China Data Institute

Center for Geographic Analysis
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社会地理计算联合研究中心
Geocomputation Center for Social Science

Spatial-temporal analysis of COVID-19 in Russia & Italy

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June 23

Outline

- ❑ Background
- ❑ Data Sources
- ❑ Data Classification
- ❑ Data Depository
- ❑ Data Processing and Flowchart
- ❑ Italy
- ❑ Russia
- ❑ Discussion

Background

全球累计 10 万人以上新冠病毒疫情

欧洲时报 制图

2020/06/21 23H00（巴黎时间）

地区	New confirmed 新增确诊 *	Total infected 累计确诊	Active Cases 现存确诊	New Deaths 新增死亡 *	Total Deaths 死亡总数	Recovered 治愈
美国 USA	19788	2350366	1250989	235	122215	977162
巴西 Brazil	3237	1073376	480008	124	50182	543186
俄罗斯 Russia	7728	584680	236858	109	8111	339711
印度 India	15183	426910	175955	426	13703	237252
英国 UK	1221	304331	-	43	42632	-
秘鲁 Peru	3413	251338	104714	201	7861	138763
西班牙 Spain	338	246272	67573	1	28323	150376
智利 Chile	5607	242355	37307	184	4479	200569
意大利 Italy	224	238499	20972	24	34634	182893
伊朗 Iran	2368	204952	31738	116	9623	163591
法国 France	284	201103	97091	7	29640	74372
德国 Germany	645	191123	7488	0	8895	174740
土耳其 Turkey	1192	187695	22505	23	4950	160240
巴基斯坦 Pakistan	4951	176617	105224	119	3501	67892
墨西哥 Mexico	4717	175202	22735	387	20781	131686
沙特 Saudi Arabia	3379	157612	55215	37	1267	101130
孟加拉国 Bangladesh	3531	112306	65765	39	1464	45077
加拿大 Canada	267	101286	28996	20	8430	63860

* 新增（北京时间0点起）

– 代表当日数据尚未更新

数据来源：欧洲各国官方发布、JOHNS HOPKINS、worldometer、Wikipedia

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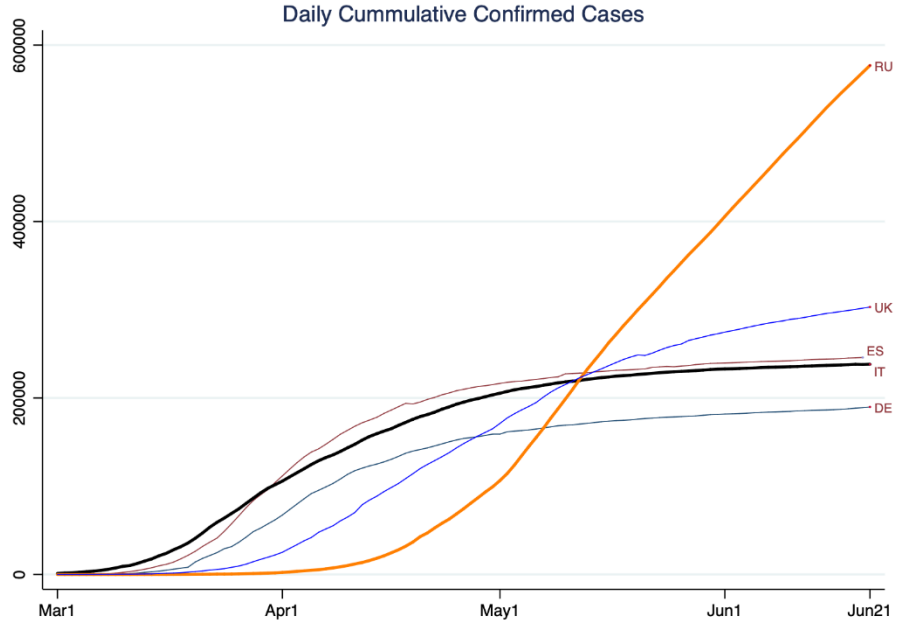
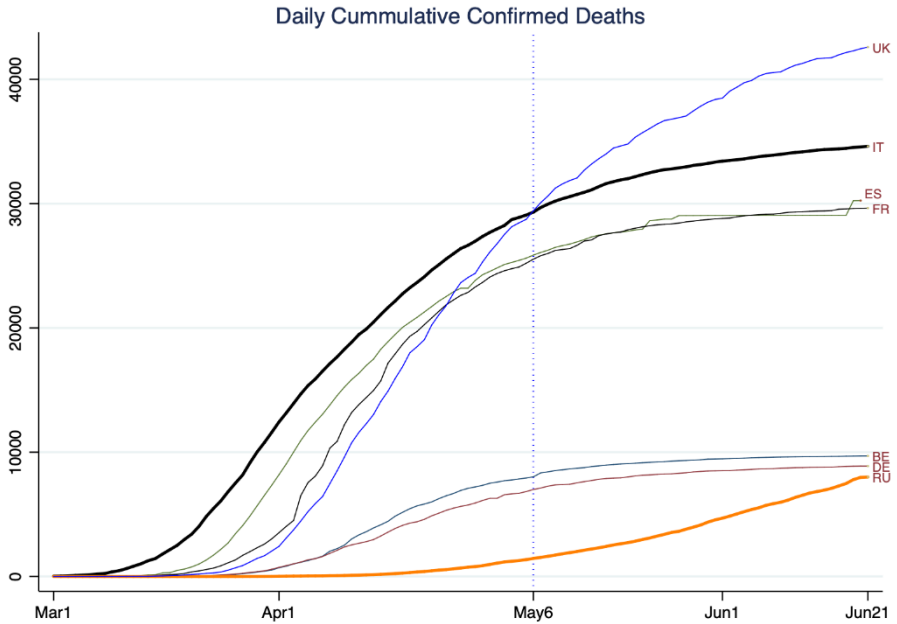
免责声明：最终数据以官方发布数据为准

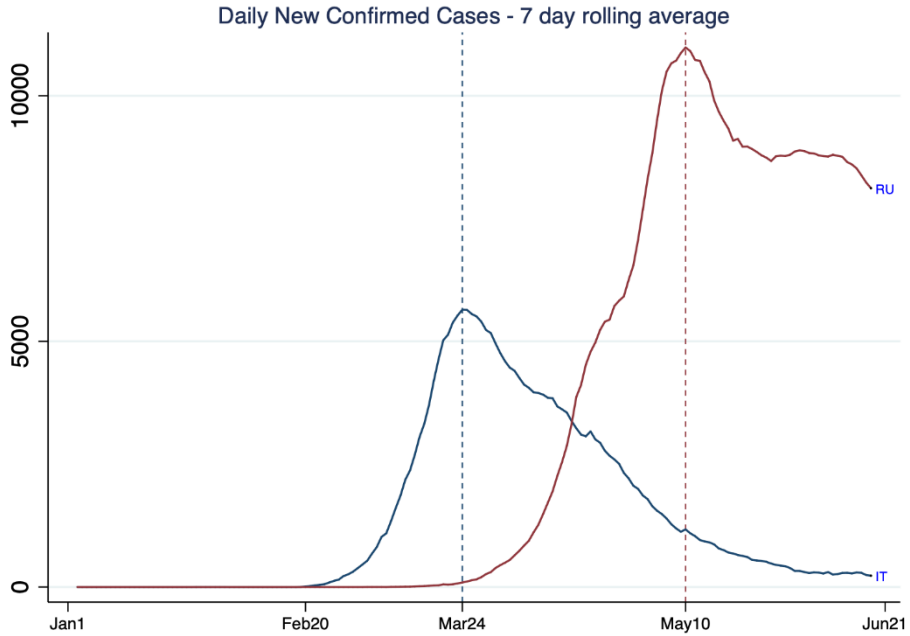
Background

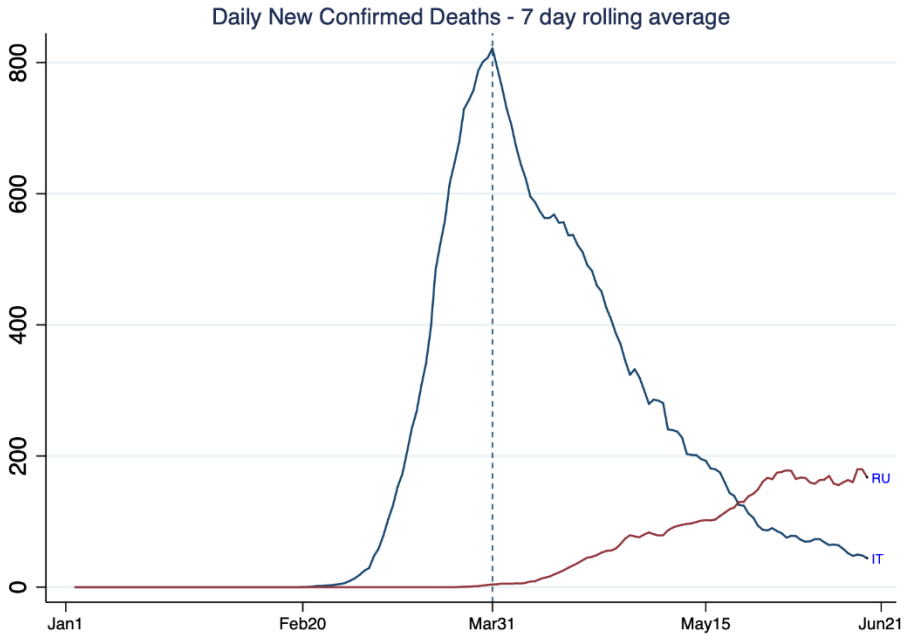
- In the EU,
  - recorded coronavirus cases: Russia the **1st** *vs* Italy the **4th**
  - recorded coronavirus deaths: Russia the **7th** *vs* Italy the **2nd**





