Of course, it is hard to claim that all this excess mortality is directly caused by COVID: given the excessive pressure on the national healthcare system, some people might have died of other causes. However, an excess share of such casualties may be partly attributed to the relative shortage of resources distorted due to the pandemia.

Unambiguous attribution of new cases to COVID is more problematic. First of all, in accordance with the national standards, a patient is officially recorded as COVID-infected if his or her diagnosis has been confirmed by the PCR tests; all other diagnostic measures, such as Computer Tomography or X-rays, are not sufficient on their own. Because of that, many patients whose diagnosis has not yet been confirmed are qualified as patients of other diseases, predominantly off-hospital pneumonia, although these are treated in the same COVID-specialized hospitals, or at home if their condition permits. Another reason is that the existing PCR test predominantly comes from one local producer – the State Scientific Center "Vector" from Novosibirsk, and its precision has been relatively low, calling for its repeated application. Last but not least, the quality Russian COVID-19 data has been questioned on the ground of data manipulation[17]. Local governors and healthcare authorities may have strong incentives to mitigate the severity of the situation, especially if their region lacks proper healthcare facilities due to the quality of their governance. Evidence abounds: over the first wave, in some regions, the number of newly diagnosed people has been constant for over fifteen days. In the republic of Dagestan about 40 medical doctors have been infected and perished over a short time period, which has apparently not been included in the records[18]. Over the second wave, a hospital in the Kursk region has been officially fined for mitigating the number of medical specialists infected by COVID[19]. Also, for some time at least, the official statistics did not seem to include many local cases of infection, such as those in prisons, military or shift work settlements, which together account for several million inhabitants many of whom are in close contacts with each other. Finally, the strength of anti-COVID measures in large cities may actually backfire on the quality of statistical reporting: afraid of being fined for violation of quarantine, be it imaginary or real, some infected people in medium condition prefer to stay home and take care of themselves rather than reporting to the hospitals.

Most of this evidence, however, remains indirect, and the relative contribution caused by them remains indistinguishable from observational errors coming from the quality and frequency of tests, as well as data manipulation. In the next section we shall see to what extent are these conclusions warranted in light of the statistical data.

[17] bloomberg.com/news/articles/2020-05-13/experts-question-russian-data-on-covid-19-death-toll

[18] meduza.io/feature/2020/05/20/ministr-ponimal-chto-nazrevaet-katastrofa (Russian).

[19] kursk-izvestia.ru/news/164757/?nw=1608408437000 (Russian).

Variable	N.	Mean	S.D.	Median	Min.	Max.
Disposable income per capita	83	30.43	13.28	26.83	15.60	79.40
Share of rural population	81	29.92	12.63	29.00	1.30	71.00
Share of population over retirement age	83	25.04	4.69	25.80	10.80	31.30
Hospital beds, per 1000	83	7.54	1.51	7.38	1.09	13.09
Mean hospital bed occupation	83	11.12	1.15	11.12	7.14	14.69
Share of ambulances arrival within 20 min	83	88.59	7.47	90.20	65.00	99.60
Ambulance doctors per 10,000	83	0.874	0.425	0.84	0.19	2.57
Ambulance staff, per 10,000	83	6.55	1.17	6.6	3.4	10.4
Ambulance cars, per 1,000	82	0.179	0.0870	0.17	0.03	0.74
Budgetary expenses on healthcare per capita	83	7.12	8.42	4.42	0.97	47.24
Medical doctors per 10,000	83	37.88	7.42	37.20	24.20	65.50
Medical staff, per 10,000	83	93.25	16.53	92.00	61.40	147.00
Doctor epidemologists, per 10,000	83	0.46	0.18	0.42	0.22	1.22
Isolation index	21399	1.70	0.84	1.50	0.10	4.30
'Lost smell' search, per 1 mln	22576	94.80	109.00	53.90	0.00	773.00
'Buy antiseptic' search, per 1 mln	22576	5.32	13.10	1.81	0.00	280.00

Note: *Sources: Rosstat for exogenous regional data, Yandex for COVID-related data.*

Table 1. Summary statistics of explanatory variables

Determinants of COVID spread: what do the data say

In order to explore the determinants of COVID spread by regions of Russia, we use an excessive battery of explanatory variables. Major socioeconomic and healthcare system indicators by regions are taken from the official Russian statistics (Rosstat, rosstat.gov.ru/) from the previous years (2018, the most recent for which full data is available). This ensures that these variables are exogenous to the dynamics of COVID-19 by regions.

