THE FIRST THIRTY DAYS[1]

COMPARATIVE LESSONS FROM THE COVID PANDEMIC

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This presentation aims to compare the effectiveness of national responses to the covid-19 epidemic in 24 countries, mostly in Western Europe, but also covering North America and Central Europe; Russia, Turkey, and South Africa; and the Middle East and Asia. The question is whether we can say anything about the effectiveness of responses to the pandemic, including:

1) "reactive" measures immediately taken by public authorities, and the population's behavior in response to them;

2) "proactive" measures, consisting of regular health spending and the state of health infrastructures.

To this end, the study focuses on available mortality data. First, it recalculates national mortality rates by controlling for national demographic parameters that might prevent any direct comparison between them. Second, it compares these adjusted and now comparable mortality rates with some major public health parameters. The goal is to observe the extent to which the combination of structural (proactive) health efforts and immediate (reactive) measures tempered the severity of the scourge.

This article starts with two methodological sections detailing how I worked with the available statistical data. It has been written in such a way that one can skip directly to the results and conclusions, provided in section III page 6 and in the appendices. Some "technical" findings also appear in a specific typographical format to improve readability.

The oral presentation will focus on section III.

[1] This paper is based on a report published in French in May 2020, and available at http://tnova.fr/notes/un-balcon-en-foret-2020-essai-comparatif-sur-l-epidemie-de-covid.

I. Controlling mortality rates for structural demographic parameters

The comparisons currently found in the media and scholarly debate on the epidemic are at best limited to reporting the number of recorded deaths in relation to the total population of each country. This overlooks the fact that a number of structural parameters prevent an immediate comparison between countries.

Americans would not expect epidemic hazards to equally strike New Jersey (almost 400 inhabitants per km²) and Wyoming (2.22)… By comparing the US to Belgium, President Trump forgot that the same holds true at the international level. Europeans have not always hit the mark either. Sweden has been widely envied for combining low mortality and very light collective restrictions, whereas Italy and Spain were blamed for their high mortality and severe lockdowns. But given its low density (15 times lower than Belgium), which "naturally" distances residents, Sweden's ability to contain mortality should be placed in perspective.

Other parameters stand in the way of straightforward international comparisons. The pandemic is less likely to affect a dense population evenly distributed across a national territory than less dense countries where the population is concentrated in one region. Intense human mobility (be it internal, or to and from other countries) is also conducive to the dissemination of the virus. Age structure penalizes countries that have the highest shares of senior citizens. We now know, through the largest epidemiological survey available to date, that this is by far the greatest risk factor, much more so than known comorbidities or socio-environmental variables[2].

In this paper (**see Table 1, Appendix 1**) I control for all these variables in order to harmonize comparisons between "corrected" mortality rates.

Another preliminary condition for any comparison is the chronology of a disease that tends to initially emerge as an avalanche. Since each country has its own timeline, international comparison requires consideration of mortality data covering comparable phases of the epidemic. To this end, I captured the 24 countries in my sample at a comparable point in time in the epidemic, starting with the day when 50 cases of covid-19 were recorded – bearing in mind that this also happens to correspond to when the first deaths were recorded[3]. I then followed the development of the epidemic for 30 days.

> *This was the maximum timeframe available when I began the study and accounts for why certain geographical areas (South America and Central Africa) are excluded. This period is long enough to observe what I call "the first cycle of epidemic maturity". It is also highly relevant for my purposes. Given that mortality results from an infection that may have occurred a few weeks earlier, it is a "strategic" period that captures public authorities' attitude towards an unexpected shock as it hit either the national territory for "pioneer" countries such as South Korea, Japan, and Italy, neighboring countries, or the rest of the world.*

[2] Elizabeth Williamson et al., *OpenSAFELY: factors associated with COVID-19-related hospital death in the linked electronic health records of 17 million adult NHS patients*, preprint doi: https://doi.org/10.1101/2020.05.06.20092999, 7 May 2020.
[3] I increased this observation threshold for the most populous countries in the sample, namely Russia, Japan and the United States, which in their cases shifts the starting point of the analysis by a few days.

Over this one-month period, starting between February 19 (South Korea) and March 17 (Hungary), I determined the observed mortality rate for each of the countries in the sample by relating the number of deaths to the total population. I then calculated an "adjusted" mortality rate by controlling for the raw data on the demographic variables previously mentioned: population density, geographical concentration, percentage of elderly people, and internal and external mobility.

The results are provided in Table 1 (Appendix). It significantly changes the ranking of countries. However, with the exception of Iran, which is discussed below, the order of magnitude of the differences between the countries least affected and most affected by mortality remains the same as it was at the outset, i.e. very high. Gross mortality varies from 0.00286% (Japan) to 1.65225% (Spain), and adjusted mortality, from 0.00483% (Japan) to 3,69662% (Turkey).

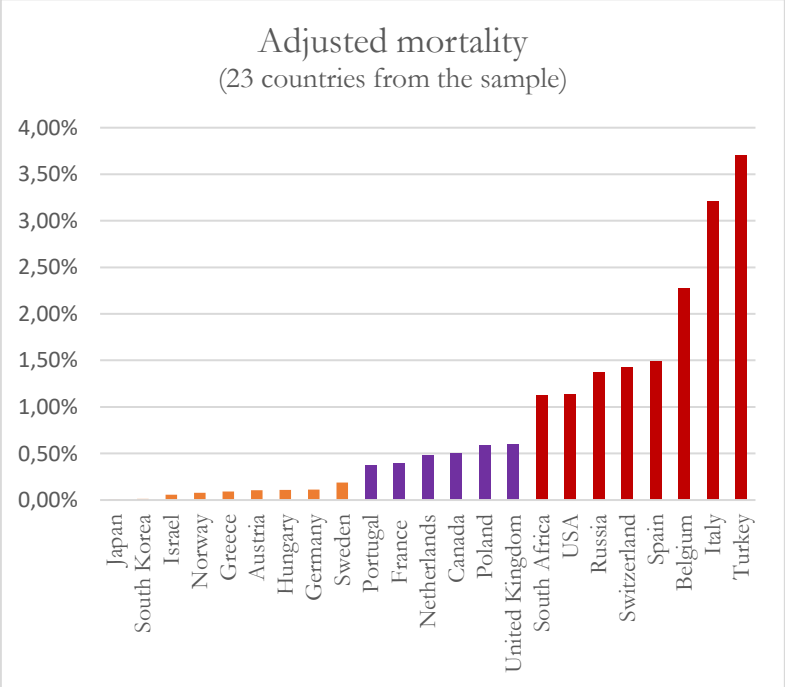
Table 1, and the resulting graph 1[4], show three jumps in the order of magnitude: first between Sweden and Portugal, then between the United Kingdom and South Africa, and finally between Spain and Belgium. By aggregating the nations most severely affected by the pandemic (i.e. starting with South Africa), three comparably sized groups of countries become apparent (9, 6, and 9 respectively).