Background


Daily New Confirmed Cases - 7 day rolling average
10000
5000
0
Jan1
Feb20
Mar24
May10
Jun21
RU
IT


Daily New Confirmed Deaths - 7 day rolling average
800
600
400
200
0
Jan1
Feb20
Mar31
May15
Jun21
RU
IT

Italy Timeline of Lockdown

- **First case:**
  - **Italian scientists say sewage water from 2 cities contained coronavirus traces in Dec 2019 (BBC News Jun 19)**
  - suspends flights to China and declares a national emergency after 2 cases are confirmed in Rome on 30 Jan
- **Initial lockdown**: Feb 21
  - 10 municipalities of the province of Lodi in Lombardy and 1 in the province of Padua in Veneto
  - meant to last until Mar 6
  - **Permitted to** leave homes with supplies such as food and medicine being allowed to enter
  - **Prohibited from** attending school, going to workplaces, attending public gatherings
- **Expansion to much of northern Italy**: announced on Mar 8
  - restricting travel from, to or within the affected areas
  - banning funerals and cultural events
  - requiring people to keep at least one meter of distance from one another in public locations such as restaurants, churches and supermarkets
  - public locations such as gyms, nightclubs, museums and swimming pools were closed altogether
  - still be able to use trains and planes to and from the region for "proven work needs, emergencies, or health reasons"
  - tourists from outside were still permitted to leave the area
- **National lockdown**: announced on Mar 9, come into effect on Mar 10
  - Mar 11: all restaurants and bars are closed
- **Ease lockdown:** May 4

Russia Timeline

- **Jan 30:** closed its far-eastern border with China; flights and railway services were also restricted between the two countries
- **First case: Jan 31**
- **Feb 20:** banned the entry of Chinese citizens, followed by restricting travels from South Korea and Iran
- **Since Mid-Mar:** began to restrict air traffic with Europe
  - **Mar 13: limited flights to and from Italy, Germany, France and Span, banned entry of Italian**
  - Most of Russia's COVID-19 cases registered before were related to travelers from European countries, esp Italy
  - Mar 15: closed land borders with Portland and Norway
  - **Mar 18: banned entry of all foreign nationals**
  - Mar 19: made 2-week quarantine mandatory for all arrivals from abroad
  - Mar 23: all schools closed
  - Mar 27: grounded all international flights
  - **Mar 28: announced national paid holiday to encourage Russians to stay at home**
  - Mar 30: closed all borders
  - **Mar 30: Moscow enacted city-wide quarantine, followed by St. Petersburg**
- Apr 3: Chechnya imposed curfew
- Apr 14: Moscow rolled out digital tracking to enforce lockdown
- Apr 17: spread to all the country's all 85 regions

Data Sources

- **Base map:**
  - Harvard Dataverse: Federal subjects of Russia & Regions of Italy
- **Covid-19 data:**

Region	Source	Link	Start Date	Update
Italy	Harvard Dataverse	https://dataverse.harvard.edu/dataset.xhtml?persistentId=doi:10.7910/DVN/4Z8ZKI	2/24/2020	6/15/2020
Russia	Harvard Dataverse	https://dataverse.harvard.edu/dataset.xhtml?persistentId=doi:10.7910/DVN/ZR5KW9	3/22/2020	6/15/2020

- **Demographics:**

Region	Source	Link	Year
Italy	Wikipedia	https://en.wikipedia.org/wiki/Regions_of_Italy	2019
Russia	Russia Federal Statistical Office	https://gks.ru/bgd/regl/B19_16/IssWWW.exe/Stg/pril1.xls	2019 (Estimate)

Data Classification

Italy

- COVID-19 data by administrative units:
  - Regions
- COVID-19 data by categories:
  - Confirmed cases: daily cumulative
  - Death cases: daily cumulative
  - Recovered cases: daily cumulative

Russia

- COVID-19 data by administrative units:
  - States/Autonomous Republics
- COVID-19 data by categories:
  - Confirmed cases
  - Death cases
  - Recovered cases

Data Depository: dataverse.harvard.edu

The Dataverse® Project

Open source research data repository software

Researchers

Enjoy full control over your data. Receive *web visibility, academic credit,* and *increased citation counts.* A personal dataverse is easy to set up, allows you to display your data on your personal website, can be branded uniquely as your research program, makes your data more discoverable to the research community, and satisfies data management plans. Want to set up your personal dataverse?

Journals

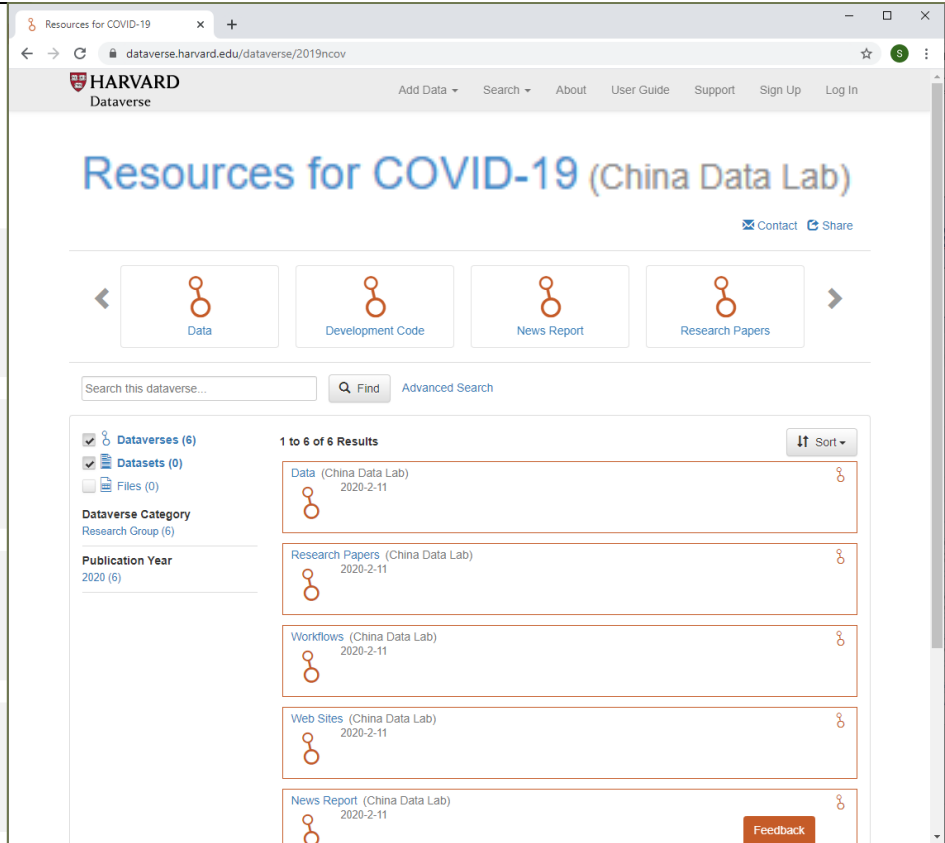
Seamlessly manage the submission, review, and publication of data associated with published articles. Establish an *unbreakable link* between *articles in your journal* and *associated data.* Participate in the open data movement by using Dataverse as part of your journal data policy or list of repository recommendations. Want to find out more about journal dataverses?

Institutions

Establish a research data management solution for your community. Federate with a growing list of Dataverse repositories worldwide for increased discoverability of your community's data. Participate in the drive to set norms for sharing, preserving, citing, exploring, and analyzing research data. Want to install a Dataverse repository?

Developers

Participate in a vibrant and growing community that is helping to drive the norms for sharing, preserving, citing, exploring, and analyzing research data. Contribute code extensions, documentation, testing, and/or standards. *Integrate research analysis, visualization* and *exploration tools,* or other research and data archival systems with Dataverse. Want to contribute?



