

# Understanding Public Health Dynamics in the Face of Uncertainty and the Unknown

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## SUMMARY

For the time being, until a treatment or a vaccine are found, only a person's immune system is capable of eliminating the SARS-CoV-2 virus from their body. This is generally very effective and explains why morbidity and mortality are so low, as a percentage of all cases. However, at the beginning of the pandemic, in contrast to seasonal influenza, not one single immune system was familiar with the virus. This explains the high absolute numbers for morbidity and mortality compared to seasonal influenza [1]. COVID-19 particularly affects over-60s and people with associated pathologies, such as lung disease or heart disease. Based on current knowledge, the only way to completely avoid death is by implementing non-medical measures to stop the virus from spreading. Absolute protection depends on the adoption of appropriate preventative behavior, but ensuring that people adopt such behavior is beyond the role of the medical sector [2-5]. As the virus has a very high transmission capacity, and a large proportion of carriers are pre-symptomatic or asymptomatic, everybody needs to be considered a potential transmitter of the disease. As a result, prevention is the only way to really protect ourselves from the virus.

Different societies need to decide what prevention measures are the most appropriate, based on what is socially realistic, economically viable, susceptible to be put in place rapidly and applicable to the vast majority of the population [6]. As such, community-based organizations have an important role to play in promoting preventative behavior. Uncertainty is a major source of stress. There is an urgent need to improve the level of awareness in the media and social networks in order to reduce the amount of insufficiently verified information that is circulated. Avoiding doom-mongering headlines makes it easier to promote preventative behavior among the general public – and the authorities [7]. Clearer communication about our complete dependence on a few well-selected prevention measures will help to protect economies and people's health, even for those located 'deep in the bush'. This change in behavior is the best investment we can make, especially for the most vulnerable population groups. We will continue to reap the benefits even after a vaccine has been found, due to the risks of the virus mutating and the existence of other airborne diseases.

## Introduction

The whole world is focused on a minuscule agglomeration of molecules, SARS-CoV-2, and how it reproduces within human cells: the virus penetrates these cells, without which it would not be able to survive and the contaminated cells die, freeing millions of copies that will then infest others in turn. By sneezing,

coughing and other secretions, the host transmits the virus to other people. The patient's immune system reacts more or less rapidly or strongly to eliminate the virus [8]. Many people are not aware that they are carriers; they are asymptomatic. Others will have a moderate to severe set of symptoms that are generally referred to

as “flu symptoms”. However, some people’s immune systems are either not capable of combatting the virus, or overreact to it. Others have ‘associated’ health conditions, such as chronic respiratory problems or heart disease, which mean they are unable to resist the secondary effects of the viral invasion [9]. These people usually then die in their homes, in retirement homes or in intensive care units [10]. It is these extreme situations – serious illness or death – and the virus’s high transmission capacity - that changed the situation in the world within a few weeks, with more than 4 billion people in lockdown conditions. Though they may be ‘abstract’ and minuscule, the virus – SARS-CoV-2 – and the disease – COVID-19 - have become a concrete and particularly powerful reality in the form of a global pandemic.

### Review of Healthcare Capacity

Five months since the beginning of the epidemic, there is still no treatment for the virus per se. For the moment, only a person’s immune system has the capacity to eliminate it [11-13]. As such, the medical sector’s role is to save lives by reducing the secondary effects as the virus multiplies and/or by reducing the impact of causes of co-morbidity in order to give the patient’s immune system the time to activate its response. In general, the immune system allows the patient to get better by eliminating the virus and then protects them from reinfection by keeping the memory of the infection which can be measured by the presence of antibodies. In this case though, there is some concern; serious sources have reported cases of people being re-infected by the virus , for example, in South Korea , and also apparently in several European countries. We do not yet know if these were genuine reinfections or if there were errors of detection due to the limits of the tests available. We need to be wary of solutions that might seem obvious but which also raise a lot of questions. For example, sending large quantities of unfamiliar, sophisticated biomedical equipment (such as respirators) weakens the response capacity even more [14]. Over the years, a great deal of equipment has been sent to many different health institutions all over the world. Unfortunately, this is often not really used and eventually deteriorates. The remaining skeletons continue to haunt the corridors and courtyards of hospitals in the South. The aim rather should be to support simple, inexpensive solutions that staff are familiar with.