Group 1 with "low mortality": Japan, South Korea, Israel, Norway, Greece, Austria, Hungary, Germany, Sweden;

Group 2 with "average mortality": Portugal, France, Netherlands, Canada, Poland, United Kingdom;

Group 3 with "high mortality": South Africa, United States, Russia, Switzerland, Spain, Belgium, Italy, Turkey, Iran.

Graph 1



[4] For graphic reasons this leaves out Iran, which has an overly large mortality gap.

Having established these groupings, the idea is to relate the corrected mortality data that can now be compared, "all demographic structures being equal", with the public health variables objectifying the responses to the epidemic.

II. Public health indicators

II.1 Indicator selection

Let us now turn to the public health indicators, both proactive (national public health policy prior to the epidemic) and reactive (measures to control the epidemic).

With regard to the first group of factors, the first two variables cover national public and private funding for health – an essential distinction to test since it corresponds to different structures of "medical goods and care"[5].

The third variable, from the same source, is the number of hospital beds per 1,000 inhabitants. This indicator has the disadvantage of aggregating very heterogeneous types of care. I supplement it with two quality indicators for intensive care units (ICUs). The number of ICU beds would not be a very good parameter because it aggregates highly specialized and heterogeneous medical services[6]. Moreover, some countries have adapted their hospital structures in response to the epidemic. I therefore chose a measure of the quality of intensive care, which is decisive given the seriousness of coronavirus complications: the case fatality rate in the 30 days following serious interventions – "a rate that reflects care procedures (e.g. timely transport of patients) and effective medical interventions"[7].

This measure is reliable and comparatively available for all OECD member countries, albeit unfortunately for these countries alone. Its other limitation is its specificity: each type of medical incident has its own measure that cannot be combined into a general indicator. Two different rates best suited my purposes: the case fatality rate within 30 days of hospital admission for ischemic stroke and for acute myocardial infarction (AMI). To ensure sufficient comparative data, I used the mortality measure for patients who remained in a single hospital[8].

These two indicators also have the advantage of implicitly incorporating information on the health status of populations with respect to the coronavirus. Both strokes and AMI depend on people's overall vascular condition, and their effects are aggravated in diabetic and obese patients – two covid-19 risk factors.

Let's now turn to "reactive" data. The first variable concerns the stringency of responses to the epidemic: the severity of containment measures, understood in the broadest sense (closings of schools, workplaces, and borders; cancellation of public events; and restrictions on public transportation), as well as contact tracing, testing, and the magnitude of awareness campaigns. The Coronavirus Government Response Tracker (CGRT) of the Blavatnik School of Government at Oxford University has reported all this data daily and globally[9]. By recording government provisions on a daily basis and weighting them in terms of strictness, the CGRT has produced an "Oxford Stringency Index" (OSI).

Although it has the weaknesses of any indicator that combines heterogeneous dimensions, this parameter is of major interest to me. Its daily cadence completely aligns with my objective of monitoring the reactions of States in a comparable 30-day epidemic timeframe. I incorporated the "Stringency Index" on three

[5] The data is for the year 2017, and provided in 2017 $ per inhabitant. Source: WHO, *Global Health Expenditure Database,* https://apps.who.int/nha/database/Select/Indicators/en.

[6] Meghan Prin and Hannah Wunsch, "International comparisons of intensive care: informing outcomes and improving standards", *Current Opinion in Critical Care*, 18, 6, 2012, p. 700-706, doi: 10.1097/MCC.0b013e32835914d5

[7] *Health at a Glance 2019,* OECD, p. 134.

[8] The coupled rate, which also includes patients who changed institutions during their care, is more accurate but unfortunately it is not available for all OECD countries.

[9] https://www.bsg.ox.ac.uk/research/research-projects/coronavirus-government-response-tracker

different dates for each country: on the first day of the 50 declared cases (D1), ten days later (D10), and on the 30th and last day (D30).

The second "reactive" data relates to disease testing. This variable is not continuously available for all the countries, but can be approximated, more or less precisely depending on the case, for the 30-day observation period. It is tenuous data. Performed testing is uneven. In addition, some countries count the number of people tested, while others count the number of tests. The US data in particular is questionable[10]. I add this parameter to the OSI, of which it is but one of the components, in order to approximate its specific effect.

II.2 Public health and anti-epidemic measures

II.2.1 Proactive measures

When adjusted mortality is related to public health data, the first observation is the heterogeneity of country profiles and the apparent inconsistency of the results. Switzerland and the United States respectively rank 22nd and 23rd out of 24 for mortality, while both countries have by far the highest health spending in the sample, and high-quality ICUs. Hungary, Greece, and Israel, ranked between 15th and 20th in health spending, are among the six countries with the lowest adjusted mortality, alongside affluent Norway.

Aggregating the countries into three blocks according to their adjusted mortality (above) allows for an initial organization of the data, without assuming a priori that each of the three blocks is homogeneous.