Data Depository: Cloud for COVID-19 Study

Data Processing and Integration: Spatiotemporal Dynamic Graph

hasc	Subdivisions	20200322	20200323
RU.MC	Moscow	191	262
RU.SP	Saint Petersbu	16	16
RU.MS	Moscow Oblast	0	0
RU.SA	Samara Oblast	0	0
RU.SK	Saha Republic	0	0
RU.SV	Sverdlov Oblast	0	0
RU.KN	Kaliningrad Obl	0	0
RU.KV	Kirov Oblast	0	0
RU.NS	Novosibirsk Obl	0	0
RU.KX	Krasnoyarskiy K	0	0
RU.TB	Tambov Oblast	0	0
RU.LP	Lipetsk Oblast	0	0
RU.TV	Tver Oblast	0	0
RU.KH	Habarovskiy Kra	0	0
RU.TY	Tumen Oblast	0	0

Python processing

1.Python composes a sequence of files - a file
  Processing file xIs (xIsx)

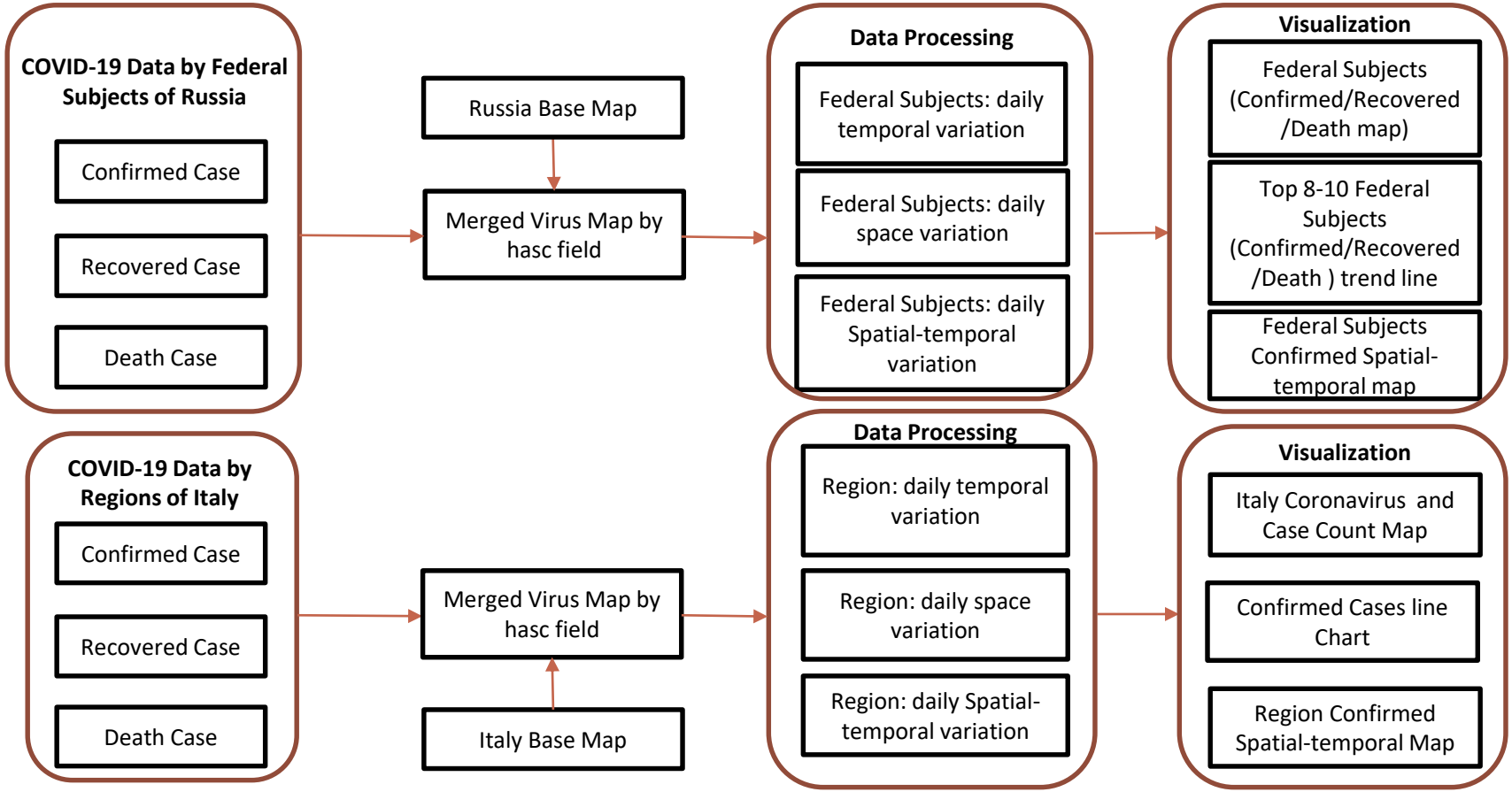
ArcGIS processing

1.Shapefile (administrative division) property sheet for layers
  A table of time series corresponding to the property sheet

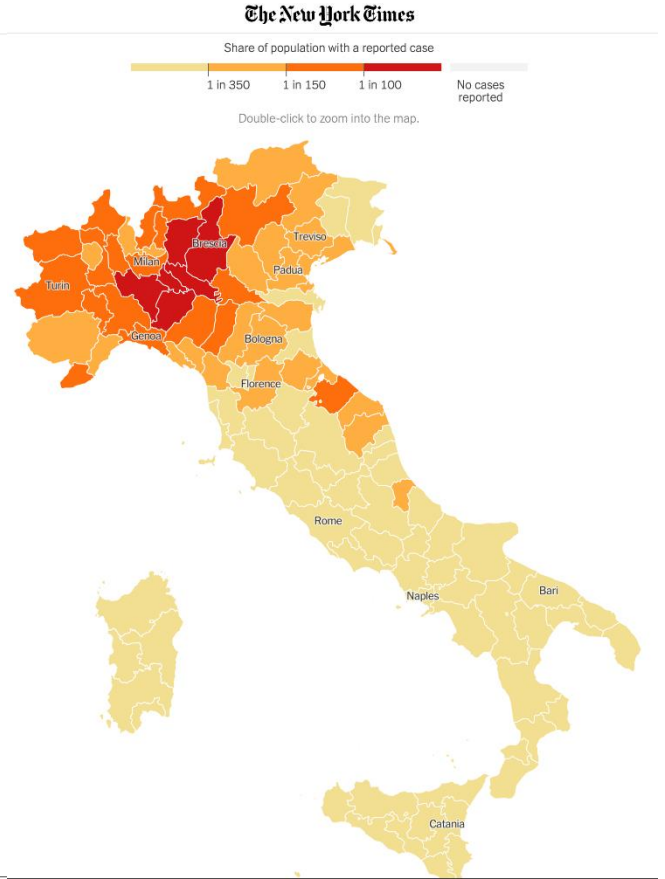
2.Shapefile joins the table, Connected shapefile output to the folder
  Use the transpose tool to expand the table data in two dimensions

3.Time data type, After the transpose is complete, open the time property and you can operate (You need to manually convert it to text after transpose)

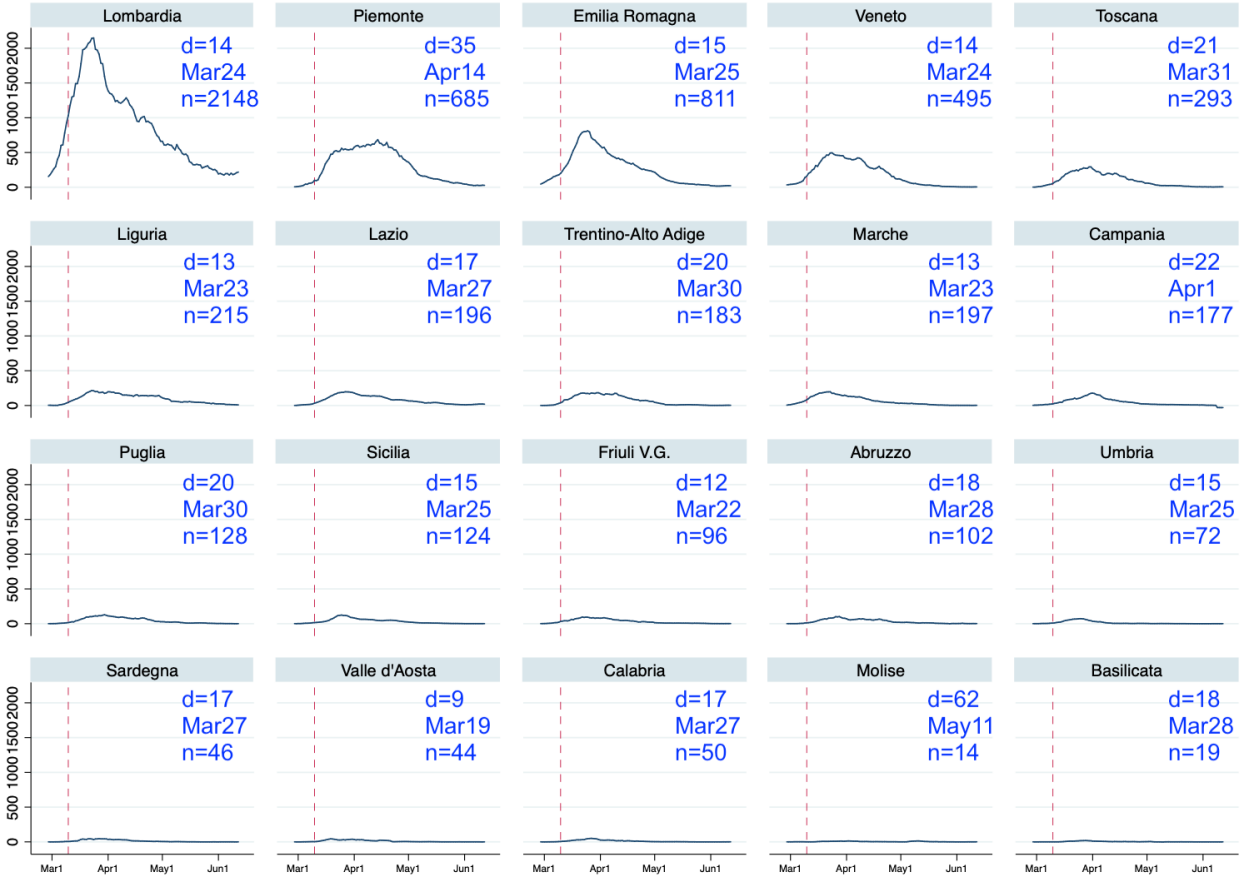
The Flowchart for Virus Data Integration & Visualization

