Digital View on COVID-19 Impact

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Abstract. COVID-19 pandemic has produced such issues as drastic changes in people’s way of life and work, housing instability, economic shock, privacy issues and health care crisis. This paper aims to study COVID-19 Impact on worldwide Life by digital approach. Searched some digital libraries and other electronic sources (e.g. ABI/Inform Global, DBLP, Elsevier, IEEE, Nature, Plos, Springer, Taylor & Francis, Wiley) on ‘COVID-19 Impact’ topic we have found data that were analyzed and systemized. Total confirmed cases, total deaths caused by COVID-19 pandemic were analyzed based on Reports of the World Health Organization. Based on hypothesis that COVID-19 spreading is subject to the law of normal distribution we tried to predict the length of this pandemic. Using Excel function, we predicted some values of COVID-19 spreading for the nearest future.

Keywords: Coronavirus · COVID-19 · 2019-nCov · Coronavirus impact · Lockdown · Impact · Prediction of COVID-19 spreading · Crisis · Pandemic

1 Introduction

The name “coronavirus” was given by researchers because this virus under microscope visually looks like it is surrounded by a crown. This virus has been officially named COVID-19. Also, the virus affecting people now is what’s called a novel coronavirus (nCoV) because it’s the first time this particular strain is being seen in humans. So, we have two officially abbreviations for Coronavirus: COVID-19 and 2019-nCoV (for laboratory tests) [1].

Since 11.03.2020 COVID-19 was declared as a pandemic by World Health Organization (WHO) [2, report 51, 71] we have had an unthinkable time in human history. The COVID-19 pandemic has created unprecedented changes to all aspects of our life. So, COVID-19 is now recognized as the one of the most tempting challenges and largest tragedy of the century after the Second World War [3] and can be qualified as ‘Black Swan’ event [1]. Humans are social animals, and we rely on each other for our health and well-being [4]. As such, social disconnect can have serious consequences for our physical and mental health [5]. This is especially true during times of uncertainty and distress when social contact can act as a buffer against adversity and suffering. The COVID-19 pandemic is having an unprecedented impact on people around the world and can be viewed as a global stressor induced by a threat to health, economic consequences, and a disruption of daily routines. Social connections provide us with support when dealing with negative emotions, such as feelings of distress and
worry, especially in such times of adversity and uncertainty [6]. However, to limit the spread of the virus, most countries have instituted varying degrees of social distancing measures (and in particular physical distancing measures), some that require large swaths of the population to stay home and restrict physical proximity to others [7]. But COVID-19 does not affect everyone equally. It magnifies pre-existing class differences and reveals a social gap among individuals living in the same country, even in the same city, but experiencing completely different living conditions. In some countries the main issue is the high concentration of people in precarious living conditions, with high demographic density per room and inadequate basic sanitation services [8]. There are signs that governments’ authorities are still trying to conceal the true scale of the problem with Coronavirus, but at this point the virus appears to be more contagious than the pathogens behind diseases such as Ebola or SARS—though some experts say SARS and coronavirus are about equally contagious. Events like the coronavirus epidemic, and its predecessors—such as SARS, Ebola and MERS—test Health Care systems and force us to think about the unthinkable. [9] Crisis caused by COVID-19 pandemic is not only an economic crisis, but also – and perhaps more fundamental – a health crisis [10].

2 Method and Methodology

Worldwide spreading of COVID-19 we analyzed based on data of World Health Organization (WHO) mostly. In addition, searched some digital libraries and other electronic sources (e.g. ABI/Inform Global, DBLP, Elsevier, IEEE, Nature, Plos, Springer, Taylor & Francis, Wiley) on ‘COVID-19 Impact’ topic we have found data and information that were analyzed and systemized.

The previous version of this paper was presented at International Webinar on “Quantum Mathematical Modelling On Covid-19 (QMMC)” organized by the Department of Physics in collaboration with IQAC, Derozio Memorial College, Kolkata, India that held online on 30th September 2020. The author analyzed the questions and comments expressed at the end of this presentation and then corrected the research approach and some insights on COVID-19 distribution. During this work was used systematic approach by digital, visual, and intuitive views on considering data and the information similar to some scientists in [11–16].