> *To highlight and facilitate discussion of apparent consistencies, I have each time indicated the country's rank for the relevant variable rather than the absolute data itself (Tables 2 to 4). This shift from the cardinal to the ordinal is also better suited to the often fragile nature of the data: it is better in this heuristic approach to elevate the data's main strength, which is its comparativeness, than to exaggerate the legitimacy of the basic data by objectivizing them with sophisticated statistical measurements.*

On that basis, it appears that the higher the national investment in public health infrastructure, the lower the mortality (table 2, Appendix). This effect is both linear and very strong. Between the first and the third group in terms of mortality, the ratio, in terms of rank, of total health spending per capita is 1.38. It reaches 1.63 for public health spending, and even 1.70 for the number of beds.

As with any retrospective evidence, it is tempting to take this result for granted in the case of an epidemic: having a reserve of beds enables treatment of a greater number of seriously ill patients, and probably adjustments to the supply of care by devoting some – or all, in the case of some Italian regions – of the hospitals to covid-19 care, provided they have the necessary equipment and, above all, specialized staff. But this retrospective evidence overlooks the fact that the average number of beds is "in normal times" considered to be a problematic variable in health economics: high numbers are seen as a sign of suboptimal management, as international organizations such as the OECD impressed upon its members. Countries that bucked the advice had greater strategic leeway to fight the disease.

[10] "States currently report testing figures in a range of different ways: some report the number of tests performed, others the number of people tested; some include private labs, others not; some report negative test results, others only positive test results; some include pending tests, others do not (below we show figures that exclude explicitly pending results). Moreover, many states do not explicitly provide details about these important factors needed to interpret the data they provide. There are issues in comparing the figures over time. The totals given for early on in the outbreak do not include all states. One significant uncertainty is the extent to which the rapid rise in tests seen from the mid-March in part reflects states beginning to report private lab tests" (https://ourworldindata.org/covid-testing).

Covid-19 pandemic thereby raises a fundamental question that will remain well beyond the current crisis. **Does the pandemic call into question "regular" health policies? Or is it just an exceptional case arising from the combination of two aspects of covid-19:**

1) The length of intensive care needed by the most affected patients – often three weeks or more;

2) The influx of sick people in a very short period of time, linked to the contagiousness of the virus (and the unpreparedness of most states).

It is this double bind – unheard of for decades in most of the countries considered here – of suddenly having to treat a mass of patients for a long period of intensive care – that makes this disease unique from a public health perspective.

The final set of "proactive" variables relates to the quality of critical care. The results differ depending on whether the care follows a heart attack or ischemic stroke: no significant effect was observed for the former – in fact, it was a slightly negative effect (0.92) – but a ratio of 1.6 was observed for stroke between the ranks of extreme groups of countries in terms of adjusted mortality. These two gaps are probably actually higher, since the data is only available for OECD countries and is incomplete for the states in the high mortality group, 4 out of 9 of which are not members.

Why is the ability to fight ischemic stroke more discriminating than that for AMI? First, with a comparable level of information in the population through prevention campaigns, it is easier to identify the chest pain associated with AMI than signs of stroke. The difference between the two indicators is thus an indirect marker of the health system's efforts to raise public awareness, or of the public's greater openness to it – an advantage that may also be relevant to covid-19. Second, stroke management requires a highly specialized staff. It is an indicator of a country's ability to allocate teams of "hyper specialists", reflecting a particularly high level of investment in the healthcare system.

II.2.2 Reactive measures

Let us now turn to reactive measures (Table 3, Appendix). That the number of tests per 1 M. inhabitants is positively correlated with the difference in adjusted mortality between the first group and the next two – a difference of around 15% - is quite remarkable considering the fragility of the variable. Even if its measurement is too imperfect to serve as absolute proof, the results for this variable confirm the generally shared assumption about the protective role of tests.

By contrast, the three sets of data on lockdown severity produce what appears to be a counterintuitive result. J30 shows an inverse relationship between the severity of measures taken against the epidemic and the effectiveness of the fight against mortality. **Countries with low adjusted mortality adopted less stringent provisions than moderately affected countries, which in turn adopted less severe measures than the most affected countries.**

Of course, this does not mean that lockdowns failed to contain the epidemic, or that they helped it. It has been much noted that **lockdowns were often palliative, serving as a catch-up policy for countries where a weak health infrastructure and/or lack of preparedness forced a default response that was costly in human, social and economic terms.** Thus under-resourced South Africa falls within the group of countries with high adjusted mortality, but is in an honorable position that places it ahead of the United States. Hungary, which ranks 19th out of 24 on health spending but 1st at D1 for stringency measures, ranks among the group of countries least affected by covid-19 mortality.

What the results for stringency actually reveal is that, **unlike the previous parameters, it is not strictly speaking a variable. Rather, it is a kind of residual reflection of all the parameters** – a crude indicator of the authorities' response to the pandemic **based on initially available resources**.

Even if one focuses on the health dimension, ignoring the liberticidal uses of epidemic control measures[11] by authoritarian governments, their intensity and severity, which rapidly changed over the 30-day observation period, are primarily indicative of contextual public policy decisions. As a historian, I would need specific sources to understand the rationale for these measures from the perspective of governments. However, it is possible to identify general patterns that are valid for several countries. They guide the following conclusions and hypotheses.

III. CONFRONTING THE VIRUS: CONCLUSIONS AND HYPOTHÈSES

1. The general scale and quality of public health investment and infrastructure were a major factor in the effectiveness of the fight against mortality

For countries leading the way in the fight against mortality, regular health efforts and/or the ability to test during the epidemic have proven valuable in limiting the loss of human life among their populations, and by the same token the strictness of anti-epidemic measures.

> *Let's remove information on the severity of lockdowns, and simplify the data in tables 2 and 3 by retaining only the cases where a given country is in the top 5 of the sample for a given criterion, or is ranked between 6th and 10th (Table 4, Appendix). For the remaining six criteria (proactive measures + tests), the nine countries with the lowest adjusted mortality (37.5% of the total) alone account for almost two thirds (19 out of 30) of the possible spots in the top five. This compares with only 13% for the countries in the middle group, which is admittedly smaller (25%), and 23% for the high-mortality countries.*
>
> *Countries with intermediate mortality – including Canada, France and the United Kingdom – are also around the average for the selected indicators. They dominate in the ranks between 5th and 10th place, accounting for 40% of the items in each of these ranks, compared with 30% for each of the other two groups, even though this middle group is smaller.*

2. However, if one focuses on the single criterion of mortality control, there is no one path to effective mortality control. A comparison of countries with low epidemic mortality suggests three profiles and three strategies.