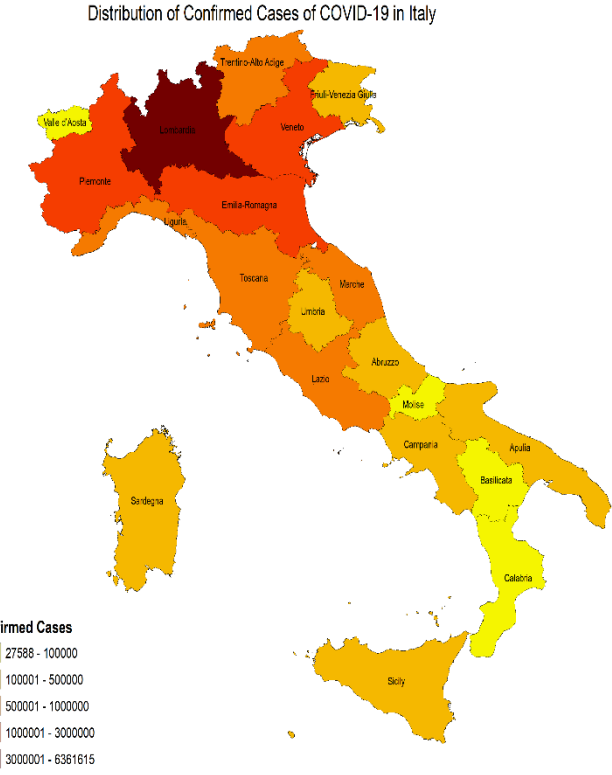


New York Times: Italy Coronavirus Map and Case Count

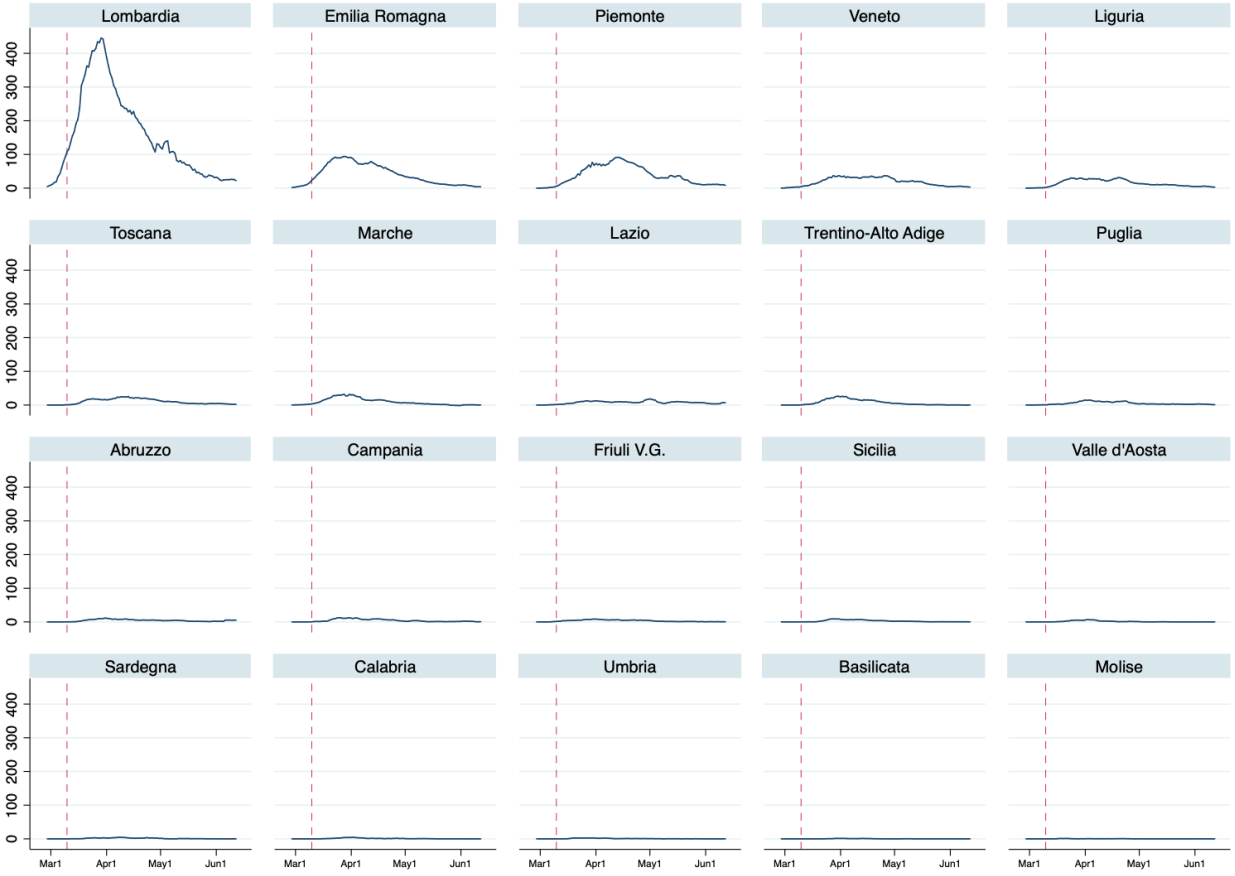


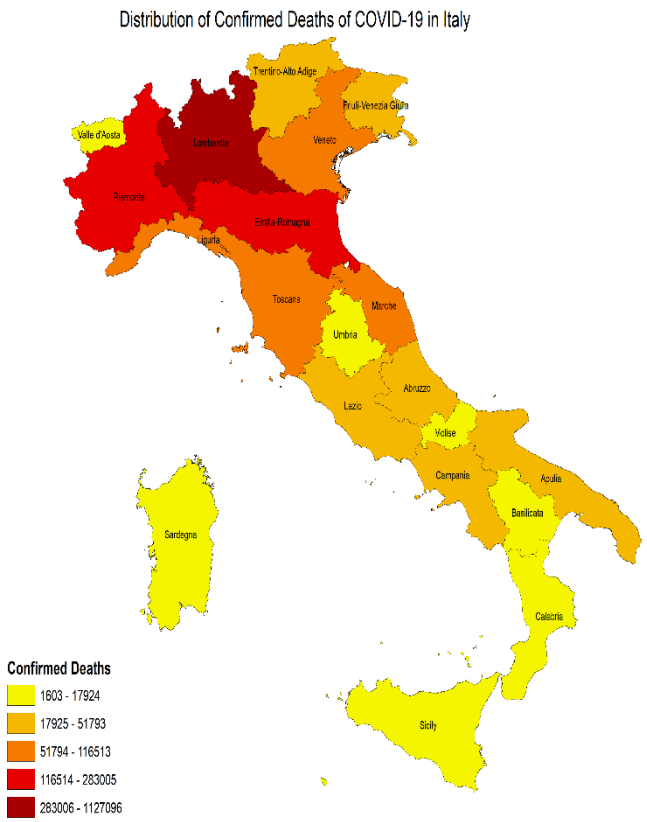
Italy: Daily New Cases by Region





Italy: Daily New Deaths by Region



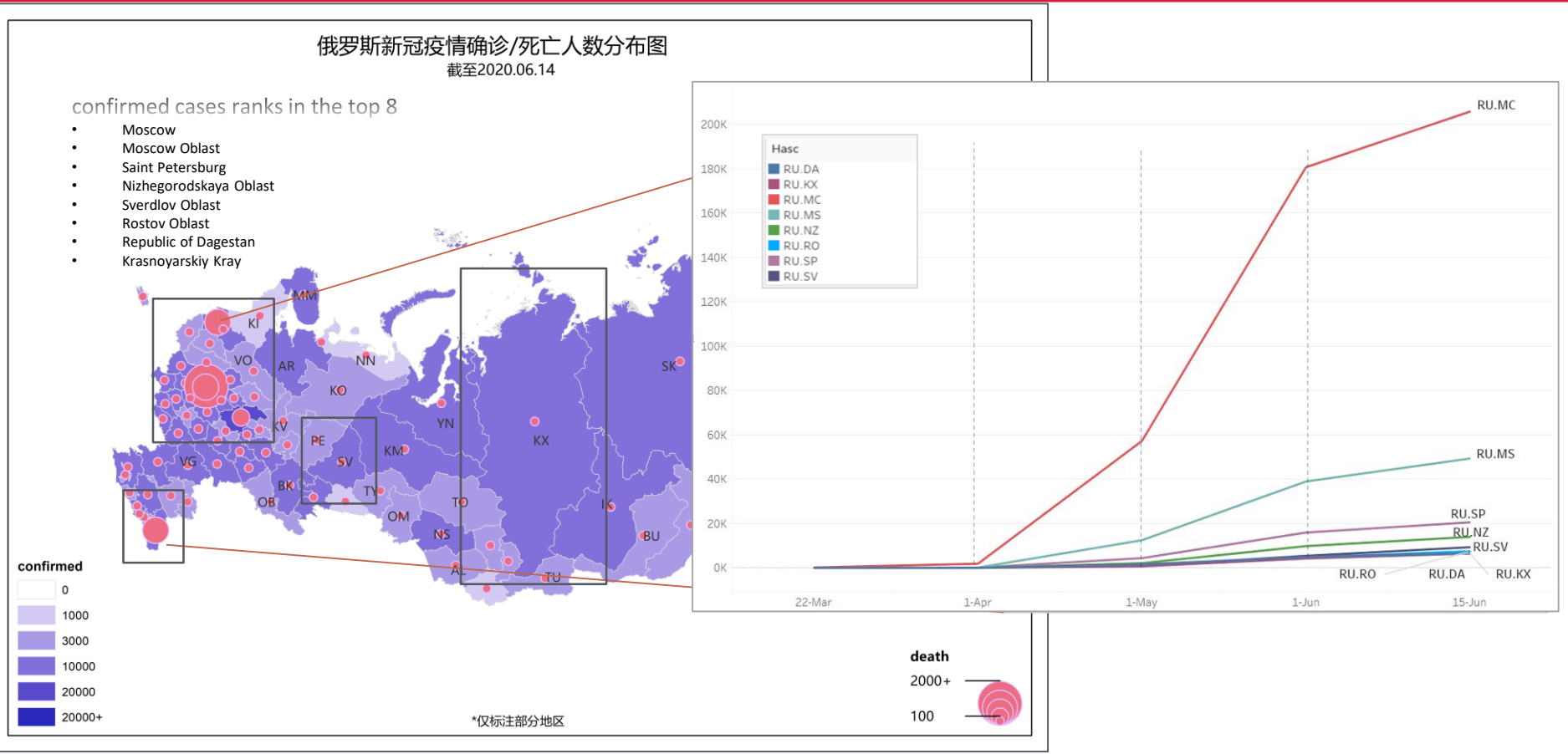


Pairwise Correlation Coefficients of Variables

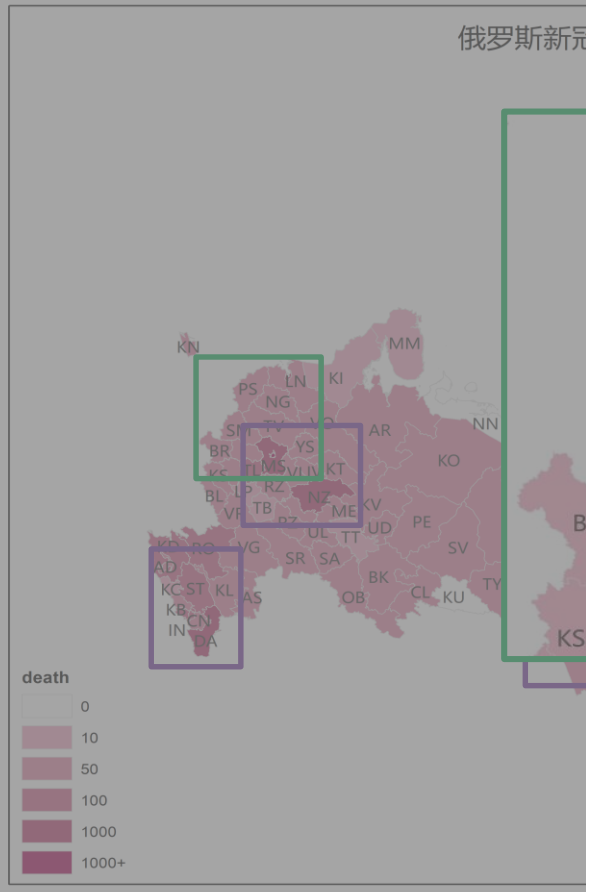
	Total Confirmed	Total Death	Total Recovery	Population	Area km2	Pop Density	HDI
Total	1.0000						
Total Death	0.9888*	1.0000					
Total	0.9969*	0.9783*	1.0000				
Populatio	0.7597*	0.7201*	0.7453*	1.0000			
Area km2	0.4555*	0.3922	0.4524*	0.6924*	1.0000		
Pop Density	0.5633*	0.5361*	0.5530*	0.8491*	0.3216	1.0000	
HDI	0.4214	0.3704	0.4535*	0.1360	0.0119	0.1350	1.0000

