What Measures are Truly Effective in Fighting COVID-19 ?

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ABSTRACT

“Those who argue that lockdown measures were not necessary and that, without them, the final number of deaths would not be much different from those of a strong seasonal flu are wrong,” explains Marc Fleurbaey, who has developed with a team from Princeton University, a tool simulating the evolution of the pandemic in the absence of intervention, as well as under policies reducing contacts between people or implementing broad testing to identify infectious people early (downloadable on WPRN). This simulator indicates that in the United Kingdom, total mortality would differ by a factor of nearly five with or without lockdown. In France, this factor is between ten and…

“Those who argue that lockdown measures were not necessary and that, without them, the final number of deaths would not be much different from those of a strong seasonal flu are wrong”, explains Marc Fleurbaey, who has developed, with a team from Princeton University, a tool simulating the evolution of the pandemic according to the implemented measures (downloadable on WPRN). This simulator indicates that in the United Kingdom, total mortality would differ by a factor of nearly five with or without lockdown. In France, this factor is between ten and twenty. Virus eradication or control strategy, timing, toughness and type of measures: what works and why? On the World Pandemic Research Network, several studies provide preliminary answers.

Lockdown is very effective in the early stages of the pandemic.

According to the Princeton simulator, if a virus eradication strategy is implemented before the 20th week of the pandemic, it saves many more lives than a control strategy [1]. It usually does so at a lower economic cost. But for this strategy to work, it must be firm, come early (ideally, the tenth week) and last long enough. Most countries which have succeeded in eradicating the virus (such as Vietnam, New Zealand or South Korea) adopted very early a lockdown policy coupled with testing and contact tracing in order to break the

transmission chain of the virus. Once the virus has spread widely, lockdown is no longer so effective and the eradication strategy requires longer and repeated lockdown episodes: the socio-economic costs are then higher for less effectiveness.

An eradication strategy challenging to implement reality.

On WPRN, Princeton University researches point out that for near-total suppression of the virus, by beginning the 15th week of the outbreak, the required lockdown duration would have to be four months with a 70% reduction in interpersonal contact (or three months with an 80% reduction in contact). Very small variations in the intensity and duration of lockdown can have a huge impact on its effectiveness. If authorities return to a more modest control strategy too soon, they will only have pushed the wave of infection into the future, while lockdown will have come at a high cost. However, it is politically difficult to impose a long and strict lockdown: strong support measures for the populations deprived of work are necessary. In the special COVID-19 issue of the European Journal of Risk Regulation (University of Cambridge - relayed on WPRN), researchers point out that the eradication strategy was successful in New Zealand because the country began testing before its first symptomatic case and quarantined anyone entering the territory. Its insular nature has proven to be decisive. In comparison, the extent of the European Union's land borders makes absolute control impossible.

Softer measures can be more effective

A study published in *Nature Human Behaviour* shows that to stop the spread of the virus, an appropriate combination of less disruptive and less costly measures than lockdown can be as - or even more - effective than lockdown. Sequence and timing are crucial. These results are confirmed through 226 countries, three databases and four independent methods. In terms of effectiveness, the greatest consensus surrounds closing or restricting access to places where people congregate for extended periods (shops, bars, schools, etc.). Cancelling small gatherings decreases the ΔRt [2] virus reproduction rate between -0.22 and -0.35, and closing educational institutions decreases it from

-0.15 to -0.21. Several less intrusive measures are also highly effective, including land border restrictions (ΔRt between -0.057 and -0.23) or communication about risks (ΔRt between -0.18 and -0.28: communicating the importance of social distancing is only marginally less effective than legislating it).

Economic support has a health impact

Government food assistance programs and other financial support to poor populations are also very effective (ΔRt between -0.17 and -0.18). These measures not only have an impact on the socio-economic sphere, but also a positive effect on public health. For example, as outlined by the Oxford University *COVID-19 government response tracker*, allowing people to self-isolate without fear of losing their job or part of their salary can help reduce the rate of transmission. Facilitating people's access to testing by making it free is also helpful. On WPRN, the Princeton University simulator indicates that early testing is essential to reduce the time people are contagious and in contact with other people: cutting this time in half reduces final mortality by five.

Timing is crucial.

The CoronaNet research project, led by researchers from the Technical University of Munich, New York University Abu Dhabi and Yale, and listed on WPRN has compiled more than 30,000 policies in over 190 countries. It concludes that by implementing several measures in the right order and at the right time, the reproduction rate of the virus can be reduced to below 1. Timing is crucial: the same measure can have a dramatically different impact depending on when it is implemented, which affects both the number of deaths and the length of time it takes to implement. The meta-analysis conducted by researchers from Oxford University indicates that strict and early restrictions are generally the most effective in limiting the number of deaths. However, they point out that while implementing containment measures in the early stages of a future health crisis is strongly recommended, this recipe does not always work (counter-example of Peru).