Within the group of low-mortality countries, **the first subgroup includes those that focused on hospitals prior to the current crisis**, with a large number of beds and high-quality intensive care. Japan and South Korea are the leading countries in this regard, while their performance is modest on the other criteria. This selectivity confirms the extent to which the first variable in addressing the epidemic is the number of available hospital beds. It could only be strengthened by variables that are unobservable here, such as hygiene in private and public spaces, especially public transportation, and the habit of wearing masks as well as following government instructions or even strict social control[12]. It is difficult to mention these variables here without being able to objectify them, and thus risk falling into the trap of culturalism. But it is equally difficult to ignore the role of the populations themselves in the dynamics of the epidemic.

[11] For an analysis of Hungary's instrumental use of the health situation, compared to other countries in the Visegrad group, see Jacques Rupnik, « Orbán and rhe European Right », *Esprit*, 4, 2020, p. 33-37, *https://www.cairn-int.info/abstract-E_ESPRI_2004_0033--orban-and-the-european-right.htm#*

[12] For a statistical simulation of the braking effect on the current epidemic that the availability of masks would have had in France, see Hugues Lagrange *Masques et bergamasques… Contradictions des démocraties*, 30 March 2020 https://www.sciencespo.fr/osc/sites/sciencespo.fr.osc/files/masques_et_bergamasques_V6.pdf

A **second type of low-mortality country** includes Germany and Austria, which are akin to excellent decathletes, **ranking highly across virtually the whole range of indicators**: level of health spending, number of beds, quality of intensive care, and number of tests. It also includes the Scandinavian countries Norway and Sweden, which were able to make up for their low number of beds with the scale of their overall health investments, the quality of their intensive care, and for Norway, the number of performed tests.

Because they proved to be both lavish in their public health investments and far-sighted in terms of hospital capacity, all these states with low adjusted mortality rates were able to spare their populations from overly drastic measures. The only exception, albeit a moderate one, is South Korea. Undoubtedly bearing in mind the SARS precedent, it adopted stricter measures than average in the first days of the epidemic, unlike the first European countries affected.

Finally, among the countries with the highest adjusted mortality, a third sub-group includes countries – Hungary, Israel, and Greece – **that compensated for a more limited initial level of health resources with strict and immediate measures.**

> *These States made up for their initial disadvantage through comparable means deployed to various extents. Hungary and Israel, and to a lesser extent Greece, adopted drastic measures (close to maximal OSI). Greece sought to compensate for its relatively weak health infrastructure in the aftermath of the 2015 crisis by speeding measures to limit the epidemic to reflect lessons learned from the Italian overflow: it imposed early restrictions on mobility from and to foreign countries, facilitated by its insular position in the Schengen area and therefore its greater border control; closed schools and universities; prohibited large gatherings; and also attempted to double its intensive care unit capacity. Israel, which shared the record with South Africa in our sample for strictness, limited its citizens' authorized mobility area to 100 meters. It also partly entrusted the army with ensuring that rules were followed – in order to address the real internal threat of some "ultra-Orthodox" communities that placed religious rules for collective worship above public health rules.*

These strategies were all the more effective that they could draw on public health assets (quality of intensive care for Israel, and number of beds for Hungary) and, where applicable, on the **high adaptability of the health care system.**

> *Moreover, Israel is a special case with respect to the range of means it deployed – a wider range than that of Austria, with which it shares a large number of features. In addition to the policy of systematically testing people likely to be contaminated, either because they were showing symptoms or because they came from abroad (as in the case of Greece, it had the advantage of insularity), Israel deployed intrusive individual tracing techniques, the non-parliamentary adoption of which has given rise to much debate. Israel was also one of the first countries to (as early as February) adopt a policy of "dedicated quarantines"*[13]*, using different tools to follow the same strategy as Japan. While the latter used its reserve of beds to confine covid-19 patients within hospitals, thus limiting contamination of their social circles, Israel did the same by using the hotels deserted by tourists.*
>
> *Another strategy was to call for hospital volunteers to relieve healthcare workers – a variable that would be interesting to quantify for all countries, since it is indicative of the direct mobilization of populations. It was central in Italy, where the Civil Protection played a key role, to which I will return below.*

The Hebrew state's **responsiveness**, which reflects the political and institutional organization of a country at war, **was one of the indirectly measurable but essential variables in limiting the epidemic, as was "preparedness" for East Asian countries**, which unlike Western states had learned the lessons from previous epidemics over the past 20 years. Despite its initially limited resources, Israel is ultimately the only OECD nation to have come close to containing mortality to an extent that only the latter have achieved, but at an incomparable social and economic cost.

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[13] "Israel said planning for coronavirus with isolation units", *Times of Israel*, 20 February 2020, https://www.timesofisrael.com/israel-said-planning-for-coronavirus-with-isolation-units-tourist-site-closures/. On the notion of "dedicated quarantine", see James Wael and V. Elrayes Lawler, "Quarantine Unit Operations", *in* Theodore J. Cieslak et al., *Nebraska Isolation and Quarantine Manual*, University of Nebraska Press, 2020, p. 33-38.

3. **While each country's situation is unique, an examination of the patterns that are effective in limiting mortality enables, via comparison, a better understanding of the heterogeneity of countries with the highest mortality. The combination of preparedness/responsiveness/stringency of measures is also central here.**

The presence in this group of countries with a relatively weak healthcare infrastructure, such as Russia, and especially South Africa, Turkey, and Iran, **confirms the crucial nature of this parameter. To compensate for limited public health capabilities, the most immediate remedy is to adopt drastic lockdown measures.** South Africa most stringently did this, deploying the military to enforce them. The particular plight of Iran, which has a significantly higher adjusted mortality rate than any other country, is an experimental confirmation of sorts, by contrast, that for poorly equipped countries the lack of a response, or a late response, has disastrous consequences in the first phase of the epidemic's maturity.