### The Numbers War

A person’s immune system is the most effective defence, but certain patients may have died due to an overreaction of the immune system. This possibility was already suggested in the past, for example, in relation to the avian influenza (H5N1) virus, related to the so-called Spanish influenza epidemic of 1918 [15]. What happens is that cytokine – an immune system protein that helps to coordinate cells to combat infection – is produced in such high quantities that the inflammation that this causes destroys the cells

of the host person. This theory has not been confirmed by other studies, but due to a series of reports carried out on the basis of this hypothesis, for example in China on COVID-19 and SARS in 2003 , researchers from the Keck School of Medicine of USC (Los Angeles) have begun studying a counter-intuitive treatment by administering immunosuppressants . For the time being, it is too early to say whether or not this treatment could have promising results. These rare cases, such as the presence of micro embolisms or the inflammatory reaction of cells covering the inside of blood vessels, are intriguing, and scientists are developing hypotheses about them [16].

These usually remain within scientific circles, but some have been tempted to publicise them before all the data has been consolidated. These hypotheses are very useful for research, but spreading this kind of invalidated information in the public realm can have negative effects, discrediting research and favouring rumours. Other figures, such as the number of deaths, are also worrying. On 11 May 2020, a total of 282 244 people had died due to COVID-19 throughout the world. By comparison, seasonal flu kills an average of 291 000 people per year, and up to 646 000 people in the most deadly years, without making it to front pages [17]. Though it is too early to determine precisely how many people die of COVID-19 in relation to the number of people who are infected by it, estimates continue to fall due to the large number of suspected cases. In South Korea and Switzerland, where there has been widespread testing, mortality seems to be around 1%. This is ten times higher than seasonal flu mortality in the United States, which suggests that this pandemic will be more deadly. The first cases of COVID-19 that were declared in different countries have all been recognized as being several weeks late in relation to the first actual cases. This is understandable in that, in contrast to what was perceived at the beginning of the pandemic, there is a lot of discreet transmission of the virus via asymptomatic cases. One piece of good news to emerge from this is that the level of immunity that has been achieved is probably much higher than the number of cases reported, though unfortunately this still remains much lower than the percentage necessary to achieve group protection. [18] If the number of deaths remains the same, the percentage of deaths in relation to the number of cases of the disease therefore falls. On the other hand, a high level of asymptomatic cases increases transmission enormously and affects many more people than initially perceived. Paradoxically, the number of deaths globally will be much higher for this virus than for Ebola, which is a much more deadly disease, but affects far fewer people.

It is this paradox that makes some people say that COVID-19 is harmless – because only 1 percent of people die. However, at the level of a country, this is enough to make leaders very worried. It also means that an entire population needs to take preventative measures (or, at some point in the future, get vaccinated) to reduce

the number of cases in hospitals and the overall number of deaths [19]. To date, in contrast to other transmissible disease epidemics, mortality is higher in countries with a higher gross domestic product. Part of these considerable differences is attributed to calculation methods and differences in the quality of systems for monitoring health statistics (under-reporting, problems of data quality, and delays). However, as the crisis has continued, data collection and management systems have been reinforced due to the efforts of numerous Health Ministries, with support from the WHO, the African Union and certain donors, and these significant differences in the number of deaths have remained.

This raises the question of why mortality and morbidity vary depending on the context. A thousand and one causes have been suggested: age distribution, genetic differences, natural selection in very aggressive environments, climate, etc. For all these reasons, it seems that, in order to measure the real impact of COVID-19, we should measure excess mortality, that is to say, by calculating how many more people died during the COVID-19 period compared to the number of deaths over the same period in previous years. Indeed, mortality in countries that have not been affected by a major disaster (epidemic, tsunami, etc.) is reasonably stable. This method is therefore preferable as long as countries have not changed the way they count the number of deaths. On EUROMO, the graphs show significant differences, particularly for older age groups [20]. The meaning of certain results nevertheless still needs to be clarified, such as, for example, the number of years or months of life that COVID-19 has "taken" from the people who have died from it.

