Coursera Data Science Project:

The Battle of Neighbourhoods

(Week 1)

Measuring the efficient number of pharmacies in Moscow during Covid-19

Cover Sheet

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Introduction

Background

Coronavirus Disease 2019 is an infectious disease caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) [1] (see Figure 1). It started in December 2019 and has been continuing to this day. More than 3.5 million cases of the disease and more than 250,000 deaths have been reported worldwide [2]. The vaccine has not yet been invented, so there is still no effective way to fight the virus, except for self-isolation and following WHO recommendations. As a result, the number of active cases is growing, which increases the burden on hospitals and pharmacies around the world. Therefore, reducing the rate at which a population becomes infected would give hospitals more time to resolve the situation and would flatten the COVID-19 curve (see Figure 2).

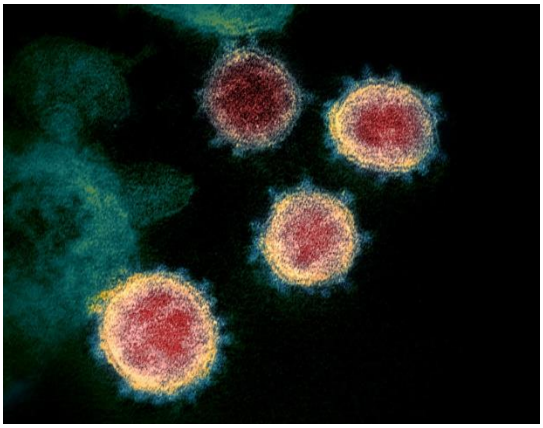


Figure 1. Scanning electron microscope image showing SARS-CoV-2 [3]

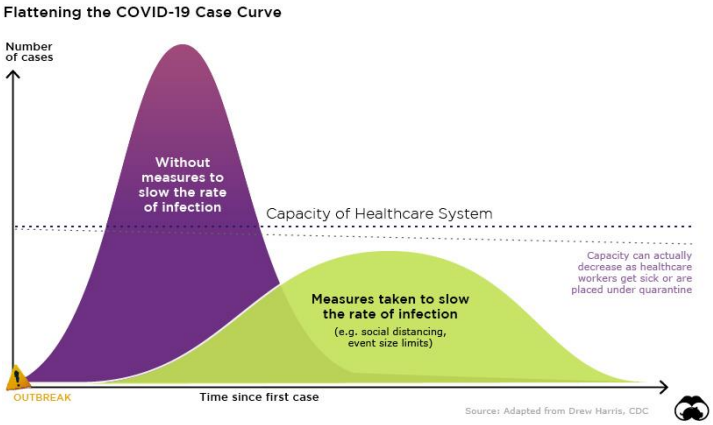


Figure 2. Flattening the COVID-19 case curve [4]

Description of the Problem

One way of the virus spread is between people during close contact, often through the small droplets that may occur during coughing, sneezing, and breathing [5]. The use of disinfectants and face masks helps to curb the spread of the disease, but some countries like Russia have imposed restrictions on the sale of medical products online to stop fraud. For example, in Moscow, the sale of masks is allowed only in pharmacies now.

After 12 May 2020, the wearing of masks is necessary in public places [6]. All Moscow pharmacy institutions must maintain prices and ensure the availability of a mask supply and other means of respiratory protection, which will be controlled by the Office of the Federal Antimonopoly service of Russia. However, Moscow is the second most populated city in Europe with over 12.6 million residents [7], which means that not all the districts may have enough medicine for everyone. Thus, the goal of this project is to identify the neighbourhoods where people might lack the means of protection against the virus.

Target audience

Providing information about pharmacies that might theoretically be in high demand could help suppliers to distribute medicines around the city during the Coronavirus disease. Moreover, if the results recommend the pharmacy infrastructure to be improved in these areas, then this could be considered by the local authorities. From the business perspective, this information could be useful for pharmaceutical companies, as opening new venues in high demand areas usually brings a good benefit for the companies.

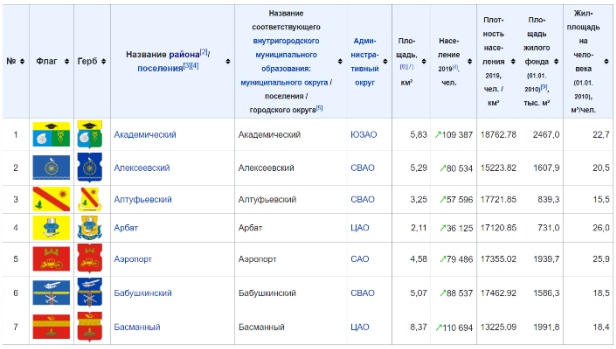
Data

Sources of the data

The neighbourhoods of Moscow will be analysed in project. To do so, the following sources of information will be used:

- A Wikipedia page about the Moscow neighbourhoods [8] provides the names, areas and populations of the neighbourhoods.
- NextGIS [9] provides a GeoJSON file that contains the coordinates of the neighbourhoods' administrative borders.
- OpenStreetMap [10] is used for determining the centre of every neighbourhood and making maps.
- Foursquare [11] will be used to search for pharmacies in the neighbourhoods.