The second confirmed criterion is the responsiveness and adaptability of healthcare systems. Their inadequacy translated into a very high adjusted mortality in Spain and Italy. The latter was heavily and enduringly penalized by epidemic progression among the major European countries (D1 to 22 February).

Spain (D1 to 29 February) was affected at the same time as France and Germany (28 February), but had a weaker healthcare system (the rank for cumulative indicators of "proactive" measures is 38 for Germany and 48 for France, compared to 60 for Italy and 75 for Spain). It is not Spain's early timeline that explains its high mortality per se, but rather the fact that it lacked adequate healthcare infrastructure, starting with the number of beds and the quality of intensive care services, to allow for any fumbling. As the gap with its Portuguese neighbor suggests, **Spain lagged in compensating for its modest health rank with sufficiently rapid reactive measures.**

The notion of "preparedness", which is central to public health[14], is not universally applicable. Poorly ranked Switzerland was one of the first countries to follow the WHO's recommendation, at the end of the 20th century, to develop a pandemic plan – one that it revised in 2018[15]. Although it prefaced its plan with Benjamin Franklin's motto, "If you fail to plan, you are planning to fail", Switzerland's update was based on an influenza control model that fell short of addressing the specificities of the coronavirus. The plan had maintained a post-Cold War legacy policy of sourcing medical goods from abroad; emphasized vaccination; and limited containment measures to public spaces. These elements combined with the practical difficulty of responsibility sharing between the Confederation and the cantons, particularly with regard to statistical information. As a result, the country was not able to capitalize on its "anticipation". **It is therefore a combination of preparation** *and* **responsiveness that is decisive, and all the more so when the healthcare infrastructure is inadequate**. The Swiss case also illustrates the possible discrepancy between private and public health spending, and the importance of the latter in combating a collective health scourge.

4. **The cohesiveness of the group of countries with intermediate mortality demonstrates the importance of political variables in fighting the epidemic. The group includes wealthy countries with a strong democratic culture[16] but a health infrastructure that, high quality aside, did not have a sufficient reserve of beds to address an epidemic overflow, thus tightly constraining authorities from the outset. Unlike the other two groups, the trajectories of these countries converged. During the observation period, authorities constantly juggled conflicting demands from populations for freedom of movement and activity on the one hand, and for protection against the virus on the other.**

[14] Andrew Lakoff, *Unprepared: Global Health in a Time of Emergency*, Berkeley, University of California Press, 2017.
[15] Federal Office of Public Health, *Swiss Pandemic Plan Influenza 2018*. See also Marc Guillaume, "Sur le papier, la Suisse était prête" [On paper, Switzerland was ready], *Le Temps*, 13 April 2020.
[16] In the sense that their governments are subject to continuous evaluation by citizens who are free to be represented and to organize themselves as they wish, and who receive information from a media whose journalists can exercise their profession without risking their freedom, let alone their lives.

The procrastination of the countries in the intermediate group is reflected in the rapidly growing stringency of their anti-epidemic measures. During the 30-day observation period, the OSI of countries in this group increased 3.7 times, compared with 2.6 times for low-mortality countries. Unlike comparable Human Development Index countries, their healthcare structures exposed them to risk in the event of an epidemic outbreak linked to insufficient compliance with precautionary measures, and of a sudden influx of seriously ill people in hospitals (the cumulative rank of this group on health policy variables was 61, compared to 38 for low mortality countries). The fact that the Netherlands, although highly ranked in this area (34), was slow to impose lockdown measures in the name of a herd immunity strategy, probably cost it a higher mortality level than that of countries in the first group.

The comparison between Portugal and the United Kingdom confirms the need for lockdowns in countries with modest healthcare systems in relation to their wealth (the cumulative rank on "proactive" variables is 82 for Portugal and 73 for the United Kingdom[17]). While Portugal compensated for this initial handicap with a strict lockdown on D1 and D10, and with abundant testing (ranked 3rd in the whole sample), the United Kingdom pursued a moderate lockdown, and mediocre testing (ranked 16th). This passivity translated into a much higher adjusted mortality rate than Portugal (over 60%) and France (over 50%) – a rate that I expect to see reassessed as more accurate death figures are published.

5. **The relatively homogenous group of countries with intermediate mortality illustrates the centrality, to understanding anti-epidemic measures, of authorities' anticipation of the population's attitudes towards measures restricting their freedom of movement and activity.**
   This real or assumed attitude is far from being universal and reflects each country's different way of dividing political responsibility for managing the epidemic across national and local governments, individuals, and civil society.

Every day since the beginning of the epidemic, a Ministry of Health official has announced the death statistics in France, whereas in Italy this has been the purview of the head of Civil Protection, an association that centralizes data from hospitals. This contrast illustrates national variations in the way responsibility for fighting the epidemic is shared between authorities and citizens.

France exemplifies countries where the authorities rightly or wrongly believed that they could not count on the population to adhere to "qualitative" containment measures that would have been limited to "social distancing" in public spaces, as in Germany. The official form that citizens were required to fulfill for each daily one-hour outing within a one-kilometer radius officially placed epidemic responsibility on the shoulders of political and administrative authorities.

Herein lies the key to the French paradox: the population is all the more critical of the state, because it expects the state to take charge of *all* aspects of epidemic management, including the provision of masks – unlike Germany, which stands in sharp contrast on this point. At the same time, France idealized the Swedish example of simply appealing to civic values, even though Sweden's so-called "light" strategy is based on both moral and legal accountability. Under a "law on communicable diseases", Swedish citizens are *co-responsible* for not spreading the epidemic: failure to heed this *responsibility* can lead to prison sentences[18] - a historical legacy of the powerful hold of "reform eugenics" in mid-20th century Sweden[19].

[17] In concrete terms, for example, the United Kingdom has poor public health statistics, ranking 12th out of 24 in overall public health spending, 21st on the number of beds, around 16th on the quality of intensive care, and 17th on the number of performed tests.