Summary statistics of explanatory variables are presented in Table 1. General indicators include average monthly incomes per region (as proxy to regional wealth), share of rural population (as proxy to population density), and share of regional population over retirement age (60 for males, 55 for females at the time).

The next set of explanatory variables describe the ex ante (before COVID) state of the healthcare system. Relevant variables include number of hospital beds per capita, mean duration of occupation per hospital bed, per capita number of ambulance medical doctors, medical staff and ambulance cars, as well as share of ambulance arrivals within 20 min (which is the normative time in the cities). Further to this, we control for the share of medical budget in regional budgets, as well as the total number of medical doctors and staff, and specifically for doctor epidemologists per 10,000 inhabitants of the region. All these variables are expected to contribute to fight the pandemia prior to its propagation.

Finally, we use dynamically changing explanatory variables available from yandex. One of them is the Isolaton Index[20] described above, calculated over all cities with population over 50,000 inhabitants, which account for the wast majority of registered cases. This index is calculated at a daily basis from 0 (no isolation) to 5 (everyone stays at home). Since the quarantine has an impact over future spread of the disease, we use as explanatory lagged values of this variable to check if it mitigates the disease after the incubation period. Yandex also provides the number of search requests by regions per 1 million over a set of words related to COVID, such as 'call an ambulance', 'antibodies', 'lost smell', 'buy antiseptic', 'buy mask' or 'what to do if the ambulance does not arrive'. Despite this data is indirect (in particular, may be boosted up by automated search by bots etc.), it may serve as a good and exogenous measure of the perceived severity of pandemia in the region. Since many of these indicators are correlated, we use 'lost smell' as most generic symptoms, and 'buy antiseptic' as a generic proxy to precautionary measures taken by people in the respective region.

[20] yandex.ru/company/researches/2020/podomam (Russian).

Dependent variable: cases	RE	RE, excluding Moscow
Lag Isolation index, 1-14 days	-1,223.965***	-848.215***
	(380.539)	(87.870)
Lag 'buy antiseptic' search, 15-45 days	-132.645***	-23.835***
	(18.852)	(4.598)
Other controls	Yes	Yes
Observations	1,500	1,480
R2	0.072	0.082
Adj.R2	0.064	0.074
F-Statistic	115.084***	131.686***

Notes: Standard errors in parentheses. *p<0.1; **p<0.05; ***p<0.01, Other controls: yes.

Table 2. Isolation effect and the new cases

We begin with the analysis of the effect of holiday period on the dynamics of the new cases over the period from the early spells of pandemia in Russia, March 10, through May 5, 2020. Table 2 shows the coefficients of the panel data linear model[21] regressing the number of daily new cases on Isolation Index by regions, lagged 1 to 14 days (the incubation period of SARS-CoV-2), as well as yandex search marker 'buy antiseptic' averaged over the period from 15 to 45 days back, and a bunch of exogenous control variables from Table 1. The two coefficients of interest have the expected signs and are highly significant, confirming the intuition from Figure 1. Higher isolation under the quarantine regime has had an impact on smothening out the pandemic spread over the first wave, and higher caution represented by larger interest in antiseptics had served the same purpose. Model (1) shows the effect for all regions, while model (2) confirms the same tendency on a restricted data sample excluding Moscow. On the other hand, this tendency serves only to shift and smoothen the peak, but not to overrun it: once the estimation window is shifted towards the peak of the first wave, the mitigating effect of isolation disappears.

Let us now turn to Table 3, which explores the determinants of casualties from COVID-19. The first model regresses cumulative registered deaths from COVID-19 on average search requests 'loss smell' and 'buy antiseptic' over the last month, accompanied with medical and socioeconomic indicators from Table 1. Inasmuch as medical statistics may be not very accurate (as discussed above), the second model estimates the same model using monthly excess mortality rates over 2019 as dependent variable, and average values of 'loss smell' and 'buy antiseptic' lagged by one month, i.e. the same time period as in the first three models[22]. We find that the two lagged variables have expected signs and are significant, although their effect under excess mortality are stronger, suggesting that the residual variance of casualties with respect to behavior is larger when the outcome variable is measured independently of the pandemic development.