Author believe these insights are not only valuable for the ongoing mitigation of the current pandemic, but may also serve to inform governments’ and public health organizations’ information dissemination and infection control strategies in the future. One of the manifestations COVID-19 Impact on human life have so-called lockdown.
3 COVID-19 Lockdown

As coronavirus cases continue to be reported around the world, WHO says countries still have a chance of containing the outbreak. Officials have also sought to differentiate Covid-19 from other viruses, as part of efforts to quell public panic. And the most of countries apply lockdown in their countries.

What is Coronavirus Lockdown?
While “lockdown” isn’t a technical term used by public-health officials, it can refer to anything from mandatory geographic quarantines to non-mandatory recommendations to stay at home, closures of certain types of businesses, or bans on events and gatherings. Within a some period of time, the population was required to largely withdraw from their normal lives and practice physical distancing, while the social-, financial-, and health-related consequences of COVID-19 were becoming rapidly apparent.

This period is characterized by unprecedented physical distancing (often communicated as social distancing) measures resulting in significant changes to people’s usual social lives [7].

Lockdown is stay-at-home orders for elderly people aged 65+ and often includes:

- borders closures to travelers in most of countries;
- restricting all movement to only work, and family emergencies;
- shopping for essentials;
- ban on all public gatherings (including cinemas, gyms, weddings, funerals, sports events);
- moving schools & universities education from physical to virtual mode (so-called online education);
- mask wearing and compliance with social distancing between people in public places (usually 1,5 m);
- all large events, museums, cultural centers, swimming pools, and spas have been closed at least in Springer 2020.

How Many People Are on Lockdown?
As of March 2020, the world population is 7.8 billion people. As of May 26, 2020 more, then one third of the world population lives in one form or another under the blockade caused by coronavirus. More than three billion people in almost 70 countries and territories asked to stay at home. Thus, about one third of the world population was blocked in spring 2020.

But as testing is not readily available in many places, this number is likely to be much higher1, especially after ‘second wave’ that started in the fall of 2020.

1 https://www.express.co.uk/news/world/1260709/lockdown-which-countries-are-in-lockdown-how-many-people-coronavirus-cases.
4 Coronavirus Spreading

WHO daily reports incidence of confirmed 2019-nCoV cases on https://www.who.int/emergencies/diseases/novel-coronavirus-2019/situation-reports/. The first Situation Report was dated as of 20.01.2020. It is necessary to note that new WHO Situation Reports remark that “Data as received by WHO from national authorities”. It means that there are reported just data provided by authorities. Bearing in mind that “Everybody lies” it means that we can see the picture by wishes of authorities and we cannot check how truly it is because data reflection sometimes depends on political situation/game in each separate country.

In addition, there are many questions about how to calculate the number of confirmed 2019-nCoV cases and deaths from coronavirus. These methods differ from country to country. For example, in Italy, the authorities considered only the number of a severe form of disease (15% of infected people, according to WHO data [2]), but in China - all who received a positive 2019-nCoV test result. In the method of calculation also matters the degree of the population’s coverage by testing for coronavirus and antibodies to it. As of the current date, there is no uniform methodology for calculating the number of deaths from coronavirus that all countries would apply equally. So, we can consider just approximately data that represented by national authorities then counted by WHO.

In addition, from a general point of view, the outputs returned by the simulation fit quite well the data reported by the WHO. In particular, they estimated reasonably the date and magnitude of the peaks corresponding to the number of new cases, new deaths and amount of hospitalized people. This indicates that the proposed methodology can be used as a useful decision tool for policy makers. However, considering an estimation performed at an early stage of the epidemic could produce poor results. Focusing on the study of the peaks of some relevant curves of the epidemic (e.g. new exposed people, new cases, new deaths and hospitalized people), results show that the control measures in China were efficient to quickly reduce the magnitude of the epidemic. However, due to the transition rates between the disease compartments, the visible impact for the society has a delay of two weeks after the beginning of those control measures [17].