[18] Cf. Marta Paterlini, "Interview with Anders Tegnell", *Nature*, 580, 574, 21 April 2020, *doi: 10.1038/d41586-020-01098-x* and, for the legal content, *Legal Responses to Health Emergencies*, https://www.loc.gov/law/help/health-emergencies/sweden.php

[19] May I refer you to Paul-André Rosental, *A Human Garden: French Policy and the Transatlantic Legacies of Eugenic Experimentation*, New York, Berghahn Books (2020).

Besides the state and private individuals, another type of actor has played a key role in some countries, complementing and sometimes virtually replacing state action. All kinds of NGO and volunteer activities – such as the aforementioned Italian civil protection system – were mobilized, be it to replace hospital staff, bolster prevention policies, address impoverishment and even food shortages for people deprived of income, and even take over a large part of the actual medical control of the epidemic, particularly in sub-Saharan Africa, by drawing on precedents[20]. The Iranian case of "managing disorder rather than disposing order" is a good example of this **use of subsidiarity**, which has since appeared *mutatis mutandis* in countries that were affected by the pandemic later.

> *In Iran, "virtual debate on social media and the news outlets, grassroots organisations, charities, social workers and medical professionals worked strenuously to create a mobilisation web of intervention aimed at informing, safe-guarding, and reducing the risks of the viral outbreak. These networks of mobilisation are organised through local groups of citizens, in NGOs, charities and also mosques. They supply food and personal protective equipment to citizens in need. They also act as a safety net against extreme poverty for those workers which have been most affected by the economic impact of Covid-19, in particular informal workers who number in several hundred thousand"[21].*

6. **Beyond the apparent naturalness of the death figures, and of the legal measures taken to address them, all aspects of the covid-19 epidemic involve a significant role for the social sciences as a prerequisite for any comparative interpretation. Such fundamental notions as people's perception of risk, containment, and the distribution of institutional powers, call for national contextualization in each case.**

Consider the seemingly obvious notion of "confinement", the most dramatic embodiment of restrictions on individual liberty. It appears simple to characterize since it has a legal definition. But this administrative and legal concept only accounts for part of people's behavioral adjustment in response to the epidemic. Measurements of proxy variables, which I will delve into during the presentation, indicate that even in nations and regions that maintained full freedom of movement, populations often took it upon themselves to limit their movements, and this self-confinement may have been as impactful as imposed strict lockdowns.

These more abstract concepts are especially tricky. Two of the dimensions I mentioned above – responsiveness and subsidiarity – reflect a relationship between institutions that exists across all cases: that between the state, regions, NGOs, and healthcare systems. The interplay between these four dimensions, complicated by the wide range of elements and logics at work in the "state" (especially if regional authorities, Parliament[22], etc. are also considered), unfolds in both a purely national context and according to dynamics that call for comparisons. For example, the central government placed responsibility on regional authorities in Russia, and even happened to directly oppose them in the United States.

Similarly, the very perception of the risk associated with the epidemic calls for comparison. As we have seen, it was particularly extreme in countries that sensed their healthcare systems would fall short of meeting their citizens' expectations, and anticipatorily closed their borders and adopted various measures to limit mobility and collective activities. Some cases were specific: South Africa adopted particularly severe measures because it considered its population to be at very high risk, with approximately 8 million people

[20] Florence Bernault, *Quelques enseignements de l'histoire des épidémies en Afrique* [Lessons from the history of epidemics in Africa], Center for History at Sciences Po, Webseminar, 20 April 2020, http://chsp.sciences-po.fr/publication/quelques-enseignements-de-lhistoire-des-epidemies-en-afrique-florence-bernault

[21] Maziyar Ghiabi, *Managing Disorder: Iran's Governance Amidst the COVID-19 Pandemic*, Istituto per gli studi di politica internazionale (ISPI), 12 May 2020, https://www.ispionline.it/it/pubblicazione/managing-disorder-irans-governance-amidst-covid-19-pandemic-26080

[22] Olivier Rozenberg, *Inquiries by Parliaments The political use of a democratic right*, Report to the European Parliament's Committee on Citizens' Rights and Constitutional Affairs, March 2020, https://www.europarl.europa.eu/RegData/etudes/STUD/2020/648709/IPOL_STU(2020)648709_EN.pdf

suffering from HIV, tuberculosis, and/or pneumoconiosis linked to mining activity. Still reeling from the economic embargo, the Iranian government deliberately chose to preserve economic activity to the greatest extent possible rather than minimize the number of deaths[23].

7. **The social state plays a decisive role here. It acts as a real hidden variable at work behind the great apparent heterogeneity of anti-epidemic strategies.**

A crucial comparative variable that is too often omitted in analyses is the role of the social state, and more specifically, of the interrelated formal sector of the labor market and full-benefit employment. The contrast between Europe and the United States is exemplary here. It reveals the strength of this hidden double variable. The strength of the welfare state, or in any event states' readiness to implement massive emergency social policies in the form of wage substitution, gave European states the ability (but also the terrible responsibility) to determine the balance between paying *for* lives and paying *in* lives[24].

It is feared that this tradeoff could prove less favorable to preserving human life in the United States. Despite its wealth and democracy, its working population does not enjoy the same level of collective social protection and full-benefit jobs. In addition to ideological hostility to any public intervention, the population's at times violent reactions to measures limiting freedom are reflected in independent professions' fear of being deprived of income, with knock-on effects given the indebtedness rates of individuals and the mortgage system.

From this perspective, the American situation shares similarities with emerging countries threatened by the virus but dominated by the "informal" sector of the labor market, making the attempt to strike a balance even more tragic. While the case of India perhaps best illustrates this reasoning[25], to stick to the countries in my sample, the same applies to South Africa, where the population has expressed its opposition to stringent lockdowns and their economic consequences.

