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Coronavirus disease 2019 scenarios for a long-term strategy under fundamental uncertainty

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Abstract

Early on, scientists have pointed out that coronavirus disease 2019 is most likely here to stay, although its course and development are uncertain. This requires a long-term strategy of living with the virus. However, the urgency of new waves of infection and the emergence of new variants have invoked an approach of acute crisis management over and over, hindering the design of a structural approach for the long term. Exploratory scenarios can provide scientific strategic guidance to policy processes to be better prepared in this situation of fundamental uncertainty. We have therefore developed five scenarios, which describe the possible long-term development of the pandemic from an epidemiological, virological, and broader societal perspective. These scenarios are based on four driving forces that are both important and uncertain: immunity, vaccination, mutations, and human behavior. The scenarios are (1) return to normal, (2) flu+, (3) external threat, (4) continuous struggle, and (5) worst case. Working with scenarios is crucial for appropriate public communication and provides guidance for anticipating the various conceivable possibilities for the further course of the pandemic. © 2022 The Authors. Published by Elsevier Inc. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Keywords: COVID-19; Pandemic; Virus variants; Exploratory scenarios; Scientific guidance; Policy; Strategy; Preparedness; Uncertainty; Long-term; Course; Development; Driving forces; Immunity; Vaccination; Mutations; Human behavior; Communication; Anticipation; Chess

1. Introduction

Society worldwide has been dealing with the coronavirus disease 2019 (COVID-19) pandemic for 2 years. After a series of upscaling and downscaling containment measures, countries keep hoping that the latest wave of infections will be the last one. After long periods of social distancing, face masks, and lockdowns, hopes were high that vaccines would offer a way out of the pandemic. But reality proved to be messier. Even in countries with relatively high vaccination

rates, infections may rise again due to seasonal effects and new variants of concern, also after Omicron [1,2].

Although most vaccines, with boosters, are expected to be still reasonably effective in preventing serious illness and death, they do not fully prevent infections from surging, immunity may decrease, and new variants can emerge that may escape the vaccine immunity. COVID-19 measures therefore still apply in various countries. It has however become clear that we cannot just keep returning to the arsenal of acute crisis management, now that what at first appeared to be an unwelcome visitor turns out to be a long-time traveling companion. It is necessary to develop a more long-term strategy.

At the same time, it is not easy to create space for developing such a strategy. While even in normal circumstances it is difficult to govern for the long term [3], this challenge is exacerbated in a situation where managing an acute crisis

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still requires a lot of attention. Moreover, there is a fundamental uncertainty about the development of the pandemic. Virologists and epidemiologists worldwide have pointed out that the future course and timeline of the pandemic are uncertain. They deem it likely the virus will eventually become endemic, but how long this will take is hard to predict [4,5]. In its course toward a possible endemic state, it remains uncertain how many surges of infections and how many new worrying variants global society will have to face. It could even get worse again before it gets permanently better.

Despite the extensive use of science in policy making about COVID-19 [6], awareness of this uncertainty about the development of the virus has had a difficult time finding its way into policy making and the public domain. In this context, we propose in this commentary to use exploratory scenarios for the possible course of the pandemic.

2. Modeling, scenarios, and fundamental uncertainties

Large-scale data collection and international sharing of scientific information have facilitated and improved extrapolating and predicting the possible course of the pandemic through mathematical modeling [4,7]. In addition, given the limited direct evidence on the effectiveness of control measures, modeling has been very important in estimating the expected impact of measures. However, it is essential to also be aware of the limitations of modeling and model-based predictions. Sometimes there are no (good quality) data available (e.g., when a new variant arises), and the correctness of the assumptions in the models can change over time [8]. Furthermore, when looking further into the future, the reliability of the assumptions decreases, and the width of the confidence intervals of the predictions increases. Therefore, to develop a long-term strategy, we need additional tools such as exploratory scenarios. Exploratory scenarios are not predictions but describe possible futures and are a way to deal with the fundamental uncertainties inherent to the development of the pandemic. While modeling tries to predict, exploratory scenarios focus on anticipating. We can compare it to chess: chess players cannot predict what their opponents will do but can anticipate the opponents' moves as much as possible, including the less likely but potentially dangerous ones. The better and the further players anticipate, the greater their chances.