The author has analyzed bimonthly WHO situation/operational reports to define trend of Coronavirus spreading. As a result of those reports’ study, total numbers of registered cases of Coronavirus infection and total deaths are shown on Fig. 1.

To date (Fig. 1), the total number of confirmed Covid-19 cases globally topped over 33 025 642 people, causing about one million (996 342) deaths as of 28.09.2020 and covering more than 230 countries.

Intuitively, we can assume that COVID-19 spreads according to the laws of normal distribution (Gaussian curve), since the behavior of COVID-19 distribution curve is similar to the Gaussian curve (Fig. 2).

Moreover, this assumption has historical roots. The Great Plague of London, lasting from 1665 to 1666, was the last major epidemic of the bubonic plague to occur in England. It happened within the centuries-long Second Pandemic, a period of intermittent bubonic plague epidemics which originated from Central Asia in 1331, the first
The Great Plague killed an estimated 100,000 people—almost a quarter of London’s population—in 18 months, based on the data of plague pandemic (Great Plague in 1665–1666 in London) [19, 20].

As we can see on Fig. 2 this graph looks like Gaussian curve in general (see Fig. 3).
Also, we can see the similarity between Gaussian and COVID-19 distributions curves if we place them side by side (Fig. 4).

![COVID-19 Distribution](image1)

**Fig. 3.** Gaussian curve.

![Comparison COVID-19 distribution with Gauss’s curve.](image2)

**Fig. 4.** Comparison COVID-19 distribution with Gauss’s curve.

Figure 4 shows visual similarity of COVID-19 distribution and Gaussians curves. Anyway, we can see that curve of total COVID-19 confirmed cases has no downward trend yet. Bearing in mind that in many European countries came “second wave” of COVID-19 we cannot expect close decreasing. Moreover, given that the most favorite holiday of the year is Christmas, we suppose that COVID-19 distribution would increase until the Christmas week at least, when it is customary to meet with the whole family in most countries due to the historical and cultural traditions of most countries.

According to visual representation and similarity of two curves behavior (Fig. 4) we can suppose that the length of COVID-19 spreading takes about 1/3 of whole path and taking into account the well-known symmetry of Gaussian curve about maximum, the extent in time would also take one third. At this moment, the COVID-19 is currently spreading for nine months (January–October) officially. Consequently, we can expect the duration/length of the COVID-19 curve for approximately 27 months. This hypothesis is true if the coronavirus spreads complain with Gaussian law and
other conditions. Also, it is important to notice that our analysis and forecasts assumed that the data are accurate. To define when will occur the peak of COVID-19 spread we need more accurate data and take into account many other factors.

To forecast COVID-19 distribution in the nearest future we can try to use Excel function FORECAST.ETS. Having the curve’s behavior for COVID-19 distribution based on WHO situation reports data from 20.01.2020 to 28.09.2020 we can continue this type of curve until 20.12.2020 by implementing simple Excel function FORECAST.ETS for prediction. Using Seasonable index 1 we have received following data and curve (Table 1 and Fig. 5). Table 1 shows data from WHO situation reports until 28.09.2020 and then predicted values by Excel function FORECAST.ETS (in red) from 12.10.2020 to 28.12.2020 with the keeping of the trend line after break for forecasting.

Table 1. COVID-19 distribution data (with prediction in red)

| Date       | Total confirmed cases | Total deaths |
|------------|-----------------------|--------------|
| 20-01-2020 | 282                   | 3            |
| 09-02-2020 | 37 358                | 813          |
| 23-02-2020 | 78 811                | 2 471        |
| 03-03-2020 | 89 493                | 3 071        |
| 13-03-2020 | 132 758               | 4 955        |
| 20-03-2020 | 234 073               | 9 840        |
| 31-03-2020 | 750 890               | 36 405       |
| 13-04-2020 | 1 773 084             | 111 652      |
| 30-04-2020 | 3 090 445             | 217 769      |
| 14-05-2020 | 4 248 389             | 292 046      |
| 28-05-2020 | 5 593 681             | 333 334      |
| 13-06-2020 | 7 553 182             | 423 349      |
| 23-06-2020 | 8 993 659             | 469 587      |
| 07-07-2020 | 11 125 245            | 528 204      |
| 18-07-2020 | 13 876 441            | 598 087      |
| 1-08-2020  | 17 396 943            | 675 060      |
| 15-08-2020 | 21 026 758            | 755 786      |
| 29-08-2020 | 24 257 988            | 827 246      |
| 12-09-2020 | 27 486 960            | 894 983      |
| 28-09-2020 | 33 025 642            | 996 342      |
| 12-10-2020 | 35 692 452            | 1 066 341    |
| 27-10-2020 | 39 422 184            | 1 143 956    |
| 12-11-2020 | 43 400 563            | 1 226 745    |
| 26-11-2020 | 46 881 644            | 1 299 186    |
| 12-12-2020 | 50 860 026            | 1 381 976    |
| 22-12-2020 | 54 838 406            | 1 464 766    |