8. **More speculatively, it appears that the statistical results produced in this paper suggest the need to reflect on the *morphological* limits of international epidemiological comparisons. Three state entities should probably be considered in further studies: the Empire, the State, and the City.**

I will conclude with the limitations of my approach, pertaining to the very definition of statistical adjustment. In the initial version of this work, published in French, I underscored the limitations of the demographic and public health indicators I had chosen. Another problem needs to be addressed here because it points to possible paths forward for this study: its geographical level of observation. Dictated by the national statistical framework, it actually covers three types of entities: the Empire, the State, and the City.

Some of the states studied in this paper are in fact too large to be fully compared with the others: vast Russia, sparsely populated Canada, and the United States with its diverse healthcare systems (not to mention the diverse social conditions) are therefore included here only for the sake of global comparison, to set orders of magnitude. It would be interesting to duplicate the analysis on a few states in the United States, comparing them with European nations; as it would be to go down to the macro-regional level for the

[23] Maziyar Ghiabi, *Managing Disorder*…, op cit.
[24] For more on this distinction, cf. Ariel Colonomos, *Evaluer le prix de la vie en temps de pandémie*, [Assessing the cost of life in pandemic times], 22 April 2020, https://www.sciencespo.fr/fr/actualites/actualités/evaluer-le-prix-de-la-vie-en-temps-de-pandemie/4730
[25] Amartya Sen, "Overcoming a pandemic may look like fighting a war, but the real need is far from that", *Indian Express*, 8 April 2020, https://indianexpress.com/article/opinion/columns/coronavirus-india-lockdown-amartya-sen-economy-migrants-6352132/

largest nations: India, Russia, Brazil, and China. The latter was excluded from this analysis due to great uncertainties about the quality of its sources. Note that the reverse approach would also be possible: to compare these empire states with the European Union as a whole.

But the problem doesn't end here. Some authors erroneously object that the national framework obscures the understanding of epidemic dissemination, which follows a primarily geographical logic. This observation is indeed applicable to some of the countries in the sample. The most eloquent case is perhaps that of Switzerland. Its very high adjusted mortality in fact consists of three different levels that reflect the country's three linguistic zones. Each of these zones reflects the mortality of its respective border country: the highly affected, Italian-speaking Ticino is close to Italy; the mortality in French-speaking Switzerland is akin to that of France; and German-speaking Switzerland is much less affected, in alignment with Germany and Austria[26]. Similarly, the results of many countries with very high national mortality actually reflect one or two particularly affected regions: Lombardy in Italy, the regions of Madrid and Barcelona in Spain, or the Moscow region in Russia.

But besides my attempt to mitigate this effect by including population concentration among the variables for correcting mortality, it would be fallacious to dissolve states by reducing them to one or two martyr regions. The purpose of this paper was to better compare political responses to the epidemic. From this perspective the national framework plays a major role in terms of legislation and institutions; of regional comparison (fundamental in Italy); of the decision, deemed necessary or not depending on the state, to close internal borders; and above all of resources. France mostly succeeded in eschewing overrun hospitals, because when the epidemic peaked, the State transferred patients suffering from the most serious complications to healthcare institutions located in the least affected regions. This confirms both the centrality of national indicators on hospital infrastructure and their limitation, since the parameter of the number of beds available in intensive care units across the country was only operational insofar as political authorities gave themselves the means to activate it. France was also able to evacuate patients to neighboring Germany, again demonstrating a variable of state action: diplomatic relations.

But after Empires and States remains the case of Cities, or more precisely quasi City-States. For both Belgium and Switzerland, the internal circulation indicators that I selected, based on citizens' number of overnight stays, probably overestimated the adjusted mortality: given the density of the urban fabric, which is very well connected by road and rail infrastructure, daily round trips are common. In the Swiss case, an additional mechanism may be at play. Between its border cantons with heavy circulation with foreign countries and its small mountain cantons, the Confederation embodies the two processes that are comparatively conducive to the spread of the epidemic.

These few remarks show how relevant the current pandemic is to a well-known methodological question: the conditions enabling international comparisons.

[26] Reto Fehr, "So stark wirkt sich Covid-19 auf die Todesfall-Statistik in den Kantonen aus", *Watson*, 26 April 2020, https://www.watson.ch/schweiz/coronavirus/973207961-covid-19-die-todesfaelle-in-den-drei-schweizer-sprachregionen

SOURCES

Population and density: https://www.populationdata.net/palmares/population/

Population concentration: https://www.populationdata.net/palmares/villes/

Share of people aged 65 and older:
https://donnees.banquemondiale.org/indicator/SP.POP.65UP.TO.ZS

Mobility flows (internal, from and to foreign countries): World Tourism Organization, *Compendium of Tourism Statistics dataset*, Madrid, 7 November 2019 (data used: 2018 or the most recent available ones). http://statistics.unwto.org/method_notes_tourism_stat_database_2019ed

Oxford Stringency Index J1, J10, J30: https://www.bsg.ox.ac.uk/research/research-projects/oxford-covid-19-government-response-tracker

Tests: number of tests per inhabitant during the D1-D30 period.
https://ourworldindata.org/covid-testing, or failing that
https://www.worldometers.info/coronavirus/

AMI (resp. **Ischemic stroke**): mortality rate after a month of intensive care in a given hospital for acute myocardial infarction (resp. ischemic stroke). Source : *Panorama de la santé 2019,* OCDE.

Number of hospital beds per inhabitant:
https://donnees.banquemondiale.org/indicateur/SH.MED.BEDS.ZS

Health spending: WHO https://apps.who.int/nha/database/ViewData/Indicators/en (2017, in $).