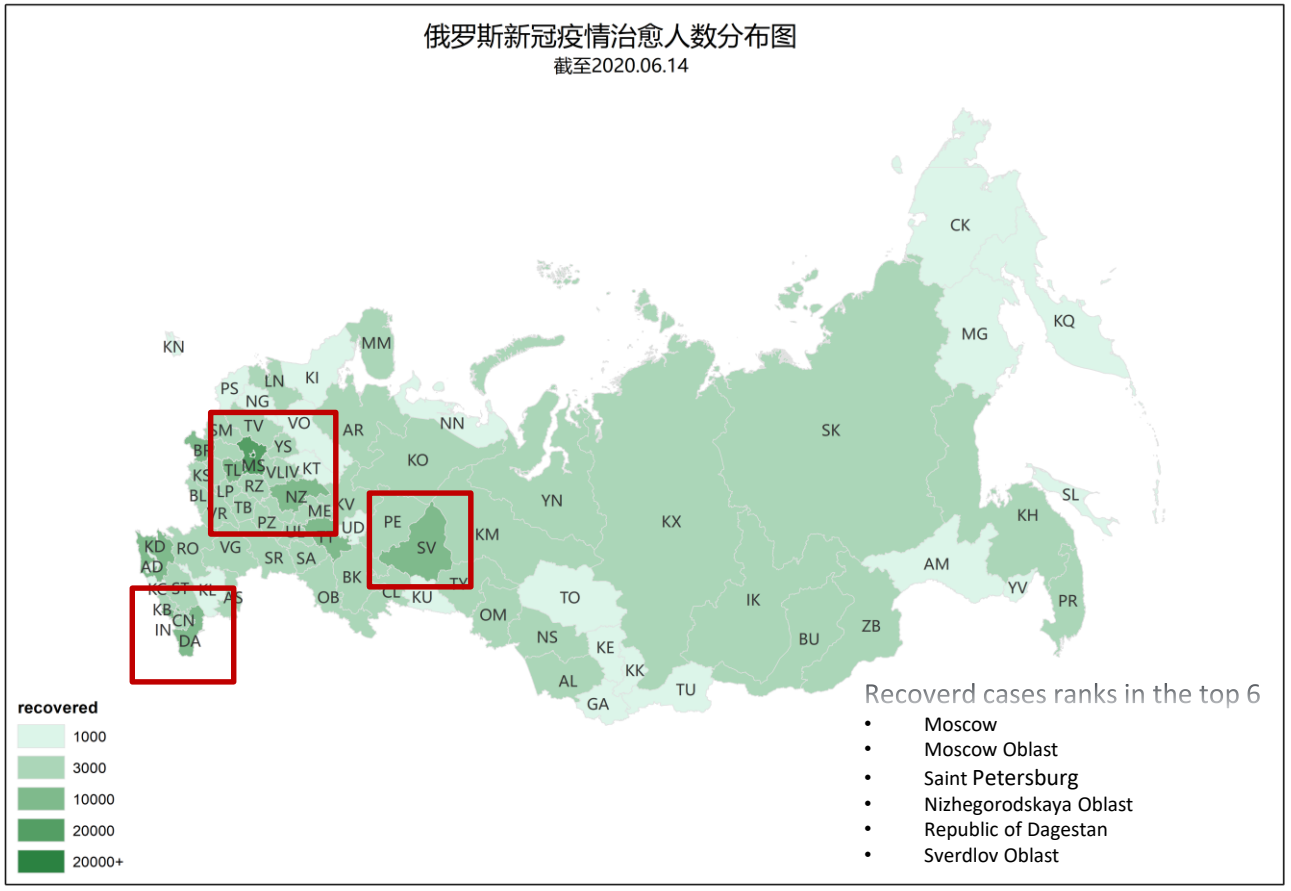
*: significant at 5% significant level

Confirmed Cases and Deaths in Russia



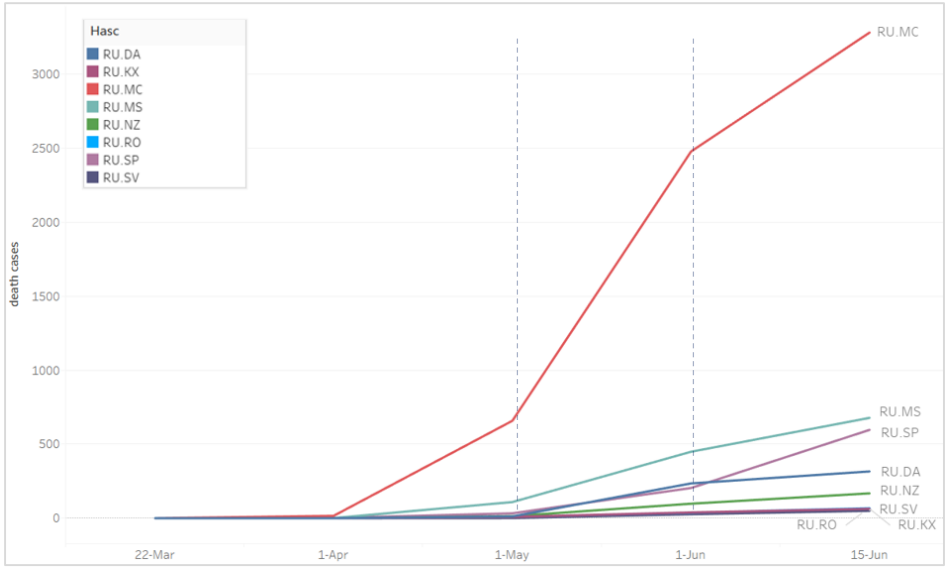
Deaths and Recoveries in Russia



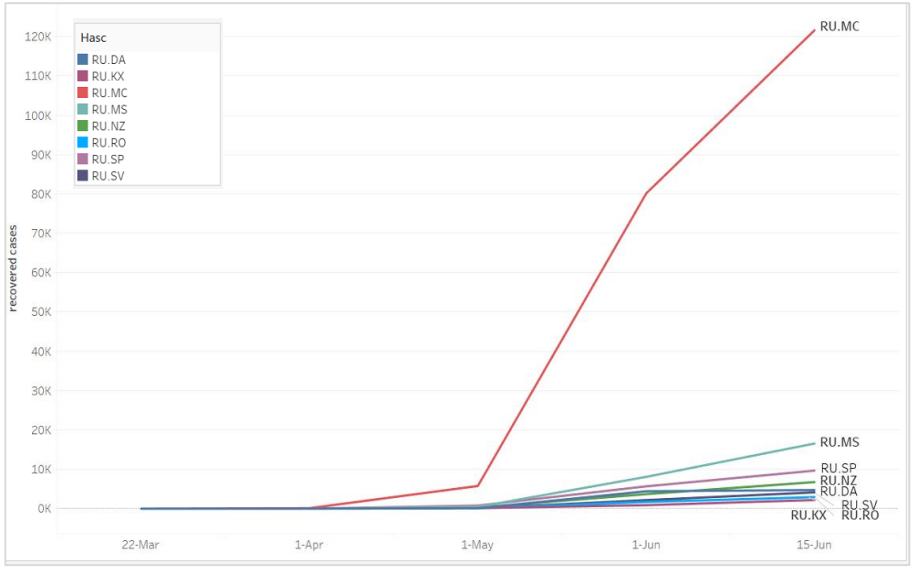


Deaths and Recoveries in Russia

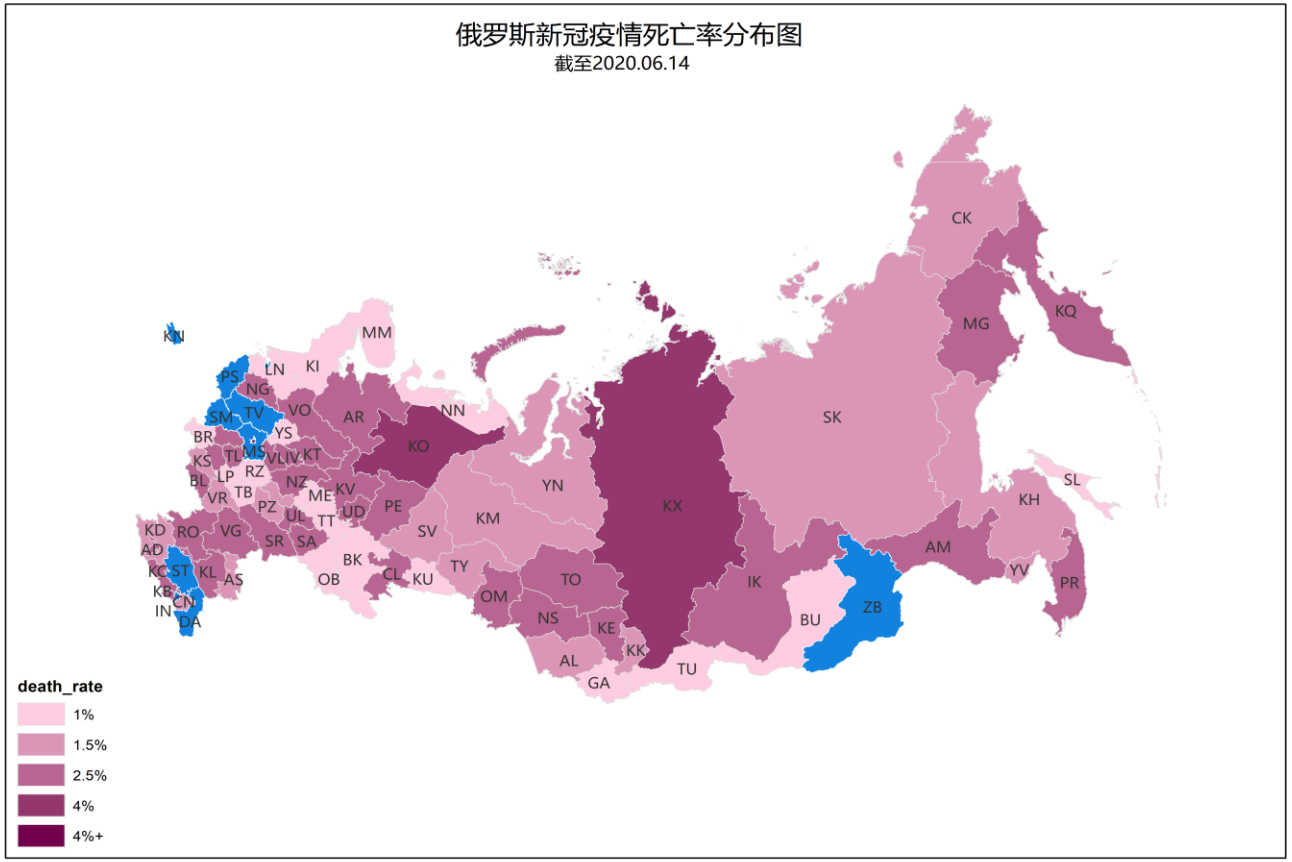
Reported Deaths



Reported Recoveries



Death Rates in Russia