See figures below for the examples of the source data.



№	Флаг	Герб	Название района[6] / поселения[5][4]	Название соответствующего внутригородского муниципального образования: муниципального округа / поселения / городского округа[5]	Адми-нистра-тивный округ	Пло-щадь, км²	Насе-ление 2019[7], чел.	Плот-ность насе-ления 2019, чел. / км²	Пло-щадь жилого фонда (01.01. 2019)[8], тыс. м²	Жил-площадь на чело-века (01.01. 2019), м²/чел.
1			Академический	Академический	ЮЗАО	5,83	↗109 387	18762.78	2467,0	22,7
2			Алексеевский	Алексеевский	СВАО	5,29	↗80 534	15223.82	1607,9	20,5
3			Алтуфьевский	Алтуфьевский	СВАО	3,25	↗57 596	17721.85	839,3	15,5
4			Арбат	Арбат	ЦАО	2,11	↗36 125	17120.85	731,0	26,0
5			Аэропорт	Аэропорт	САО	4,58	↗79 486	17355.02	1939,7	25,9
6			Бабушкинский	Бабушкинский	СВАО	5,07	↗88 537	17462.92	1586,3	18,5
7			Басманный	Басманный	ЦАО	8,37	↗110 694	13225.09	1991,8	18,4

Figure 3. The example of Wikipedia data


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Figure 4. The example of NextGIS data

Figure 5. The example of OpenStreetMap data

Figure 6. The example of Foursquare data

Use of data and Evaluation of results

This project will provide data analysis and a choropleth map of Moscow neighbourhoods where the colours will show the neighbourhoods with the highest ratio of population to the pharmacies number. To determine the latter, the Foursquare search requests will be made using the centre coordinates of a neighbourhood and the radius, depending on its area.

To evaluate the limits, it is assumed to be 5 minutes to serve one client in a pharmacy (12 people per hour). The working day is 8 hours, then around 100 people will be served per day and around 3000 people monthly. According to Pew Research Center [12], the average number of people in one Russian household is 3.2 and, say, every family normally goes to a pharmacy once per month. Thus, the pharmacies that serve more than 10000 people would be considered as in high demand, which will be reported as a potentially problem area.

References

[1] Mayo Clinic, “Coronavirus disease 2019 (COVID-19),” [Online]. Available: https://www.mayoclinic.org/diseases-conditions/coronavirus/symptoms-causes/syc-20479963. [Accessed 5 May 2020].

[2] Worldometer, “COVID-19 CORONAVIRUS PANDEMIC,” 5 May 2020. [Online]. Available: https://www.worldometers.info/coronavirus/. [Accessed 5 May 2020].

[3] National Institute of Allergy and Infectious Diseases, “Novel Coronavirus SARS-CoV-2,” 14 February 2020. [Online]. Available: https://www.niaid.nih.gov/. [Accessed 5 May 2020].

[4] N. Routley, “Infection Trajectory: See Which Countries are Flattening Their COVID-19 Curve,” 16 March 2020. [Online]. Available: https://www.visualcapitalist.com/infection-trajectory-flattening-the-covid19-curve/. [Accessed 5 May 2020].

[5] World Health Organisation, “Advice on the use of masks in the context of COVID-19,” 6 April 2020. [Online]. Available: https://www.who.int/publications-detail/advice-on-the-use-of-masks-in-the-community-during-home-care-and-in-healthcare-settings-in-the-context-of-the-novel-coronavirus-(2019-ncov)-outbreak. [Accessed 5 May 2020].

[6] Правительство Московской области, “Масочный режим начали вводить в Подмосковье,” 1 May 2020. [Online]. Available: https://mosreg.ru/sobytiya/novosti/news-submoscow/srochno-v-podmoskove-nachali-vvodit-masochnyy-rezhim. [Accessed 5 May 2020].

[7] Population Stat, “Moscow, Russia Population,” 2020. [Online]. Available: https://populationstat.com/russia/moscow. [Accessed 5 May 2020].

[8] Wikipedia , “Список районов и поселений Москвы,” 2 October 2019. [Online]. Available: https://ru.wikipedia.org/wiki/Список_районов_и_поселений_Москвы. [Accessed 1 May 2020].

[9] NextGIS, “MAP AND DATA,” 2020. [Online]. Available: https://data.nextgis.com/en/region/RU-MOW/. [Accessed 30 April 2020].

[10] OpenStreetMap, “OpenStreetMap,” 2020. [Online]. Available: https://www.openstreetmap.org/#map=9/55.7672/37.4758. [Accessed 5 May 2020].

[11] Foursquare, “Foursquare: City Guide,” 2020. [Online]. Available: https://foursquare.com/city-guide. [Accessed 5 May 2020].

[12] Pew Research Center, “Religion and Living Arrangements Around the World,” 2019.