APPENDIX

TABLE 1 Adjusted vs gross mortality (Day30)

Countries	*Day30*	*Total deaths*	*Gross mortality*	*Adjusted mortality*	*Rank*
Austria	5/4	204	0,23182%	0,10726%	6
Belgium	4/4	1283	1,12544%	2,27444%	21
Canada	5/4	280	0,07388%	0,50492%	13
France	29/3	2606	0,38896%	0,39153%	11
Germany	29/3	541	0,06518%	0,11393%	8
Greece	5/4	73	0,06822%	0,09221%	5
Hungary	16/4	77	0,14898%	0,11037%	7
Iran	25/3	2077	0,25360%	82,14%	24
Israel	8/4	73	0,08022%	0,05909%	3
Italy	23/3	6077	1,00446%	3,20919%	22
Japan	21/3	36	0,00286%	0,00483%	1
Netherlands	4/4	1651	0,95988%	0,48300%	12
Norway	3/4	59	0,10926%	0,07885%	4
Poland	11/4	208	0,05417%	0,58300%	14
Portugal	10/4	435	0,42233%	0,37573%	10
Russia	15/4	198	0,01350%	1,36744%	18
South Africa	14/4	27	0,00468%	1,11910%	16
South Korea	20/3	94	0,01815%	0,01360%	2
Spain	30/3	7716	1,65225%	1,48736%	20
Sweden	3/4	358	0,34757%	0,18958%	9
Switzerland	2/4	536	0,63059%	1,42316%	19
Turkey	15/4	1006	0,18512%	3,69662%	23
United Kingdom	2/4	2921	0,43925%	0,60208%	15
United States	5/4	9616	0,29113%	1,13234%	17

Legend:
Countries ranked by decreasing adjusted mortality rate.
In red: countries that improved their position by more than 3 ranks from the initial crude mortality data.
In blue: countries that fell by three ranks according to the same criterion.

TABLE 2 Proactive measures: health policies and adjusted mortality

Countries	*Total health spendings*	*Public health spendings*	*Hospital beds*	*Quality of ICUs AMI*	*Quality of ICUs Ischemic stroke*
Japan	11	6	1	18	1
South Korea	16	16	2	17	2
Israel	13	14	16	8	9
Norway	3	1	13	1	3
Greece	18	18	12	n.a.	n.a.
Austria	6	5	5	10	11
Hungary	19	19	6	n.a.	n.a.
Germany	5	4	3	16	10
Sweden	4	3	23	3	8
Average rank	***10,6***	***9,6***	***9,0***	***10,4***	***6,3***
low mortality countries					
Portugal	17	17	15	15	18
France	10	9	7	9	13
Netherlan.a.s	**7**	10	10	1	6
Canada	8	7	21	5	14
Polan.a.	20	20	8	4	19
United Kingdom	12	11	20	14	16
Average rank	***12,3***	***12,3***	***13,5***	***8,0***	***14,3***
intermediate mortality countries					
South Africa	22	23	19	n.a.	n.a.
United States	1	2	18	6	5
Russia	21	22	4	n.a.	n.a.
Switzerlan.a.	2	12	11	n.a.	7
Spain	15	15	17	11	17
Belgium	9	8	9	12	15
Italy	14	13	14	7	12
Turkey	24	21	22	12	4
Iran	23	24	24	n.a.	n.a.
Average rank	***14,6***	***15,6***	***15,3***	***9,6***	***10,0***
high mortality countries					

TABLE 3 Reactive measures: policy stringency and adjusted mortality

	STRINGENCY			
Countries	*Day1*	*Day10*	*Day30*	*Tests*
Japan	9	18	22	24
South Korea	6	9	18	11
Israel	7	2	1	4
Norway	23	16	15	1
Greece	11	2	18	22
Austria	17	1	3	5
Hungary	1	5	8	18
Germany	14	18	17	6
Sweden	23	24	24	12
Average rank	***12,3***	***10,6***	***14,0***	***11,4***
low mortality countries				
Portugal	9	6	12	3
France	11	20	6	19
Netherlands	20	9	8	14
Canada	20	23	12	7
Poland	3	9	15	19
United Kingdom	17	20	17	16
Average rank	***13,3***	***14,5***	***11,7***	***13,0***
intermediate mortality countries				
South Africa	4	6	1	23
United States	14	20	18	12
Russia	4	8	8	7
Switzerland	11	17	12	2
Spain	17	13	6	9
Belgium	14	13	8	10
Italy	7	15	3	15
Turkey	2	2	3	17
Iran	20	9	23	21
Average rank	***10,3***	***11,4***	***9,1***	***12,9***
high mortality countries				

TABLEAU 4

Summary representation of the public health and testing of each block of countries

Countries	Rank	Total health spendings	Public health spendings	Hospital beds	Quality of ICUs AMI	Quality of ICUs Ischemic stroke	Tests
Japan	1		6	**1**		**1**	
South Korea	2			**2**		**2**	
Israel	4				8	9	**4**
Norway	5	**3**	**1**		**1**	**3**	**1**
Greece	6						
Austria	7	6	**5**	**5**	10		**5**
Hungary	3			6			
Germany	8	**5**	**4**	**3**		10	6
Sweden	9	**4**	**3**		**3**	8	
Portugal	10						**3**
France	11	10	9	7	9		
Netherlands	12	7	10	10	**1**	6	
Canada	13	8	7		**5**		7
Poland	14			8	**4**		
United Kingdom	15						
South Africa	17						
United States	18	**1**	**2**		6	**5**	
Russia	16			**4**			**7**
Switzerland	19	**2**				7	**2**
Spain	21						9
Belgium	22	9	8	9			10
Italy	24				7		
Turkey	23					**4**	
Iran	25						

Legend: For each indicator, the top five countries (rank shown in red) and those ranked between 6th and 10th place are selected.

TABLEAU 5 Stringency of anti-epidemic measures in D1, D10 & D30

(Oxford Stringency Index)

Countries	*D1*	*D10*	*D30*
Japan	29	48	62
South Korea	48	67	67
Israel	38	90	100
Norway	0	55	76
Greece	24	90	67
Austria	14	95	95
Hungary	90	86	86
Germany	19	48	71
Sweden	0	29	43
Average	*29*	*67*	*74*
Portugal	29	81	81
France	24	43	90
Netherlands	5	67	86
Canada	5	38	81
Poland	57	67	76
United Kingdom	14	43	71
Average	*20*	*54*	*75*
South Africa	52	81	100
United States	19	43	67
Russia	52	71	86
Switzerland	24	52	81
Spain	14	62	90
Belgium	19	62	86
Italy	38	62	95
Turkey	67	90	95
Iran	5	67	57
Average	*32*	*66*	*84*