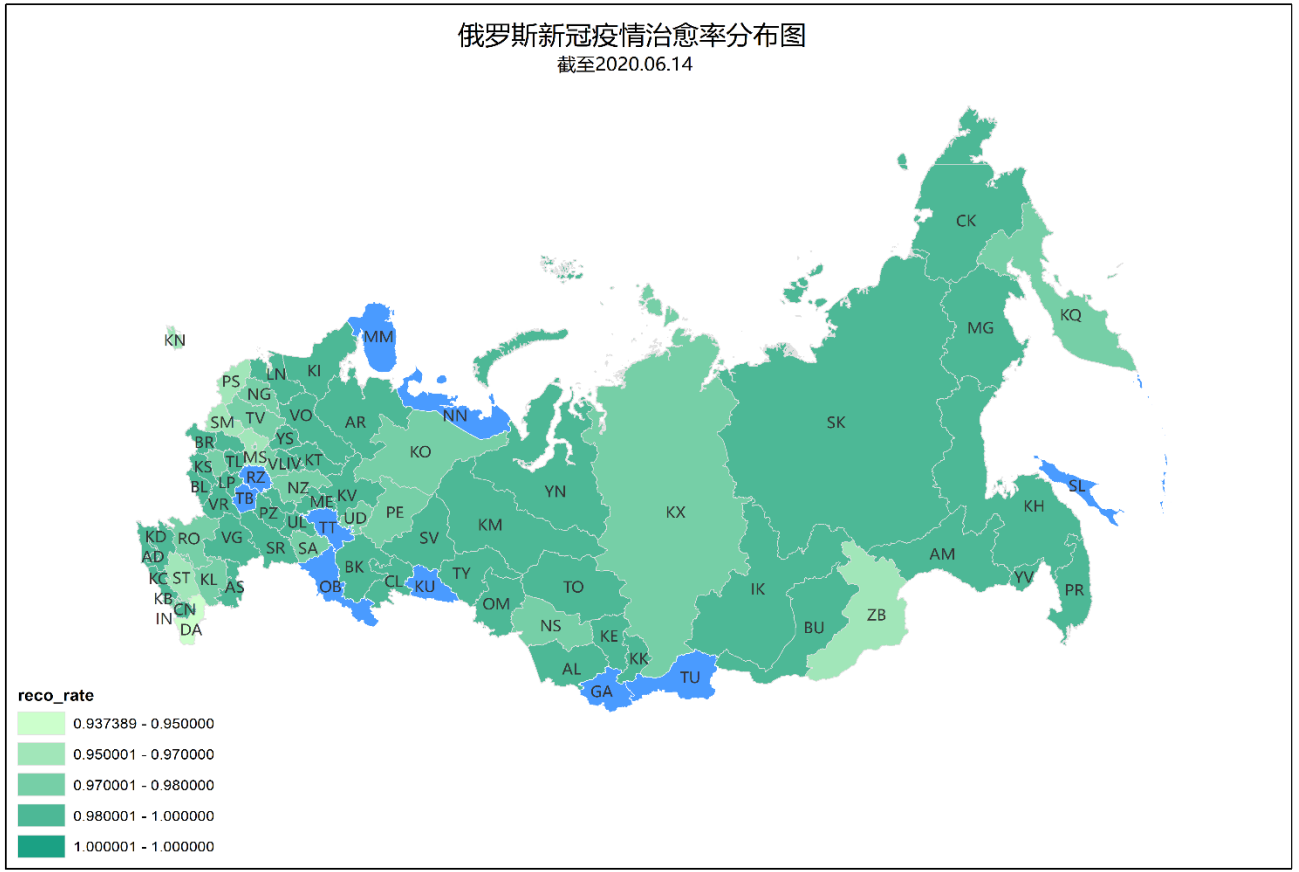
Top 10 Death Rates

- Republic of Dagestan
- Saint Petersburg
- Ingushetia Republic
- Zabaykalskiy Kray
- Tver Oblast
- Stavropolskiy Kray
- Republic of North Osetia-Alania
- Moscow
- Kaliningrad Oblast
- Republic of Kalmykia

Recovery Rates in Russia

Top 10 Recovery Rates

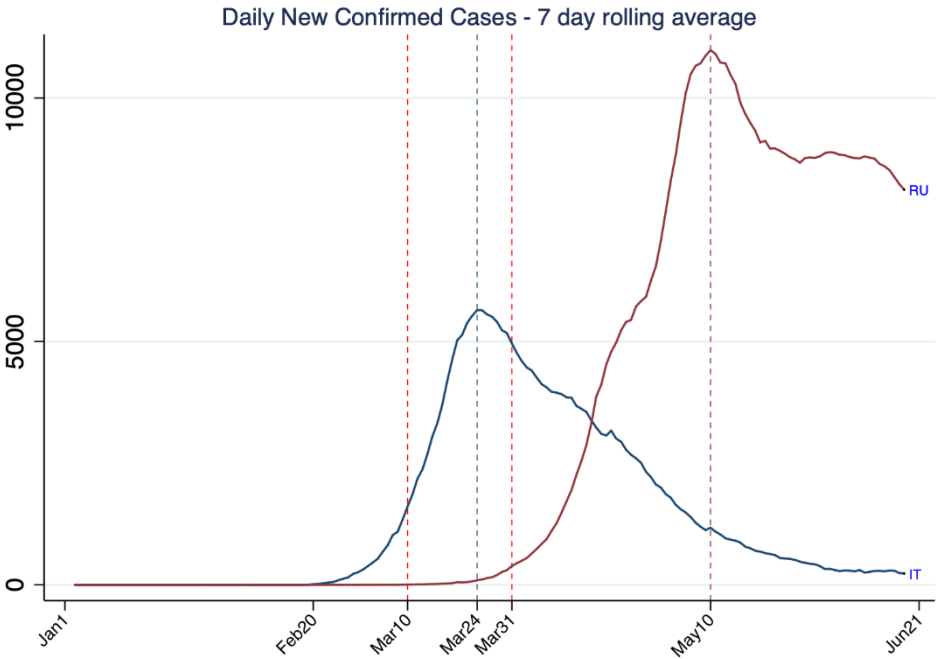
- Republic of Tatarstan