Month later, after receiving fact values as of 27.10.2020 author compared these with the prediction (Table 2).
The difference in the dates of Table 2 is due to the cancellation of WHO situation reports. Instead of daily situation reports, WHO posts operational reports on its website (who.int) weekly and we compare the closest dates. As you can see from Table 2, the number of deaths is closer to the predicted values than the number of confirmed cases. The accuracy of prediction for total deaths value is 10% as of 27.10.2020.

Surely, to make any conclusion about the accuracy/imprecision of our prediction we need long-term period of observation and more accurate data. Doubts in fair representation of COVID-19 data were evidenced by some questions from above mentioned webinar participants: Participant 1. Many governments are trying to hide and manipulate COVID-19 data. How much damage this tendency is doing for proper analysis? And does this data manipulation harm initiatives that are based on those data?

Participant 2. The COVID-19 spread is increasing day by day but the data of infected persons may not be the actual/truly because the total number of infected persons that are getting must be dependent on the coronavirus testing but how can we define those who are infected but not get tested?

Bearing in mind these questions we can suppose that there are some issues/challenges with COVID-19 data representation. An international organization with broad powers and due diligence can verify the facts of testing on COVID-19 and complying with recognized by the most governments methodology for defining the number of confirmed cases of COVID-19. But this is the topic for future researches.

### Table 2. Comparison of predicted and actual values

| Date     | Prediction Total confirmed cases | Fact Total deaths | Prediction Total confirmed cases | Fact Total deaths |
|----------|----------------------------------|-------------------|----------------------------------|-------------------|
| 09.10.2020 | 36 361 054                        | 1 056 186         | 09.10.2020                      | 36 361 054        |
| 12.10.2020  | 35 692 452                        | 1 066 341         | 12.10.2020                      | 35 692 452        |
| 27.10.2020  | 39 422 184                        | 1 143 956         | 27.10.2020                      | 39 422 184        |

5 Conclusions

The COVID-19 pandemic has a dramatic Impact that presents an unprecedented challenge to public health, food systems and the world of work. The economic and social disruption caused by the pandemic is devastating: tens of millions of people are at risk of falling into extreme poverty, while the number of undernourished people, currently estimated at nearly 690 million, could increase by up to 132 million by the end of the year. Now is the time for global solidarity and support, especially with the most vulnerable in our societies, particularly in the emerging and developing world. Only together can we overcome the intertwined health and social and economic impacts of the pandemic and prevent its escalation into a protracted humanitarian and food security catastrophe, with the potential loss of already achieved development gains [21].

In this paper, the author considered the signs of a lockdown as one of the main forms of COVID-19 Impact, analyzed the data of WHO about the COVID-19 spread in
order to approximately predict some values in the near future. As a result of this work, proposed simplest model by using Excel function FORECAST.ETS can thus be used dynamically to approximately predict the spread of COVID-19 in the nearest future. Author believe these insights are not only valuable for the ongoing mitigation of the current pandemic, but may also serve to inform governments’ and public health organizations’ information dissemination and infection control strategies in the future.