Evaluating the effectiveness of a measure: a conundrum

Determining the impact of a policy is particularly difficult: several measures are often taken simultaneously, and the sequence of implementation is crucial (previous measures taken, in what order, stage of the pandemic, etc.). The way a policy is applied may also vary from one country to another. The United Kingdom and France imposed lockdowns, but a certificate was required to leave one's home on the French side, whereas no document was needed in England. In Madrid, at curfew time in April 2021, the streets were still crowded: 45 minutes of tolerance seemed to be allowed to go home; in Canada, guards could patrol up to two hours before the curfew to ask people to leave the parks. The degree of the population's compliance with a measure also has a crucial impact on its effectiveness. However, this is a parameter that researchers rarely measure. Results may also be biased by variations in testing and reporting policies between countries. For example, most states count exclusively confirmed COVID-19- related deaths in their statistics; however, some, such as Belgium, also include suspected cases.

The effectiveness of many measures also depends on the local context. The study published in *Nature Human Behaviour* tells us that social distancing measures and travel restrictions have high entropy (effectiveness varies considerably across countries), contrary to testing and contact cases finding. The Princeton University study points out that the demographic structure of the population and its general health status may also influence the lethality of the virus. On WPRN, several meta-analyses conclude that a policy that is effective in one setting may be ineffective in another due to a variety of factors.

What effectiveness are we talking about ?

Finally, can the effectiveness of a measure be assessed only by the decrease in the transmission rate or the number of deaths? Closing schools interrupts learning and can lead to poor nutrition, stress and social isolation for children. Lockdown has greatly increased the rate of domestic violence in many countries, and has hurt the mental health of populations. It has also limited access to long-term care such as chemotherapy, with substantial impacts on patients' health and chances of survival. In France, each month of the first

lockdown cost three points of annual GDP. What about individual liberties in countries that have been governed under a state of emergency for months? The study published in *Nature Human Behaviour* concludes that, taken together, social distancing and movement restriction policies can be considered as the "nuclear option" of measures: very effective, but causing substantial collateral damages to society, economy, and human rights.

Dictatorship vs. democracy: who does better ?

Suppose we divide the world into countries where the number of deaths is higher or lower than the average (in proportion to the population). In that case, we find in both groups rich and poor states, democracies and dictatorships, nations ruled by populists as well as by technocrats. The Oxford University meta-analysis found that no one of these characteristics predetermine the quality (or robustness) of a response to the pandemic. Some countries with strong scientific and health facilities have been overwhelmed and have had many deaths. Others, less well equipped, such as Mongolia, Thailand and Senegal, have managed to keep the population healthy and the economy going.

Appendix

This memorandum is based on resources from the World Pandemic Research Network.

Fleurbaey et al., "COVID policy simulator." https://wprn.org/item/414252
This tool simulates the evolution of the pandemic in the absence of intervention, as well as under policies reducing contact between people or implementing broad testing to identify infectious people early. It also provides a monetary value of the fatalities, using the Value of Statistical Life approach commonly used to assess safety measures. Everyone is free to use it either by modifying political assumptions, the model, and parameters or by changing the equations and introducing new policy instruments. The results spreadsheets provide the possibility to compare different scenarios.

Alemanno, "Taming COVID-19 by Regulation" https://wprn.org/item/445552
Special Issue of the European Journal of Risk Regulation dedicated to COVID-19. Researchers from the University of Cambridge provide a first

analysis of “the surprisingly uncoordinated, at times unscientific, response to an essentially foreseeable event like a novel coronavirus in a geopolitically shattered world.”

Cheng, “CoronaNet COVID-19 Government Response Event Dataset” https://wprn.org/item/418152
Led by researchers from the Technical University of Munich, New York University Abu Dhabi, and Yale University, the CoronaNet research project has compiled more than 30,000 policies in response to COVID-19 in more than 190 countries.

Haug et al., “Ranking the effectiveness of worldwide COVID-19 government interventions.” https://doi.org/10.1038/s41562-020-01009-0
This study quantifies the impact of 6,068 non-pharmaceutical interventions (NPIs) implemented in 79 territories on the effective reproduction number, *Rt*, of COVID-19. Its modeling approach combines four computational techniques merging statistical, inference, and artificial intelligence tools. Its findings are validated with two external datasets recording 42,151 additional NPIs from 226 countries. It concludes that less disruptive and less costly NPIs can be as effective as more intrusive and drastic NPIs (e.g., a national lockdown).

"COVID-19 government response tracker", https://www.bsg.ox.ac.uk/research/research-projects/covid-19-government-response-tracker
This tool aims to track and compare policy responses to the COVID-19 outbreak. It contains a database from over 180 countries, with 20 indicators (school closures, travel restrictions, etc.). This data also feeds an “opening risk index,” which aims to help countries understand whether it is prudent to relax measures.

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Footnotes

1: Elimination involves a strict lockdown for as long as it takes for the virus to disappear. Control limits lockdown measures to periods when the number of deaths exceeds a certain threshold (1000 per day in the United States).

2: Rt = the average number of secondary cases caused by an infected person