- Republic of North Osetia-Alania
- Republic of Mariy El
- Ingushetia
- Pensa Oblast
- Chechen Republic
- Leningradskaya Oblast
- Jewish Autonomous Oblast
- Krasnodarskiy Kray
- Republic of Dagestan

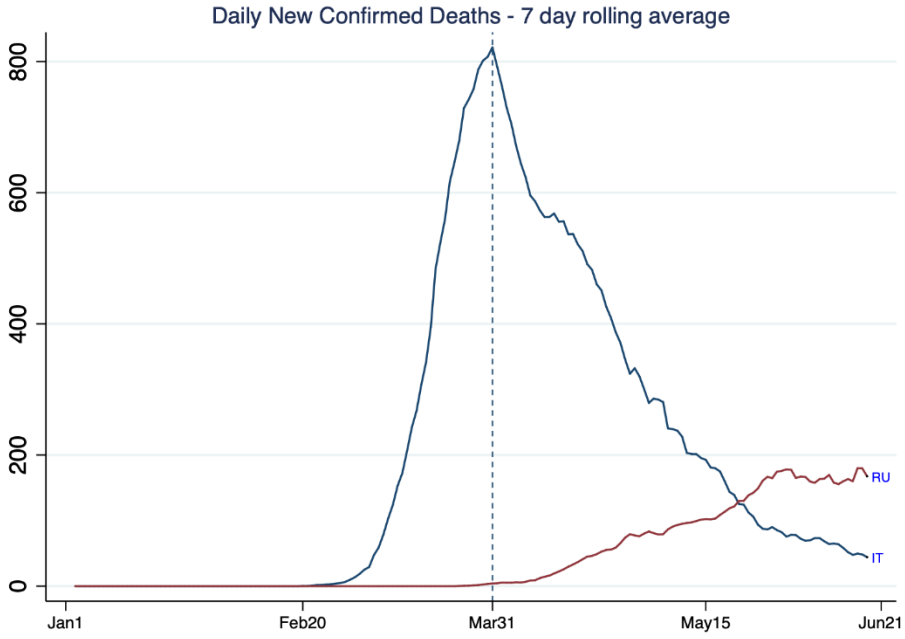


Spatial-Temporal Dynamic Graph

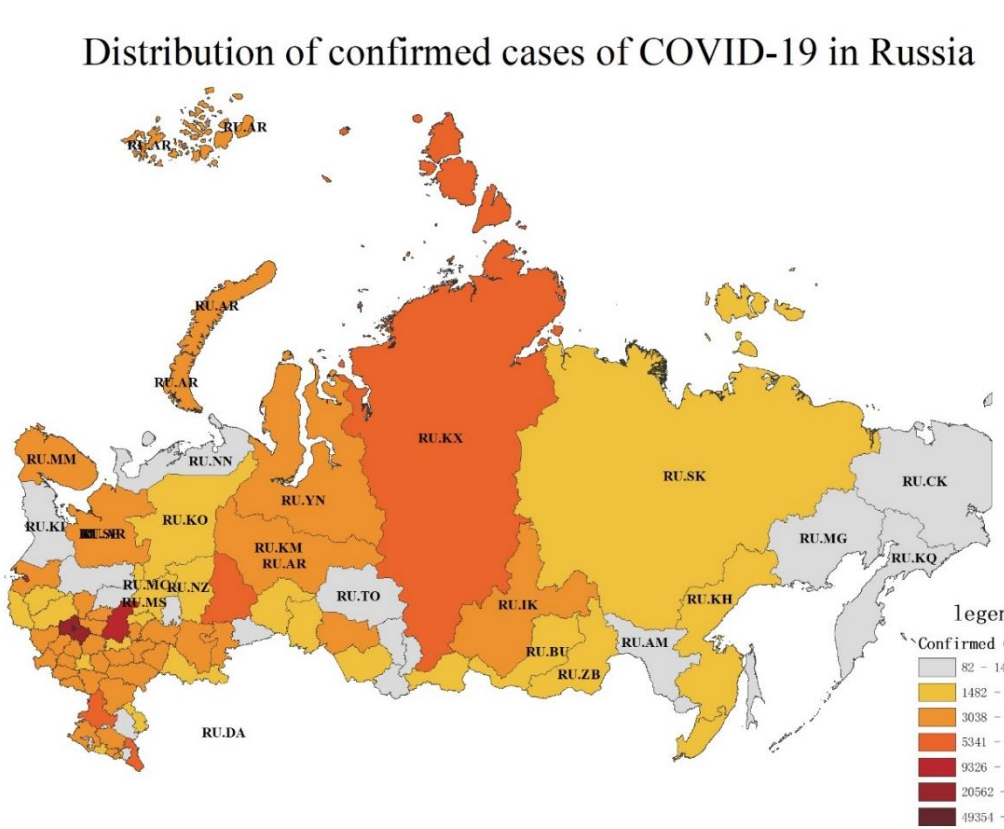
- 意大利
  - 2月21日前，意大利只有3例确诊病例； 此后疫情突然暴发，确诊病例极速增长
  - 重灾区全部集中在北部，逐步向中南部蔓延