The latter model also yields more significant exogenous covariates. More urbanised and richer areas are expectedly hit more severely, which arguably also explains the positive sign of hospital capacities. Negative and highly significant coefficient of the customary duration of hospital treatment presumably implies that the tradition of longer hospital care is favourable for survival rates. Negative impact of the number of ambulances medical staff sends an important signal that availability of emergency help following initial diagnostics might be about the most important survival factor. Symptomatically enough, none of the other healthcare-related variables seem to have a long-term impact over the pandemic-induced mortality rates.

Conclusion

The challenge of COVID-19 has posed numerous problems to the national economies and healthcare systems. Comparison of pandemic trajectories (Adam, 2020; Flaxman e.a., 2020), selection of best policies to face the pandemic threat (Avery e.a., 2020; Farboodi e.a., 2020) and their macroeconomic implications (Fernández-Villaverde & Jones, 2020) will remain of interest to scientists and the global community. The case study of Russia, with all its limitations, seems to offer several insights. First, the quarantine measures introduced at the first spells of the pandemia do have an effect but only in

[21] Breusch-Pagan LM test shows there is substantial heterogeneity in the data, so that panel data models are strictly preferred to pooled OLS.

[22] For brevity of exposition we report here only the random effect model and best specification according to LM test.

Variables	Death from COVID-19	Excess mortality over 2019
Lag 'lost smell' search, 60-30 days	0.862***	1.724***
	(0.011)	(0.193)
Lag 'buy antiseptic' search, 60-30 days	-4.792***	-8.180***
	(0.133)	(2.360)
Share of rural population	-4.018**	-7.842**
	(1.982)	(3.287)
Share of population over retirement age	-5.343	7.110
	(5.241)	(8.705)
Disposable income per capita	7.245*	11.997*
	(4.043)	(6.693)
Hospital beds, per 1000	25.061	61.542**
	(16.546)	(27.398)
Mean hospital bed occupation	-24.812	-93.540***
	(18.200)	(30.172)
Share of ambulances arrival within 20 min	2.589	6.352
	(2.533)	(4.195)
Ambulance doctors per 10,000	70.837	-130.620
	(70.587)	(116.873)
Ambulance staff, per 10,000	-33.294	-79.437**
	(24.379)	(40.381)
Ambulance cars, per 1,000	19.120	-551.314
	(302.196)	(500.349)
Budgetary expenses on healthcare per capita	-10.506	-17.867
	(7.303)	(12.093)
Medical doctors per 10,000	-5.638	-1.834
	(5.021)	(8.314)
Medical staff, per 10,000	-1.714	-4.104
	(2.038)	(3.378)
Doctor epidemologists, per 10,000	-28.208	311.776
	(198.892)	(329.314)
Constant	599.633	1,089.667*
	(391.005)	(648.050)
Observations	19,360	640
R2	0.363	0.232
Adj.R2	0.363	0.214
F-Statistic	11,041.920***	188.529***

Notes: Standard errors are in parentheses. *p<0.1; **p<0.05; ***p<0.01 *p<0.1; **p<0.05; ***p<0.01.

Table 3. Determinants of registered deaths from COVID-19 and excess mortality

the short run, as may be necessary to smoothen out the peak and gain some time to build up the capacity of the national healthcare system. However, in the long run this measure is not sufficient to fight the pandemia. At best it can relegate the peak, and does so at the expense of the citizens, which hurts the national economy and makes repeated utilization of this measure increasingly costly.

Second, the national healthcare system has been virtually unprepared to the challenges posed by COVID-19. Data analysis suggests that mortality rates are virtually unrelated to

the pre-existing capacities, indicating that the capacities to save lives are restricted, and mostly limited to general care of those in need of intensive treatment. Clinical experience and availability of medical staff in charge of treatments appear to be the only effective techniques; the rest depends on the patient's own health state, the efficiency of vaccination and public immunity. In the meantime, personal care of own safety, including proper sanitation and restrictions of contacts are instrumental in maintenance of public health.

Finally, it is very difficult to develop proper anti-pandemic measures in the absence of reliable data. Comparison of recorded COVID casualties with excess mortality rates suggests that the latter measures show stronger correlation with exogenous indicators, and thus are probably more telling in the case of Russia. A short-run policy goal to provide intensive hospital treatment to patients in acute state does not seem to be able to combat the rising death tolls. Health authorities have to come up with more efficient medical and social technologies, based on a combination of medical interventions (vaccination) and public nudge to remain vigilant and responsible to face the upcoming waves of pandemia and its socioeconomic consequences.

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