For the time being, the number of deaths related to COVID-19 in Sub-Saharan countries is lower than the disastrous situation that was feared at the beginning of the crisis. But there is still some uncertainty, given the difficulty of collecting and reporting medical information and statistics in certain countries, delays in publication and the political biases that can interfere with this publication. However, the information collected about what is happening in cemeteries appears to show that, for the moment, countries in the Global South are not experiencing a massive increase in mortality as we might see when there is a cholera or Ebola epidemic. How mortality evolves in the coming weeks remains uncertain; we do not know if it will increase, or by how much. Here too, there is a great deal of speculation. Will there be a significant rise in mortality and morbidity in the countries of the South? Or will there be a completely different scenario from the one in Europe, with a different type of mortality?

### **What Options are there for Managing the Pandemic?**

Medical treatment depends on the detection of 'flu' symptoms and underlying pathologies. Very quickly it became apparent that the main problem was less of a technical nature – knowing how

to treat the illness – and more a question of managing health structures. In many developed countries, in Europe, but also in the Americas and Asia, hospitals were very quickly saturated, forcing the authorities to use the only tool available to reduce the pressure on medical departments by limiting the transmission of the virus: generalized lockdown. In developing countries, treatment raises different issues. Even though the actual number of people requiring intensive care remains lower than what we have seen in many so-called rich countries, hospitals may rapidly be overrun in countries where the health system has even fewer beds (and particularly in emergency services) per head of population. What is more, it is very risky to place a COVID-19 patient in an under-sized hospital department that does not have the basic equipment to protect its personnel.

And when the system is saturated, it prevents other illnesses from being treated and dissuades patients from going for a consultation out of fear of catching the virus within a medical institution. Such a context raises several major questions, such as, for example, the ethical issue of triage. Who should be given priority in medical institutions? Should COVID-19 patients be excluded due to the risk of contaminating a hospital (keeping in mind that without tests it is not possible to know whether it really is a case of COVID-19)? Such a mechanism would prevent patients with similar symptoms to COVID-19 from using the health services that have the treatment they need to survive or would hamper patients' ability to gain access to their usual treatments (AIDS, malaria, tuberculosis, etc.). Screening systems and triage are particularly important. What is more, as the Ebola and cholera epidemics in numerous contexts have shown, managing this kind of epidemic depends a great deal on the capacity and dynamism of prevention and case management mechanisms at the lowest level of health care systems. Community-based health workers are an asset in many countries of the Global South.

It is a priority to recognise them, give them the resources that they need to do their work and protect themselves, and provide them with training. Indeed, without a treatment for the virus, it is essential to support the vast majority of patients who have every chance of surviving in their communities, help to break the transmission chain and, obviously, protect these vital lower levels of the health care system. Given the significant gaps in our understanding of the disease, the uncertainty about the development and availability of treatments and vaccines, and the challenges of protecting the population and the health services, only the systematic adoption of preventative behaviour can limit the impact of the pandemic. Due to the number of asymptomatic people and the high level of transmission of the virus, the wearing of masks by all outside of the home, and especially in all enclosed areas, seems to be the best way to protect the population. This measure applied by 60% of the population could reduce the transmission rate sufficiently so that

it fell below 1. This, along with hand washing which is useful for everyone both in the South and the North, in the countryside and in cities, should increase the chances of preventing the spread of COVID-19 while also reinforcing hygiene that will help to combat numerous other diseases.

These basic prevention rules are a question of behaviour. They also have the advantage of being simple and can be respected by the population, as has been shown in numerous Asian and African countries. Nothing can justify taking the risk of overloading healthcare systems and having to impose another lockdown when it is possible to adopt inexpensive means of protection. Detecting contamination pathways is a laborious business but it is needed to alert those who have been in contact with the virus without knowing it. However, contact tracing is cumbersome and expensive and can only be reasonably implemented when the number of cases is not too high, or is contained within a very limited population. But there is a significant amount of reticence in many countries about the acceptability of 'tracking' tools that are being developed because they are invasive and are a threat to democracy. Making this kind of screening voluntary and mostly anonymous might nevertheless be preferable in areas where the epidemic continues to spread.