3. Exploratory scenarios: a Dutch example

Exploratory scenarios have the potential to broaden strategic thinking and support public health and policy makers to prepare, including for unexpected turns. Building on previous work [5], the Netherlands Scientific Council for Government Policy (WRR) and the Royal Netherlands Academy of Arts and Sciences (KNAW) have developed five exploratory scenarios for the COVID-19 pandemic

[9]. They were originally developed for the Dutch context, but the situation in many other affluent countries is likely to be comparable. These scenarios are primarily based on scientific insights from the fields of virology and epidemiology, but broadened by interviews with scientists from a large variety of disciplines and policymakers and expanded through expert opinions on identified recurring themes (e.g., health and health care, economy and work, education, sustainability, digitalization, and human rights). The five scenarios describe the possible course of the pandemic and are based on four driving forces [10]: immunity, vaccination, mutations of the virus, and human behavior. They are expanded by identifying possible societal implications and policy challenges and were described as follows (see Fig. 1):

3.1. Return to normal

COVID-19 is completely eliminated. Throughout the world, enough people have become immune because of vaccination or recovery from infection. The virus is not mutating in a way that escapes immunity. Policy can fully focus on recovery and eliminating backlogs in, e.g., health care and education.

3.2. Flu+

COVID-19 becomes endemic, with annual waves. Most people do not become seriously ill, although vulnerable groups remain at increased risk. Booster vaccinations and (temporary) nonpharmaceutical interventions (NPIs) such as face masks and social distancing may still be necessary, in line with the flu season, depending on the dominant variant and the duration of immunity. The virus continues to mutate but not in a way that leads to major changes in its severity. There may be a need for seasonal upscaling of healthcare capacity, and there is less room for or delay of full recovery.

3.3. External threat

The virus is under control in most affluent countries but not in many other parts of the world. There, it continues to circulate and mutate into new and dangerous variants that may escape immunity. Strict border policies are enacted in an effort to prevent new outbreaks in “safe” countries, leading to increasing global inequities and international trade and travel disruptions.

3.4. Continuous struggle

COVID-19 remains a serious threat. Vaccines are not working sufficiently (or for a sufficiently long period), and new variants continue to develop, with at least some of them being resistant to the existing vaccines. Policy faces difficult trade-offs between acute COVID care and

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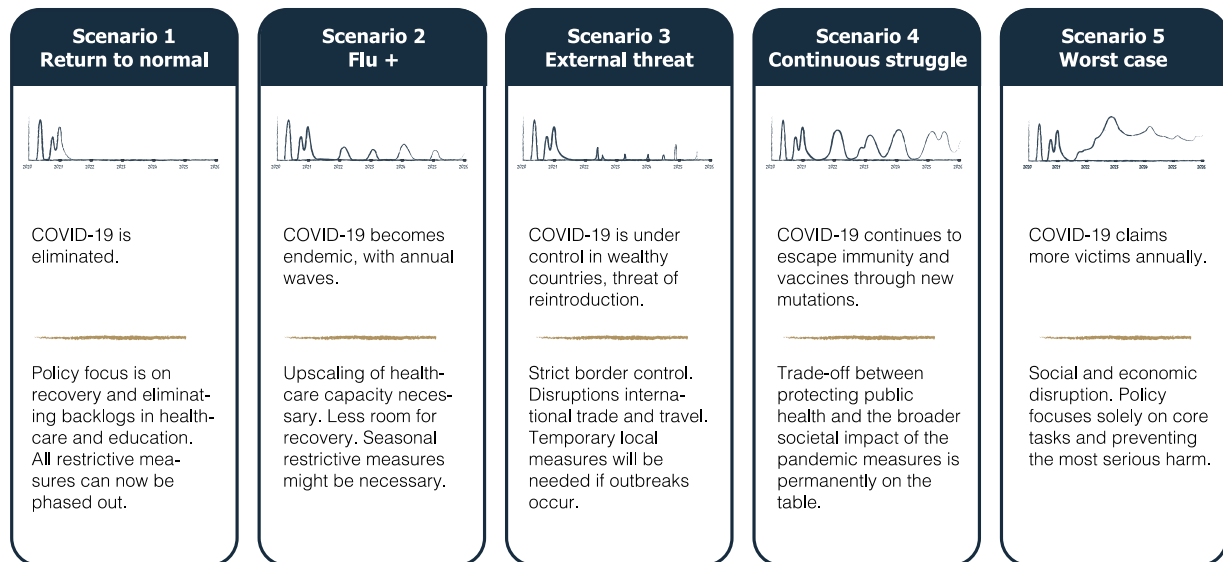