References

1. Antipova, T.: Coronavirus pandemic as black swan event. In: Antipova, T. (ed.) ICIS 2020. LNNS, vol. 136, pp. 356–366. Springer, Cham (2021). https://doi.org/10.1007/978-3-030-49264-9_32
2. Coronavirus Disease 2019 (COVID-19): Situation report, 1–77. https://www.who.int/docs/default-source/coronaviruse/situation-reports/
3. Gautam, S.: The influence of COVID-19 on air quality in india: a boon or inutile. Bull. Environ. Contam. Toxicol. 104, 724–726 (2020). https://doi.org/10.1007/s00128-020-02877-y
4. Snyder-Mackler, N., et al.: Social determinants of health and survival in humans and other animals. Science 368, eaax9553 (2020). https://doi.org/10.1126/science.aax9553
5. Bzdok, D., Dunbar, R.I.M.: The neurobiology of social distance. Trends Cogn. Sci. 24, 717–733 (2020). https://doi.org/10.1016/j.tics.2020.05.016
6. Holt-Lunstad, J.: Why social relationships are important for physical health: a systems approach to understanding and modifying risk and protection. Ann. Rev. Psychol. 69, 437–458 (2018). https://doi.org/10.1146/annurev-psych-122216-011902
7. Nitschke, J.P., et al.: Resilience during uncertainty? Greater social connectedness during COVID-19 lockdown is associated with reduced distress and fatigue. Br. J. Health Psychol. (2020). https://doi.org/10.1111/bjhp.12485
8. Cardoso, E.H.S., et al.: Characterizing the impact of social inequality on COVID-19 propagation in developing countries. IEEE Access 8, 172563–172580 (2020). https://doi.org/10.1109/ACCESS.2020.3024910
9. Briançon, P.: Are markets putting too much hope in ECB’s capacity to help europe deal with coronavirus crisis? Barron’s (Online) (2020)
10. Budding, T.: The impact of the COVID-19 crisis on public sector accounting – what can be learned from previous crises? CIGAR Newsl. 11(4), 1–2 (2020)
11. Tsvirko, S.: Informational technologies for the efficiency of public debt management in Russia. In: MosITS 2017, AISC 724, pp. 104–113 (2018). https://doi.org/10.1007/978-3-319-74980-8_10
12. Rozhkova, D., Rozhkova, N., Blinova, U.: Digital universities in Russia: prospects and problems. In: DSIC 2019, AISC 1114, pp. 252–262 (2020). https://doi.org/10.1007/978-3-030-37737-3_23
13. Popov, E., Mingaleva, Z.: The digital technologies for improving the operational efficiency: case of Russian industry of ferrous and non-ferrous metals scrap. In: ICIS 2019, LNNS 78, pp. 351–363 (2020). https://doi.org/10.1007/978-3-030-22493-6_31
14. Voskanyan, Y., Shikina, I., Kidalov, F., Andreeva, O., Makhnovskaya, T.: Impact of macro factors on effectiveness of implementation of medical care safety management system (2021). https://doi.org/10.1007/978-3-030-49264-9_31
15. Antipova, T.: Nobel prize roots in Russia. J. Digit. Art Humanit. 1(1), 33–41 (2020). https://doi.org/10.33847/2712-8148.1.1_4
16. Konyavsky, V., Ross, G.: New method for digital economy user’s protection. In: ICIS 2019, LNNS 78, pp. 221–230 (2020). https://doi.org/10.1007/978-3-030-22493-6_20

17. Ivorra, B., et al.: Mathematical modeling of the spread of the coronavirus disease 2019 (COVID-19) taking into account the undetected infections. The case of China. Commun. Nonlinear Sci. Numer. Simul. 88, 105303 (2020)

18. Haensch, S., et al.: Distinct clones of yersinia pestis caused the black death. PLOS Pathog. 6 (10), e1001134 (2010). https://doi.org/10.1371/journal.ppat.1001134. PMC 2951374, PMID 20949072

19. The Great Plague of London: Contagion, historical views of diseases and epidemics. Harvard University (1665)

20. DNA in London Grave May Help Solve Mysteries of the Great Plague, 08 September 2016

21. https://www.who.int/news/item/13-10-2020-impact-of-covid-19-on-people’s-livelihoods-their-health-and-our-food-systems. Accessed 13 Oct 2020)