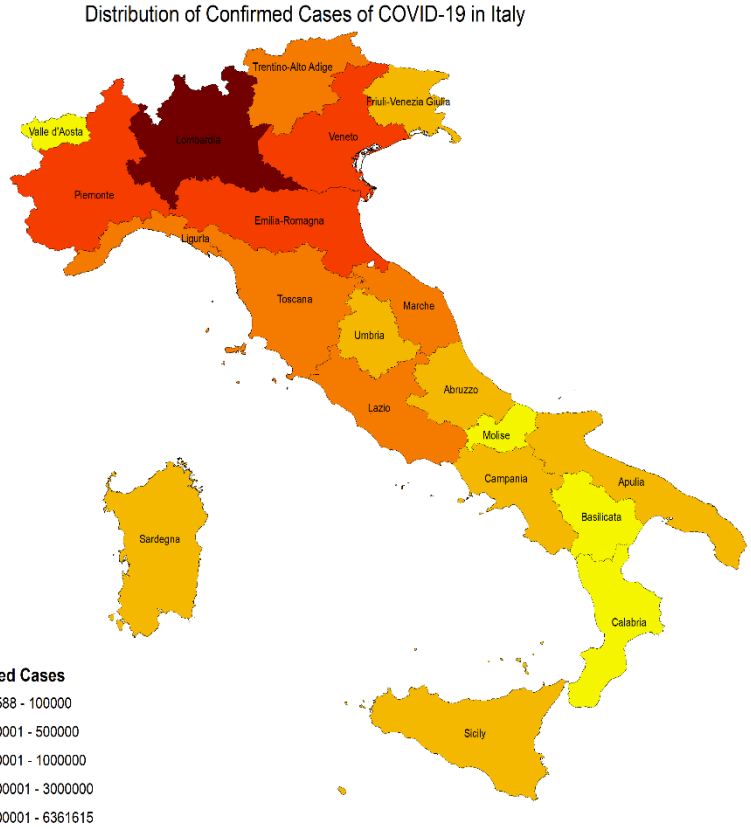
Discussion


Daily New Confirmed Cases - 7 day rolling average
0
5000
10000
Jan1
Feb20
Mar10
Mar24
Mar31
May10
Jun21
RU
IT


Daily New Confirmed Deaths - 7 day rolling average
0
200
400
600
800
Jan1
Feb20
Mar31
May15
Jun21
RU
IT

Discussion: Confirmed Cases Russia vs Italy





Discussion：Death Rate

国别	确诊	治愈	死亡	死亡率
美国	2374791	984277	122496	11.1
英国	305289	1319	42647	97
俄罗斯	592280	344416	8206	2.33
印度	440450	248137	14015	5.35
意大利	238499	182893	34634	15.9
法国	160750	74372	29663	28.5

- 俄罗斯：发展迅速、低死亡率
- 意大利：发展较快、死亡率高

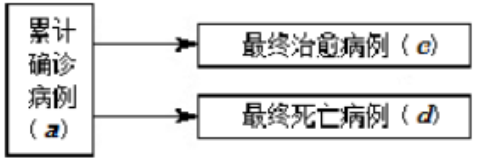


图 2

$$\eta_c = \frac{d}{c+d} \times 100\%$$

Discussion: Italy

https://www.bbc.com/zhongwen/simp/world-51985946

综合专家说法，意大利疫情严重的主要原因是防疫不严谨、人口老龄化及医疗资源不足。他们提醒，被外界认为轻忽疫情的欧美国家若不积极防范，就可能沦为下一个意大利。

Discussion: Italy

人口结构

意大利死亡人数成长速度惊人，有分析称，年纪可能是关键之一。意大利卫生部长科学顾问沃尔特•里恰尔迪 (Walter Ricciardi) 教授指出，因为人口结构导致当地的死亡率比较高。

英国牛津大学研究员在《人口科学》期刊的一篇研究中指出，意大利老年人口多，而且比起其他国家，意大利的年轻人与他们的祖父母相处的时间更多。

该研究称，意大利65岁以上的人口占全国约23%，美国则是16%。牛津大学人口统计学家暨流行病学家道得（Jennifer Beam Dowd）表示：“虽然平均寿命延长对高龄化有所影响，但主因则是生育率下降。”

研究人员也表示，意大利年轻人常会和父母及祖父母同住，但通勤到城市上班，因此在移动过程中可能会把病毒带回家中，传染给年长者这一最脆弱的族群。

数据显示，受病毒感染死亡率最高的是80岁以上的老年群体，死亡率达15%，而这一比例在10岁以下儿童中则为零。

医疗量能不堪负荷

面对严峻的疫情，意大利的医疗量能亮起红灯。有前线的医护人员向媒体透露，当地急诊室不断出现确诊病患，医院人员因物资不足濒临崩溃。

该国上下不仅医疗体系几近耗竭、前线的医护人员耗损程度也因物资不足而濒临崩溃。

Discussion: Russia

https://www.sohu.com/a/388962192_100056026

俄罗斯疫情有三个特点：第一，境外输入转入社区感染；第二西方重东方轻；第三，激增态势很明显。

罗斯疫情恶化主要原因：第一，对疫情判断有误；第二防控措施上紧下松；第三：病毒检测不够；第四，民众防控意识淡薄。

俄罗斯关闭欧洲通道太迟是造成疫情蔓延的最主要原因，俄罗斯人认为西线无战事，专心防控东线战场，战略方向错误。俄罗斯第一时间关闭了来自于东亚的航班和边境线，可是对于欧洲方向，3月中旬才开始行动。其实从那时起，意大利疫情已经大爆发了，整个欧洲已经出现了大规模感染。

俄罗斯民众前期对疫情严重性认识不够，防御措施不采用。俄罗斯民众就以为没事，开始放松了，这就导致了病毒的迅速扩散，导致了疫情在俄罗斯的爆发。当普京总统宣布全境带薪休假要求大家居家隔离时，很多民众把这一政策理解为放假，很多人在公园集会，人山人海。调查显示，全国执行居家隔离半个月后，依然有30%的公民对隔离政策不理解不支持。

Discussion: Russia

https://baijiahao.baidu.com/s?id=1665892947847903104&wfr=spider&for=pc

2、庞大的检测量

这一点就连世界卫生组织都承认。世界卫生组织卫生保健紧急情况项目负责人麦克.瑞安对媒体表示，“因感染新冠病毒而死亡的患者人数占确诊患者总数的比例如此之低，这是很不寻常的。但俄罗斯进行了大量的检测，很快就加大了病毒检测的数量”。检测多，确诊多，大大增加了死亡率的分母。

俄罗斯疫情出现期间，已经注册的诊断试剂有17种，并且在第一时间开始实施全国疑似患者筛查，至今已实施筛查一千万余例。由于高筛查覆盖率等因素，俄本土新冠肺炎检出率较高。

俄罗斯普遍检测的好处在于，检测出来大量的初期患者和轻症患者。一方面，轻症患者降低了死亡率，还被长期监测。这种情况下，轻症患者转为重症危症患者的几率大大降低，更多的人保住了生命。

3、医疗资源充裕

在多数国家呼吸机紧张的情况下，俄罗斯的呼吸机使用率却不足2%。俄罗斯在全民医保的基础上，还播出专门的资金，用于购买药品、医疗器械、个人防护装备、医院转型，等等。加上原本俄罗斯“过剩”的床位储备，目前还没有出现“过载”现象。 俄罗斯也做到了应收尽收，全面治疗。

挽救患者生命的唯一办法是，加大医疗物资投入，建设收治医院，普遍进行消毒。这几点，俄罗斯做的都不错。俄罗斯总统普京强调，目前的首要任务就是保证国家安全："我们必须保证内部安全，并认真分析周围发生的一切，以使俄罗斯的国家利益得到可靠的、绝对的保证"。在这个指导下，俄罗斯投入7.6万人家境建设16座方舱医院。保障了每一位患者都能得到收治和看护。同时，很多军工企业快速转产医疗物资，保障了物资的足够使用。

References and Contact

Resources for Coronavirus Study

http://chinadatalab.net

The Cloud for COVID-19 Study

Http://chinadatalab.org

Webinars on Covid-19 Study

https://dataverse.harvard.edu/dataverse/cdl_training

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