Fig. 1. Five exploratory scenarios for the possible course of the pandemic and its societal implications. The graphs are illustrations visualizing the five possible scenarios, not predictions of the course of the pandemic. The x-axis represents time; the y-axis was originally drafted to represent the fatalities but could also be more broadly interpreted as clinically severe COVID-19 manifestations.

regular care and between public health and broader, longer term societal and economic goals.

3.5. Worst case

COVID-19 continues to claim more victims and to circulate throughout the world. Acquired immunity and vaccine effectiveness are limited. No one knows when the pandemic will die out, and until then, serious outbreaks continue to occur. Society and the economy experience a long period of disruption. Policy focuses on core tasks and preventing the most serious harm.

These scenarios can help visualize possible futures to support strategic decision-making. To be effective, scenarios need not only be an exercise on paper, they need to live in the minds of decision makers and the broader public. In the Netherlands, scenario sessions with a variety of groups (ministries, mayors, local health authorities, sport associations etc.) in which consequences for their work were explored, have contributed to identify potential future challenges for society and policy. The scenarios are also used by the government and the parliament to outline and discuss the long-term strategy for COVID-19 and associated national policies in other societal domains.

4. Conclusion and recommendations

We do not know how the future will unfold, but it is almost certain that we will have to live with this virus on a permanent basis [5,11]. The transmissibility of the Omicron variant and the degree of effectiveness of the current

vaccines make elimination of the virus and a complete “return to normal” as it used to be highly unlikely. This calls for a long-term strategy instead of wave-by-wave crisis management. Working with scenarios can contribute to developing such a long-term strategy.

To begin with, this is crucial for appropriate public communication. For example, if short-term promises (“just one more wave” or “once we’re all vaccinated we can go back to normal”) will be repeatedly broken, this can contribute to effects such as pandemic fatigue, a crumbling of trust in society, and a declining willingness to adhere to contact-restricting measures and perhaps even to be vaccinated or revaccinated in the future if necessary [12–14]. By sharing possible scenarios, including associated uncertainties with the public, expectations can be managed more adequately, which can help to mitigate these effects.

In addition, scenarios can support the development of an appropriate long-term policy strategy because they provide guidance for anticipating the various conceivable possibilities for the further course of the pandemic. Governments should think through and make preparations for the key vulnerabilities and requirements in each scenario. Some of these can be identified as no regret options that are relevant to always implement before it is even clear which scenario will develop. One of those key requirements is a long-term strategy for worldwide vaccination. Ad hoc one-time vaccine donations may fit acute crisis management, but vaccination on a global level, which should be repeatable if necessary, requires more structural approaches [15]. Second, governments must assess general social distancing or other NPIs for their tenability in the long term. Therefore, a careful assessment, grounded in ethics and the behavioral sciences,

is needed before introducing new measures that could become the “new normal.” Third, a long-term strategy always requires safeguarding and improving the resilience of healthcare systems and society in general. Important steps can be taken in advance to ensure that society as a whole is capable of coping with long-term shocks. Finally, promoting biomedical, public health, and social science research, in combination with worldwide public data sharing and knowledge synthesis, is essential to strengthen the evidence base for improving prevention and anticipation of and response to pandemic crises [7,9,16–20].

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