### Competition Between Scientists, Wars Between Laboratories

A large number of research projects have been launched around the world. For once the problem is not funding but the number of initiatives. On the one hand, part of the scientific community has shown a real collaborative spirit (sharing data, setting up 'peer review' systems for scientific papers, etc.), while, on the other hand, there has been a lack of collaboration, or there has even been increased competition between certain researchers, pharmaceutical laboratories and governments. Such competition is inspired by the search for fame or fortune, but is not in the general interest. This is a major challenge. There are currently 119 research projects aiming to develop a vaccine, while many other initiatives are exploring other areas, including finding a treatment. Ensuring that these projects are coherent, ethical, rapid, rigorous and efficient is essential and should be a central concern of the international community. The role of WHO, major regional coordination bodies such as the African Union, the European Commission, CARICOM, and the UN Economic and Social Commission for Asia and the Pacific (ESCAP), as well as institutions such as the Bill and Melinda Gates Foundation, will be fundamental. This coordination should make it possible to select and successfully complete a sufficient number of initiatives in order to reduce the usual time needed to produce a vaccine, which is between 18 months and 5 years.

### Managing Medical Information in a World of Social Networks and Rumours

Information is now available around the world almost

instantaneously, and often removed from its context. This does not give the scientific community, or the major international institutions, the time to decree whether or not an immunity passport could be provided, or whether the rare case that has been detected really represents a danger as depicted by some on social networks. The struggle between people's desire for instantaneous information and factual truth has only just begun. The free circulation of information – sometimes intentionally produced by special interest groups – leads to rumours, false information, and smear campaigns which the media then feel they have to relay, placing the authorities and the scientific community in a difficult position. The amount of fragmented information in the media needs to be seriously reduced. Not only does it cause unnecessary stress, it also distracts from issues on which people can take action. What is more, it reduces the chances of building the international momentum necessary to protect us all. It is increasingly important to work with the media on fundamental scientific issues so that debates can take place serenely about health risks and their systemic effects, as well as about the measures to take and their possible impacts on economies and societies. Democracy and social peace are at stake in the majority of countries around the world.

### References

1. The virus is officially called SARS-CoV-2 (Severe Acute Respiratory Syndrome Corona Virus 2) and the disease is called COVID-19 (corona virus disease 2019).
2. <https://www.cdc.gov/coronavirus/2019-ncov/hcp/faq.html>.
3. 116 cases reported on 13 April in South Korea.
4. The test that is currently used (RT-PCR) detects the presence of the virus but not that of antibodies which indicate that the immune system reacted previously or recently. The assumption is that virus debris continues to be detected with the person having a second infection.
5. <https://asia.nikkei.com/Spotlight/Coronavirus/Recovered-coronavirus-patients-immunity-in-question-WHO-says>.
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11. [https://ourworldindata.org/covid-deaths?country=OWID\\_WRL](https://ourworldindata.org/covid-deaths?country=OWID_WRL).
12. The Lancet Respiratory Medicine, Jason Phua and colleagues 1.
13. Christian Bommer, Professor Sebastian Vollmer, Göttingen University: Average detection rate of SARS-CoV-2 infections has improved since our last estimates but is still as low as nine percent on March 30<sup>th</sup>.
14. Dayton G Thorpe (University of California) estimates that in the United States, 4.8 % of the population has already contracted COVID-19, which represents 39 times the number of cases declared.
15. <https://ourworldindata.org/grapher/tests-of-covid-19-per-thousand-people-vs-gdp-per-capita>.
16. On 11 May 2020, the number of reported deaths per million inhabitants

was very high in certain European countries (569.38 in Spain, 404.15 in France and 88.53 in Germany), lower in South America (54.19 in Brazil, 121 in Equator and 9.42 in Colombia), in Central America (57 in Panama, 1.37 in Costa Rica), under 2 in sub-Saharan countries, and under 1 in South-East Asia (Laos, Cambodia, etc.).

17. Certain countries, for example, only report the number of people who have died in hospitals, while others only report cases with a positive laboratory test.

18. <https://ourworldindata.org/excess-mortality-covid>.

19. Experience of other disasters has shown that it is absurd to suddenly try to increase the capacity of a hospital system in the middle of a crisis by buying equipment that is beyond the existing capacity of the technical facilities and the biomedical maintenance systems.

20. Lian Tian Cornell University calibrated intervention: <https://arxiv.org/ftp/arxiv/papers/2003/2003.07353.pdf>.

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